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Strategies for Math Teachers to Help ELLs Succeed

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by
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Abstract

This capstone project aims to support middle school math teachers and other practitioners who work with English Language Learners. In my school, teachers notice that English Language Learners struggle to get started on most tasks, have a hard time answering word problems and generally do not participate. In this paper, I discuss some of the reasons why general education teachers struggle to successfully teach English Language Learners. My goal is to provide research based ideas and strategies to general education teachers working with ELLs in math classes. I created and will implement a professional development for teachers. It is designed to help teachers with vocabulary acquisition and application, as well as to promote independent work and student participation. In addition, to addressing linguistic and socio-cultural challenges, the PD aims to enhance evaluation and assessment outcomes for ELLs. All teachers can teach English Language Learners but not all are unaware how to teach them in a way that they can learn. I believe that all of these strategies can be used in any classroom.

Keywords: ELLs, math, professional development, language, cultural, assessment challenges

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CHAPTER 1

Why are these kids failing math? Isn't math a universal language? These questions are echoed by educators of English Language Learners (ELLs) in many school districts. It's time to dispel that myth. The fact is that math is not a universal language, and educators need to be attentive to the nuances and complexity of the English language even when teaching math (Barrow, 2014).

Identification of the Problem

In my classroom I teach middle school mathematics to a variety of students. My English Language Learners, which from this point I will refer to as ELLs, struggle the most with mathematical academic language, analyzing and solving word problems, living with the stresses of being in a new country as well as taking assessments and performing at grade level in class, school, and state assessments.

> Many content teachers now have ELLs in their classrooms, because ELLs spend only a small part of their school day in the English as a Second Language (ESL) classroom. For the remainder of their school day, ELLs are assigned to regular classrooms for their math, social studies, science, and other content instruction, which is usually conducted in English (Carrier, 2005, p.4).

Many math teachers in my building are experiencing ELLs in their classroom and those teachers do not do anything different in their instruction whether they have ELLs in their room or not. This is discussed during our mathematics meetings and after school. Neglecting ELLs is a disservice to this student population and to the field of mathematics. That is why is important to provide teachers, and math teachers in

ELLs not only have the language barrier as a burden that follows them around but they also have the social culture aspect that stresses them out. Many of the ELLs in my building are first generation immigrants and their parent's hold them to a high standard. They want them to succeed and become successful. Depending on where the ELL comes from there parent's may hold mathematics on a pedestal. In my classroom sometimes ELLs show up and have not had formal education or school in a number of years. In the country they came from it was normal to stop attending school as early as third or fourth grade. Now, these students have a whole other added layer of stress. These new comers may not be familiar with what teachers' expectations are of their students, or in their culture they might have learned they cannot ask questions. They have to learn all these routines on top of everything else. Many times ELLs start to feel confident in the linguistic structures of English and then an assessment comes and they do not do well. Their social language and academic language are very different. Social language advances much faster than academic language, this leads to frustration and disappointment when they cannot perform well on an assessment or evaluation. If teachers learn new strategies, then their ELLs might perform better on their assessments. I have talked about many of the challenges I am faced with regularly when I am teaching my ELLs in an Integrated Co-Teach (ICT) setting.

Now, in Chapter 2, I will share ideas and strategies that research has proven can be used to support English Language Learners. I am going to tell you about some techniques that will introduce and strengthen your understandings of ELLs. Understanding ELLs is not just a problem happening in my school but in fact it is

happening in many places. In Chapter 3, I will lay out a professional development for middle school math teachers that will help enhance their knowledge about ELLs academic needs and give them resources to help promote and enhance their learning of ELLs. Lastly, in Chapter 4, I will conclude with implications for teaching ELLs. I will talk about what I learned and what future research will need to be done.

CHAPTER 2

Linguistic Challenges of Academic Language

I have noticed that vocabulary instruction is really important for English Language Learners to have academic success. Research indicates that the development of vocabulary plays the most critical role in ELL's language acquisition and academic achievement (August, Carlo, Dressler, and Snow, 2005; Chung, 2012). Many general education teachers are unware that ELLs need to hear and use new vocabulary more frequently than other students to acquire it. "Explicit vocabulary instruction is important for ELLs to be successful in schools" (Huynh, 2017).

> Most recent research and studies on teaching vocabulary have focused on the necessity to expose ELLs to new words through oral and written resources from several contexts within the curriculum. Accordingly, in order to capture the global and functional meaning of new vocabulary, language learners are highly encouraged to be exposed to the word knowledge explicitly (Alharbi, 2015, p. 502).

In addition, Alharbi indicates that second language learners need to be exposed 5-16 times to a word to master it.

ELLs need to understand academic vocabulary to enhance their reading comprehension. Learning academic vocabulary, practicing with that vocabulary, and applying it in the math classroom is important if we want ELL students to experience success in mathematics. Therefore, to facilitate learning, using, and transferring knowledge to a wide range of mathematical problems, teachers must modify instruction

for ELLs. For instance, it is so important that teachers provide clear, coherent, and level appropriate definition to students. I find supporting vocabulary with pictures is very beneficial. Many times if you have student look up or define their own words they run into definitions that confuse them. More specifically, if their academic is low they are to struggle more. For example, below is a definition from Dictionary.com that was searched in 2019, that defines the word "analyze."

> Analyze- verb (used with object), an-a-lyzed, an-a-lyz-ing, to separate (a material or abstract entity) into constituent parts or elements; determine the element or essential features of (opposed to synthesize): To examine critically, so as to bring out the essential elements or give the essence of: to analyze a poem. (para 1)

This definition is not going to help an ELL understand how analyze is used in a word problem or directions. Relying on a dictionary definition may not even help some of the native English speakers in the class. It is wordy, with a high frequency of academic vocabulary and multiple definitions. Some of the words are open to interpretation or further defining.

In mathematics we might give directions that say, "analyze the word problem and underline relevant information." Cross out the information that is extra, which is anything we do not need to complete the problem. If an ELL does not understand what this word means, then they are not going to be able to do the task at hand. In addition to saying analyze the problem, we might say to the class read and understand the problem. *Break down* the problem into two categories. The categories might be statements we

need to solve the problem and statements we don't need to solve the problem. For some students and ELLs, a graphic organizer or a T-table might be helpful.

> The use of comparative structures (e.g., "greater than" and "less than," "n times as much as") and prepositions (e.g., "divided by," "divided into") pose serious difficulties for students who are trying to learn the content while, at the same time, trying to learn the language used to access that content." (Slavit & Ernst-Slavit, 2007, p. 7)

These phrases are very different in a mathematical context then in an English Language Arts context. In addition to this, semantics can also create a problem for English Language Learners. In my classroom I teach a unit about algebraic phrases. If I write, "3 less than 4 times a number," on the board many ELLs would translate this as 3- 4x when it should be written as 4x – 3. When teaching topics like this it is really important for teachers to be clear and explicit with their definitions and reasoning. Be prepared to explain the why behind where the minus three goes.

Many times in mathematics there are words or phrases with multiple meanings. Multi-level words disempower English Language Learners very fast. Students in math class may believe they understand the words and then they find out differently.

> For example, Slavit and Ernst-Slavit (2007) said, "the word "table" can refers to a "times table" for multiplication facts or a "table of values" for graphing functions. "Table" may also have very different meanings and usages in non-mathematical contexts such as "timetable" in social studies, "table of contents" in language arts, "water table" in physical science, and "periodic table" in chemistry" (p.8).

English Language Learners might have heard the word table and immediately thought of the place where they sit at to have dinner. Imagine having that as your definition and then try understanding what they are thinking. Giving ELLs additional ways to relate these ideas to the real world helps make them stick better therefore, we should talk slow and pause often. Allow extended wait time when you are asking questions. Extended wait time gives ELLs time to acknowledge what is being said and recall what they know allowing them to participate more.

Burdens English Language Learners Carry

ELLs carry a burden when it comes to socio- cultural challenges. They struggle with navigating life's demands in and out of school. Their parents may have moved here to provide them with more opportunity.

> According to Rubinstein-Avila (2003) Today's adolescent ELLs (first and second-generation immigrants) are confronted with a different economy, one that has been described by using the hourglass as a metaphor: The skilled and educated workers enter top-level jobs, while unskilled workers are relegated too repetitive, badly paid jobs with little, if any, security and opportunity for upward mobility. In today's economy an adolescent with a high school diploma and only mediocre academic literacy skills is much less likely to achieve middle-class status as an adult. Therefore, in order to succeed in the current economy, adolescent ELLs need to obtain much higher levels of education and develop solid academic proficiency in English (p. 131).

This could be very stressful to an adolescent especially early on. They come to a new country, a new school with a new language, with different standards, goals and aspirations. Some students enter school and teachers find out they have had minimal to no formal schooling education but, are expected to perform, understand and succeed at the same rate as any native born student.

English Language Learners Assessment and Evaluation Struggle

Many times teachers are not aware of their ELLs proficiency level. Teachers assume students understand the vocabulary and procedures and then when it comes to testing time the ELLs cannot perform where the teachers expected them to. "An example of an extreme linguistic burden can be seen in the following ninth grade word problem taken from the practice items for the Florida Comprehensive Assessment Test mathematics sections. Students were asked to calculate volume." (Pappamihiel and Mihai, 2006, p.37)

> Pappamihiel and Mihai, 2006, give an example question from Florida's Comprehensive Assessment Test. The question says, an engineer is designing a metal gasket for a spacecraft. The gasket has the shape of a cylinder with a cylindrical hole through the center. The diameter of the gasket is 9 centimeters, and its height is 4 centimeters. The diameter of the hole is 3 centimeters. What is the volume of metal, in cubic centimeters, that is required to make the gasket? (p. 37)

The ELL student might know how to calculate volume. They might understand the mathematical calculation that is expected and may have even done many problems.

According to Pappamihiel and Mihai (2006), “even though the necessary information to solve the problem still exists in the item, it is inaccessible for this ELL. Had this problem had a labeled diagram and simple language an ELL may have been able to answer the question” (p.37). This is why the state should label the diagrams and use different, more accessible language. If you are testing ELLs in math it needs to be done so in a way that they can show they know the content even if there is still a language barrier

CHAPTER 3

In this chapter I will present a rationale for the professional development and its elements to assist math and general practitioners work with ELL students in main stream classroom. The professional development includes a Power Point and it will take place during two consecutive Mondays. The reason for doing this professional development over two days is to give teachers the opportunity to go back to their classrooms and try the activities or routines, to discuss planning, results of integrating the activities, and possible questions about and changes to practice. First, I present the two-day agenda and describe its content in detail. The discussion is framed around the material I created (see Appendix A) and findings from my Case Study (see Appendix B).

The agenda will be as follows:

Day 1- Introduction (see Appendix A: Figure 1 About Me), Ways to Get English Language Learners to Participate More

Learning target for teachers: Teachers will be able to incorporate two strategies in their lesson to engage students.

Day 2- Word Walls, Word Problems, Cultural Awareness

Learning target for teachers: Teachers will be able to incorporate two strategies in their lesson to engage students and have a better understanding of cultural awareness.

Day 1

This professional development is designed to help general education teachers learn new strategies to increase ELL participation in the classroom and improve ELLs understanding of academic vocabulary better. The goal is to learn some of these strategies

and implement them in all classrooms. Ideally, using these strategies will enhancing learning and help Ells perform well on assessments and evaluations. The goal for day one is to discuss techniques and strategies that I use in my classroom that has increased ELL participation.

Many times at the beginning of the period ELLs have a difficult time getting started. The reason could simply be that the student does not know what to do. How many times have teachers put a Do Now or Beginning of the Period, which I call BOP, question up on the board with written directions. As teachers, we expect our students to come in, unpack and get started on the assignment on the board while we greet the rest of our students at the door.

According to Wright (2015), students must receive comprehensible input, and much of that input comes from listening in the context of meaningful interaction. It is very possible that our ELLs do not have the language required to decode what the word or directions are asking them to do. Therefore, as indicated in the previous chapter, students might need to hear it in order for students to complete initial activities - Do Now's, Warm Ups, BOPs, or any other activity that aims to activate previous knowledge. Teachers, who have ELLs, need to read the Do Now to the class while they are getting settled and working on it. Teachers should not wait until students are ready to go over the Do Now to read the directions because teachers assume the students can read and make sense of the directions. Teachers need to make sure they read the directions out loud to the class so that the ELLs in the room can hear it and see it.

Since it is clear that verbal language must come first I suggest doing a Noticing activity or a Wondering activity. In practice, having the whole class work on these types of activities with no right or wrong answer encourages ELLs to participate. These activities are a big confidence builder for ELLs because in general there are no wrong answers. These activities can also be done as Do Now's. A Noticing or Do Now activity can be done in many different ways and has many different correct answers. Students tend to build on each other ideas.

Now, I am going to hand out a Noticing and Wondering Do Now problem that I have done with my students. (See Appendix A, Figure 1.1. Warm Up Activity Day 1) I want the teachers in my professional development to take 2 minutes and make a list of anything you notice on the Noticings side of your paper and list anything you wonder on the left side. Under Wonderings you might reference your noticings. (See Appendix A, Figure 1.2. Pizza Noticing Do Now Day 1) When doing this activity show your students Figure 1.2. Pizza Noticing Do Now Day 1 and ask them to write down what they Notice or Wonder.

Teacher will give everyone 2 minutes to write everything they notice and wonder about these different pizzas. There are two suggested approaches to use in class when talking about this activity. Approach number one is the teacher could walk around and take notes about what some of the students are writing down and share it out asking if anyone else wrote the same thing or idea down. For example, a teacher might say Student 1 noticed that the more toppings the more the pizza cost. Did anyone else notice that? Student 2 noticed that having 2 extra toppings cost $2.98 more and she wonders if that

means 1 topping will cost $1.49 extra. Did anyone else notice that? This option gives everyone in the classroom a voice and you as the teacher has control of what is being said and control of leading the thinking down a more thoughtful road. Approach number two is to go around the room and have each student say one of their noticings or wonderings and list them on the board. Doing activities like this requires the class to slow down and think, it allows everyone to contribute regardless of their ability and even though it requires a lot of planning you can group students based on their answers and have each group working on a level appropriate extension task. In my opinion and from my classroom observations, I feel students are so use to being told what to do that they have a hard time thinking on their own. In order to get all students to participate, including ELLs who as I stated in Chapter 2 tend to keep silent, I suggest, going around the room ask everyone to share something that they noticed or wondered (see Appendix A, Figure 1.2) This increases student participation because all students will have something written down at this point. This strategy helps create an environment where everyone has a voice and everyone in the room is capable of answering.

After going around the room and sharing answers, the teacher will write two questions on the board and ask students to copy them on their note catcher:

1) How much do you think the pizza place is charging for each topping?
2) How much would you expect to pay for a cheese pie only with no toppings?

Give the class a few minutes to see if they can answer the new questions then discuss them. Doing an activity like this could set the class up for discussing multiple

mathematical concepts. A few that might be real obvious are; how to write an equation, how to solve an equation with a variable, how to find unit price or unit cost.
This activity might grab everyone's attention and get them thinking and started.

For the next activity (see Appendix A, Figure 1.3 Manipulative Activity Day 1**)** Students will be asked to work with the person next to them on this problem and the catch is you have to show your answer using manipulatives only. For students who might have a hard time getting started you can prompt them by saying try to show what the race looks like. Some useful strategies for ELLs and other students include drawing, the use of models or blocks, or an open number line. No one is allowed to solve this problem algebraically. Wright (2005) also states that, when students are in situations where they must communicate with others and create comprehensible output, they may become aware of gaps in their developing language and may be pushed to pay more attention to input containing what they need to successfully communicate with others. An activity that requires manipulative (see Figure 1.3. Manipulative Activity Day 1) will assist students to talk about how they can accomplish the task at hand. There are many ways that manipulatives can be used to answer a math problem, (see Appendix A, Figure 1.4) in this particular case the students used the graph paper boxes to represent the meters. For Isandri, the left graph, the picture clearly shows that she ran 3 meters per second. After every three boxes they wrote one second. On the left side the head start is clearly shown, and you see after every two boxes one second was noted. When the students finish making the representation of each race they lined them up to see where the seconds matched. Whether a student is proficient in this language or just learning it, ELLs are

able to create a scenario using manipulatives, the picture in (Appendix A, Figure 1.4) shows the clear head start given to the younger sister, the distance each sister ran per second, and when the tie took place. Other students used different color blocks to represent the distance and where every three seconds took place they represented it by changing to a different color. At the end they were able to count each set of colored blocks as one second. An activity like this takes time but it helps students realize there are many ways to come up with answers.

A complementary activity may include, having the students do a gallery walk after all the groups have an answer is a really great way to allow the other students in the class see how their peers approached the problem. The gallery walk also lets students take ownership of what they have done and feel accomplished. The walk really puts in perspective the different approaches and the thought processes that took place. It also allows students to asked questions about these approaches. Another activity teachers' can do with their students to create more conversation and participation is an activity where the teacher leaves the question off of the word problem (see Appendix A, Figure 1.5 Leaving Off the Question) Students can engage in Level 1 questions that exhibit memory of previously-learned material. ELLs in mainstream classes can feel successful and engage in the activity by demonstrating understanding of facts, organization, interpreting etc. which in Think-Pair-Share groups will help students move to Level II types of questions to obtain an answer (see Appendix A, Figure 1.5 Leaving Off the Question) This next activity really puzzles students the first few times they see it. The first question to ask them is, what do you notice about the two math problems (in Appendix A, Figure

1.5) The question is missing! Now what! This activity is done best as a Think- Pair-Share. According to Wright (2005), Think-Pair-Share provides built-in wait time in a low-risk environment. Everyone is talking at once, and the ELLs are talking with only one peer. This is a great way for the ELLs in your classroom to interact with their peers and learn. The interaction between students during a Think Pair Share is different than the interaction during a whole class activity. This works at the middle school level as well as the elementary school level. See Appendix B, Case Study. When working with open ended word problems like (Appendix A, Figure 1.5) ask students to think about what kind of questions can be answered with the information provided. Generally, pick open ended questions or questions that could create more than one scenario to solve the problem. The directions for this activity is to think about what question might be asked at the end to solve the problem, give 2-3 minutes of think time, could be as much as 5 minutes if there are a few questions. Then, pair students up with each other to share the questions they came up with. Ask the students to solve with their partner, the questions they came up with.

For problem one (in Appendix A, Figure 1.5) it states, the low temperature on Monday was -8ºF. The high temperature on Monday was 18 degrees warmer than the low temperature. The low temperature on Tuesday was 7 degrees warmer than Monday's low of -8ºF. The low temperature on Tuesday was 3 degrees warmer than Monday's low. The following listed below are some of the questions students might come up with. What was the high temperature on Monday?

1) What was the low temperature on Tuesday?

2) What was the high temperature on Tuesday? What was the average low temperature on Monday? Tuesday?
3) What was the average high temperature Monday? Tuesday? What was the average temperature on Monday? Tuesday?
4) Are the high and low temperatures on Monday proportional to the high and low temperatures on Tuesday?
5) Graph the high and low temperature.
6) What is the absolute value of the low temperature on Monday? Tuesday?
7) What is the absolute value of the high temperature on Monday? Tuesday?

Problem two (in Appendix A, Figure 1.5) it states, Jose wants to invite 20 friends to his birthday, which will cost his parents $350. Jose decides to invite 15 friends instead. Some possible questions students will create for problem number two might be the following.

1) How much will it cost Jose's parents to invite 15 friends?
2) How much does it cost to invite each friend?
3) Find the unit cost? Or unit rate?
4) What if Jose decided to invite 17 friends what would Jose's parents have to pay?
5) Solve using a proportion?
6) Solve by writing an equation and solving for the variable.

Doing an activity like this creates self-differentiation, allows students to think and communicate, and also helps students become more comfortable with word problems.

Teachers will need to implement strategies for language and grouping that include a variety of "questioning techniques", warm up activities, etc. and report back to the group at our next meeting. Be prepared to reflect on how any of these activities went in your own classroom

Day 2- Word Walls

Today we are going to discuss what teacher can do specifically for ELLs to help strengthen ELLs academic vocabulary. We are also going to discuss some ways the ELLs in your classroom may have learned math in their native country. This could explain some of the silly mistakes we see.

Please see Appendix A, Figure 2.1. Reflection to talk about any activity from the first professional development that was taken back to your classroom and used. Did you go back to your classrooms and try any of the activities that were discussed. Maybe just one activity was used. How did it go?

Classroom word walls are extremely helpful to ELLs. Teachers could create a routine in their classroom where anytime there is a new academic vocabulary word being used in your lesson or word problems to bold it and explain it. The bold is a hint to the ELLs in your classroom that they need to add this word to their own individual word list or personal dictionary. A Personal Word Wall that I created to give to my students is a sheet that they could use to provide additional information or hints to themselves (see Appendix A, Figure 2.2)

When teachers introduce the use of the Personal Word Wall to the class, explain to your students that any time a new vocabulary word is introduced it will be in bold

print. Let students know they should write these bold words on their word list and they can reference them. Let them use it in class and at home. Let students have total access to it. The more ELLs see these words and definitions the faster they will learn them. You, as the teacher, will need to make these words obvious to your students. Stay consistent with the format. Make the words bold every time they should get added to the list. Have a designated area in the classroom that allows you to hang the words and possibly a hint or a picture clue up. You can give picture cut outs and allow the students to staple or clue them on to their sheet or you can let them draw something in. For example, the first word added to this sheet might be addition under vocabulary word. In the column labeled picture they might glue in or draw a plus (+) sign. Under definition have students write the definition of the word. You might have them write the total of two or more numbers or when all numbers are combined or grouped together. Lastly, provide the student with synonyms or other forms of the word that means the same thing. For some words in math there are many terms that mean the same thing. For addition students could write in the last column; add, combine, plus, in all, total, and deposit. I would like each group here to fill in three additional words, subtraction, multiplication and division, and work with your table to fill in the rest of the columns as if you were doing this for the ELLs in your classroom.

Table 1. Sample of Personal Word Wall

Subtraction	-	the difference between two numbers	take away minus less than subtracted from Withdrawal
Multiplication	x	result of repeated addition	Product Double, Triple, Half Any other quantifier Each/of Times
Divide	÷ or /	to split into equal groups	Quotient Remainder Split Divided Per

When new words are introduced, or there is an academic word add them to the word wall in your room so that as ELLs try to participate they can quickly remind themselves of the word they might be looking for. You can add these academic words slowly into word problems and have students identify them on their sheets and word list or dictionary list.

I always felt that I was doing my part being culturally responsive by creating class word problems incorporating the student's names, culture, or heritage into these problems. Many times word problems are very generic and basic. I always use my student's names and many times they are waiting for their name to show up. I use culturally relevant foods in my problems like Pablo was making empanadas. It makes

doing word problems a little bit better. Then I realized there was more to culturally responsive teaching then just that. "In addition to learning about your students' mathematical background knowledge, it is also helpful to keep in mind that mathematics looks different in other parts of the world" (Leith, Rose, & King, 2016, p. 673) We have to be aware of some of the differences that exist across cultures. I was consistently marking a student wrong or taking off points for the way they were writing their numbers.

Upon doing research, talking with various students, parents and colleagues I learned that some of my South American students may have seen some approaches or methods differently, (see Appendix A, Figure 2.3**)** for culturally related mathematical knowledge that is extremely beneficial especially if your ELLs are from South America. This just shows some of many examples of how math is seen differently across countries.

I will be referring to the information in a handout I prepared for teachers participating in the Professional Development (see Appendix A, Figure 2.3) Example 1, focuses on decimal point and coma placement. I originally thought my student was just missing the point as to where they placement of the coma and decimal goes. I mean this is something they should know by 7^{th} grade. They have been talking about this for years so why has not it clicked. It wasn't until another student informed me that in their country is it written this way. Learning this I would have to disagree with Adoniou (2014) who says, "mathematics is sometimes referred to as a "universal language", implying anybody with mathematical understandings can solve mathematical problems regardless of the

language they speak" (p.4). This student put in perspective for me that math is not as universal of a language as I had thought.

Although symbols and numbers are standard across many countries, there are subtle differences in the way in which they are used or expressed. (Brown, Cady, & Taylor, 2009, p. 534) This first example lead me to look into what other differences there are, I did this through additional conversations with my students mostly. In Example 2, the use of mathematical symbols and the way certain operations are represented are different. When we have an improper fraction we turn it into a mixed number with no addition signs but in some parts of the world they represent a fraction with a colon and add the whole number to it. Example 3, shows how different the angle symbols are written while Example 4, shows how some places write the date differently. In Example 5, the decimal point or a period indicates multiplication in some cultures. Example 6, shows how different dividing fractions is done. It is important to show students multiple ways to do something or be aware of how it might look or be taught in their culture. This is just a short list but finding the least common multiple and prime factorization is done differently in some countries. The way long division is done, subtracting numbers and the use of other symbols in math are also different in other counties. All this knowledge came from getting to know my students, seeing patterns and wanting to understand why. Providing a student with a sheet similar to (Appendix A, Figure 2.3) is a great start to closing the gap between cultures and prior learning knowledge.

I hope the last two weeks has given you a starting point on helping your ELLs in the middle school math classroom. I would love for you to provide feedback on your

overall experience during this professional development. Please complete (Appendix A, Figure 2.4) Exit Ticket before you leave. Thank you for coming

CHAPTER 4

In conclusion, there are many strategies and activities, as shown in my professional development, that are available for math and general practitioners to use when working with ELL students in main stream classroom. My professional development shares a few strategies that work in my math classroom as well as in my 2nd grade ELL classroom (see Appendix B, Case Study). My second graders really benefit from the Think-Pair-Share activity. Giving students the opportunity to work with a partner really helps them become comfortable and less intimidated to share. Allowing students to do activities with manipulatives, doing wondering activities and coming up with your own question activities allow students to self-differentiate and become part of your classroom. It is our job as teachers to help our students learn and be successful. This starts with giving our students the tools they need, like a word wall or a sheet of paper with ways we write math symbols and equations in the United States versus ways they write math in other countries.

I learned that no matter what age or grade you teach the strategies and skills discussed in this paper transfer from grade to grade and student to student. I also learned that ELLs need support and that support comes from us, the teachers, so we need to do our part in implementing strategies to help our ELLs grow linguistically, socially, and academically. As teachers, sometimes we need to take a step back and really explain our directions. It is very possible students in the room aren't aware of what a Think, Pair, Share is or how to do it.

Some implications for ENL teachers is to make sure that all of your students understand the directions. Make sure students hear what the directions are and see them. Reading the directions out loud to the class and your ELLs really provides support to them. ELLs need additional wait time to process what is being said and to answer questions. Allow it. Many times we are quick to have a student answer the question and keep the lesson moving. Pause. Wait a minute and you will see more hands go up. Allow your students to work with a partner. Students teach each other and it takes the pressure of everyone in the class listening away. This helps create a more comfortable classroom environment. Continue to use word walls with pictures, definitions and alternate words that have the same meaning. The pictures are great for clarification as well as a quick reminder.

Some implications for non- ENL teachers would be exactly the same as my implications for ENL teachers. All students can benefit from the strategies that were discussed in this paper. Keep them and put them in your teacher toolbox. One day, probably many days, you will find yourself using them and transferring that knowledge and activity to all of your students. The Noticing and Wondering activity, (see Appendix A, Figure 1.1), will give your shy students a voice. The Manipulative strategy, (see Appendix A, Figure 1.3), will give your kinesthetic students a chance to shine. The Leaving Off the Question activity, (see Appendix A, Figure 1.5), will help your students who are embarrassed to ask questions. These strategies will go to good use regardless if you are an ENL or non-ENL teacher.

The implications for student learning is to make them feel comfortable. Once the students in the room feel comfortable they will let their guard down and ask questions and not be afraid to give a wrong answer. Many of these activities do that. The word wall in the classroom and the personal word wall in (Appendix A, Figure 2.2), allow students to reference academic vocabulary they might be struggling with. These activities and strategies give the students in the room a chance to have meaningful, relevant, academic conversations. When conversations take place questions come up. When questions come up teaching happens. When teaching happens so does learning.

Further research needs to be done around strategies for ELLs to make academic gains and promote social-cultural interactions such as participating without feeling they will be judge. This is just the surface of what can be done for ELLs. I am sure there is so many more strategies and activities that can be modified and researched to help. This research also needs to be shared with teachers through professional developments, or share in an educational journal or even an email chain. Once teachers become more aware of what they can do to help their students they will. Teaching ELLs and educating their educators is what needs to be done. I also believe some research should be done around ELLs and technology. From what I have seen, every student loves when they are allowed on iPads, computers or apps on their phone. It is possible that if some research is done around this maybe ELLs will have the ability to continue learning at home even if no one else speaks English there.

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Appendix A

Figure 1. About Me

Hi everyone my name is Renee DiPiano and I teach 7 grade mathematics to general education students as well as in an Integrated Co-Teach setting where I have a mix of general education, special education and English Language Learner students. I know there is a struggle in our school to get our ELLs to participate, understand academic language and perform well on assessments and evaluation's. I am glad we are all here today for this professional development which is going to take place over the next two Mondays. This is so exciting because we can take the information we are going to learn in the first session and bring it back to the classroom to implement. Then the next week we will be able to discuss our thoughts about the strategies, did they work, will you use this again, maybe it did not work and we might have to look further into why.

The first thing that many of us notice in our classrooms is that students who are classified as ELLs tend to have a hard time getting started. I have seen this in my classroom and many of you have seen this in your classroom. But why does this happen? Many times, at least in my classroom, it is obvious that ELLs want to learn and try, so why does this happen then?

Figure 1.1. Noticings and Wondering Activity Day 1

Name_____ Date_____

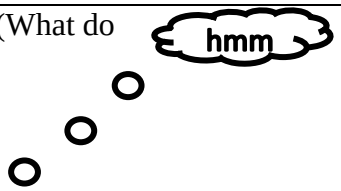
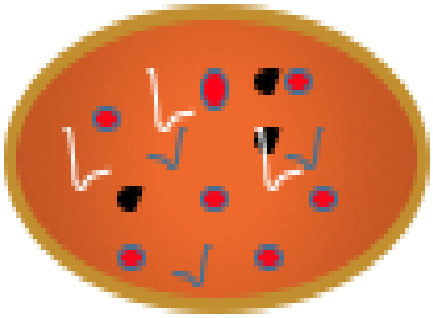
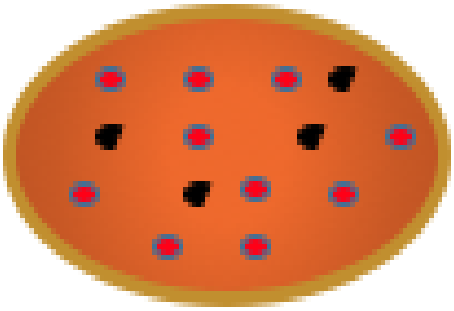
Noticings (What do you see?) 	Wonderings (What do you think?) 

Figure 1.2 Pizza Problem

Below are the prices for a large 4 topping pizza and a large 2 topping pizza.





Large 14 in pizza with 4 toppings- $16.95

Onion
Pepperoni
Peppers
Olives

Large 14 in pizza with 2 toppings - $13.97

Pepperoni
Onion

Figure 1.3. Manipulative Activity Day 1

You must use manipulatives only....

Isandri and Erica are sisters and decided to race down the street. Isandri is older and knows she can run faster than her younger sister, Erica. Isandri gives her sister a 10-meter head start. Isandri runs 3 meters per second and Erica runs 2 meters per second. If they tied how long was the race?

Figure 1.4. Manipulative Problem Possible Answer

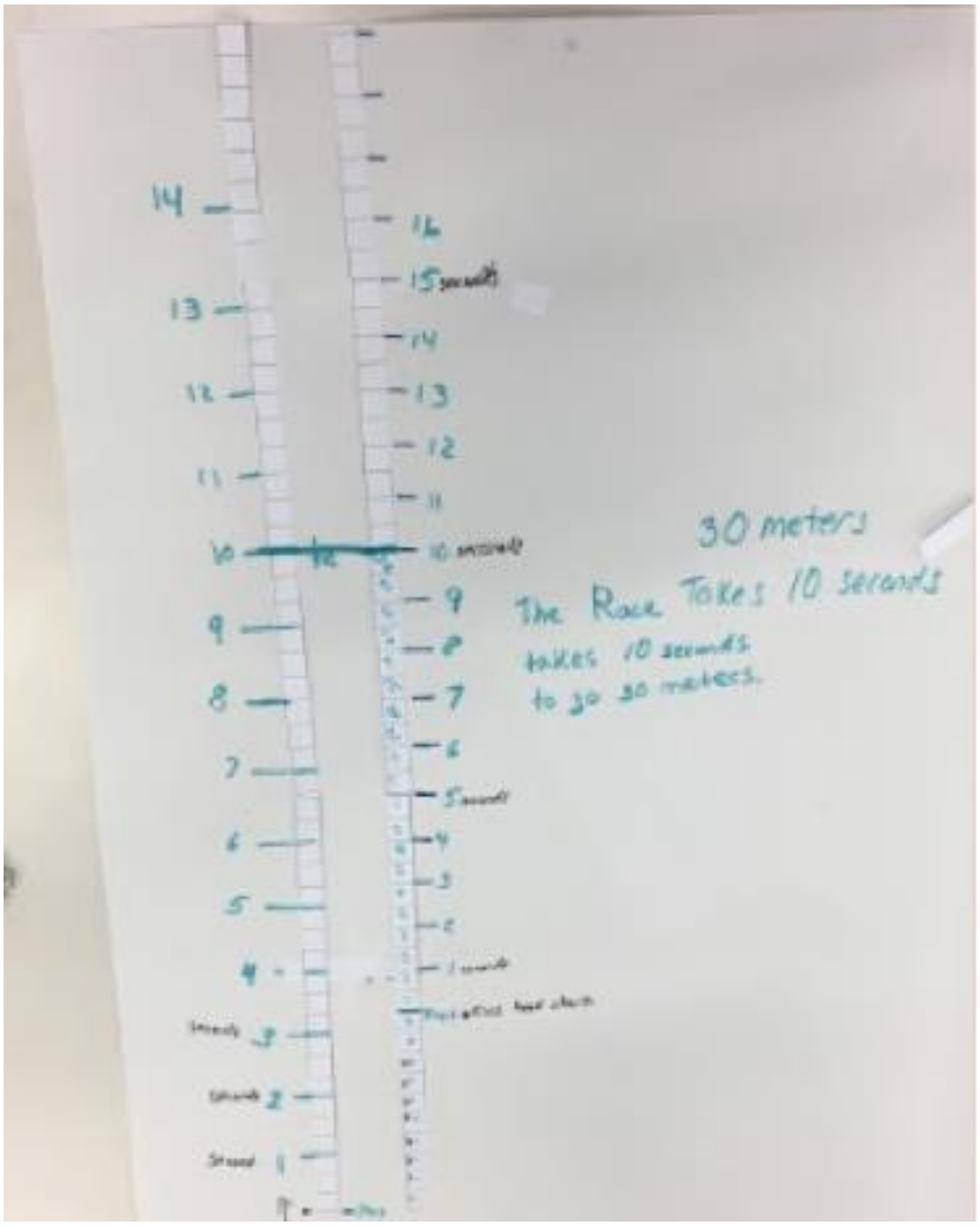


Figure 1.5 Leaving Off the Question

1) The low temperature on Monday was -8ºF. The high temperature on Monday was 18 degrees warmer than the low temperature. The low temperature on Tuesday was 7 degrees warmer than Monday's low of -8ºF. The low temperature on Tuesday was 3 degrees warmer than Monday's low.

2) Jose wants to invite 20 friends to his birthday, which will cost his parents $350. Jose decides to invite 15 friends instead.

Figure 2.1 Reflection

Name_____
Reflection on PD day 1

Directions- On the lines provided below please share any activities from our first class that you tried in your own classroom. How did they go? What was something that worked well or didn't work well? Do you think this made a difference in your classroom with your ELLs?

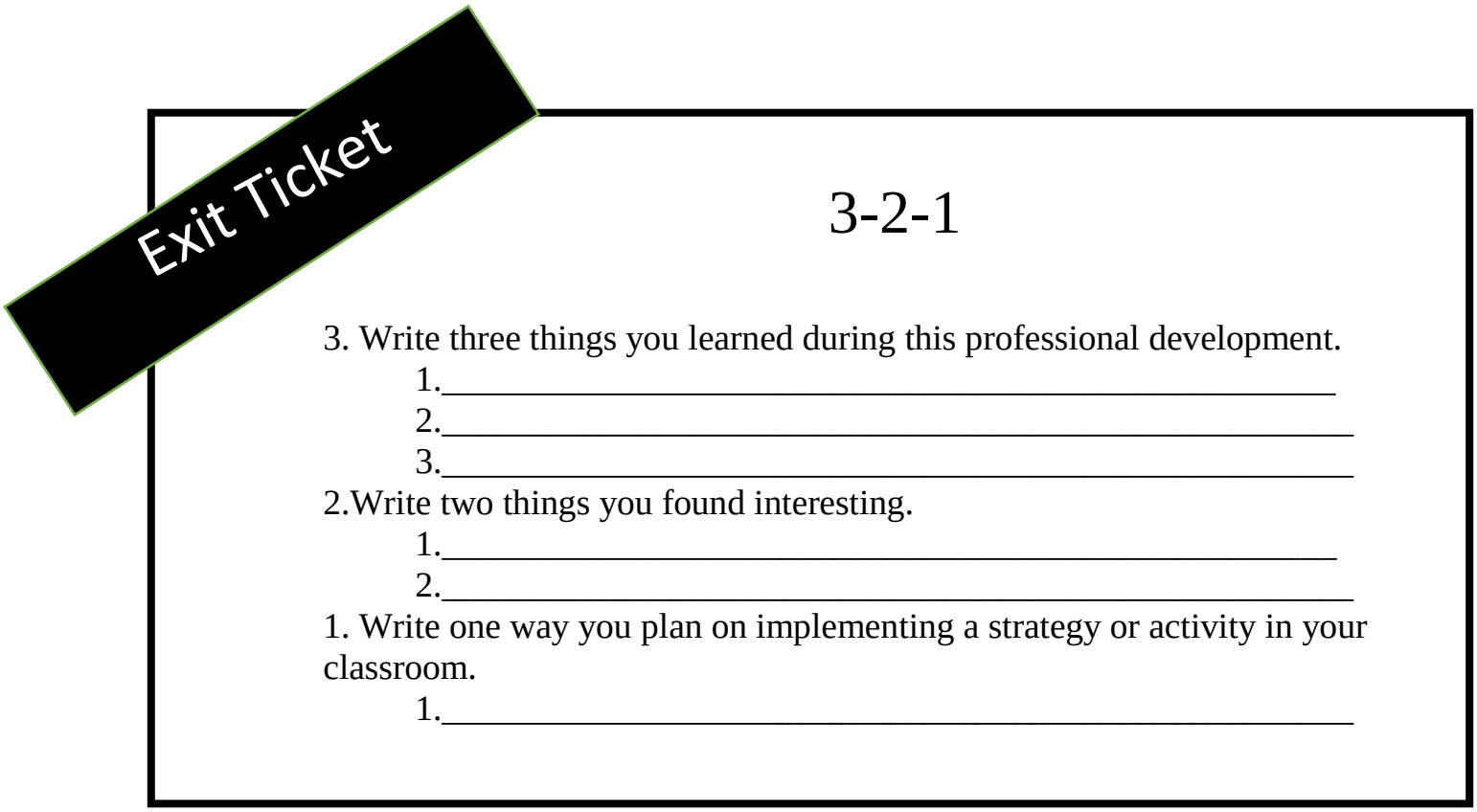
Figure 2.2. Personal Word Wall

Vocabulary Word	Picture/ Clue	Definition	Other forms

Figure 2.3. Different Representations

United States		South American Countries
Example 1 2,146.39	Decimal Points	 2.146,39
Example 2 91/ 8 = 11 3/8	Equivalent Fractions	 91 : 8 = 11 + 3 : 8
Example 3 **< XYZ**	Symbols	 ^ **XYZ**
Example 4 August 21, 2019 08/21/19	Writing the Date	 21 August, 2019 21/08/19
Example 5 5 x 5 = 25	Multiplication	 5.5= 25
Example 5 $\frac{2}{3} \div \frac{1}{6}$ $\frac{2}{3} \times \frac{6}{1} = \frac{2}{1} = 4$	Dividing Fractions	 $\frac{2}{3} \div \frac{1}{6}$ 3 × 1 = 12/3 = 4 2 × 6 12

Figure 2.4. Exit Ticket



Appendix B

Case Study

Observed student name- BRAYLOSQUI HERRERA QUITERO

Observed in a summer school setting with eighteen 2nd graders going into 3rd grade.

Name has been changed for the privacy of the student.

Introduction

Braylosqui is a second- grade student in an Integrated Co Teaching setting during the school year and is in a summer school ENL program. Braylosqui is classified as having a Learning Disability and is an English Language Learner. He receives Speech Services twice a week during the school year in a group of 4. Braylosqui is 7 years old and is Spanish. He is currently classified as an ELL, where is L1 is Spanish and his L2 is English. Braylosqui is an emerging ELL. The setting for the observation was in his summer school ELL program classroom. Braylosqui has been in the United States for a little more than 2 years.

Results of the First Observation

While observing Braylosqui I was noticed that he is very shy and quiet during most class work activities. Braylosqui did a lot of listening, he wrote down everything he was supposed to and he added words to his word list. He spent a lot of time drawing and labeling his drawings. Braylosqui talked to his peers during snack time mostly in Spanish with a small amount of English mixed in. He did not say much but did have interaction that seemed appropriate with his peers.

Results of Observations with Strategy Used

The class was reading a read aloud book as a whole class activity on the carpet by the smartboard. The book was paused periodically and the class was instructed to do a Think, Pair, Share activity. They had to think about what the book just told them and write a sentence. Then, the students had to pair up with the partner that was assigned to them and share their sentence. I observed Braylosqui whispering his sentence very slowly to his partner. This was the first time he talked to his peers in English for academic purposes. The sentence was not perfect but you were able to understand the idea behind it. Braylosqui then listened to his peer tell his sentence. When it was time to come back as a whole class Braylosqui did not volunteer to share his sentence even though he shared it in a small group setting. Braylosqui does interact in a one on one setting but has not been seen participating in a whole class discussion. He does answer questions when the adults in the room speak to him one on one. He is not very confident in what he is saying but he does try. This reinforced that Braylosqui is retaining the information heard and discussed. He is just having a hard time transferring that to the whole class. He is quiet and shy and still learning English. When Braylosqui gets stuck he is asked the question again with options. This helps expand his vocabulary and helps him still have the ability to take ownership of his answer.

Results of the Interview

I had an interview with Braylosqui where I asked him a bunch of questions to get to know him better. Braylosqui is 7 years old boy and told me he came here about 2 years ago. He came here with his family which consists of his Mom and Dad, brother and two

sisters. Braylosqui has a brother that is a year younger than he is and he has twin sisters that are 4 years younger than him. His brother speaks some English and his sisters and parents only speak Spanish. At home Spanish is spoken majority of the time as that is the only language his parents communicate in. Braylosqui and his sibling will occasionally speak English at home and will watch TV in English when his parents are not watching TV with them. Braylosqui speaks a mix of English and Spanish at school. Braylosqui says his family celebrates all birthdays, Christmas, Halloween, Thanksgiving and the day they arrived in the US. He did not mention celebrating any of the other holidays that the US acknowledges. He told me he does not play outside much but like the playground at school. The swings are his favorite. Braylosqui said he does not like to participate in class. He is scared he might have the wrong answer and does not want to get teased. He feels more comfortable in a small group setting with one of two other students.

Strategies

Some strategies that could help a teacher effectively teach Braylosqui would be to have sentence starters for him. This could help steer his thinking in a more coherent manner. If he has sentence starters it would help develop some of his ideas better. He might need many sentence starters in the beginning and then maybe slowly lessen the amount of sentence starters he gets. In doing this he might be able to articulate his thoughts in a way that make sense. Braylosqui's teacher shared some data with me. He is able to demonstrate knowledge of 1st grade academic vocabulary in literary and content area texts. Braylosqui struggles with comprehending what he has read due to

vocabulary gaps. Since this information was shared with me it is really important that Braylosqui is reading and doing assignments with a book that is targeting his reading level. A book with English and Spanish translation would be the most beneficial to him. Braylosqui benefits from the classroom word wall. He references it many times during the day. He always adds words to his site word list that is in the back of his notebook. Braylosqui would also benefit from the teacher going through the reading and listing vocabulary words that Braylosqui might struggle with. The teacher could then go over the words and the sheet with him before he starts the reading. This could also help gain fluency and vocabulary.

Conclusion

Based on the information I was given and what I have seen I predict that Braylosqui will continue to be behind academically and will need very structured intervention to help close the gap between where he is now academically and where he needs to be academically. Braylosqui will need very clear and explicit directions that are given to him verbally. As he continues school he will need redirecting prompts, graphic organizers, sentence starters or frames, rubrics to help self-check. I think Braylosqui is typical of an ELL learner. Generally, they are behind academically and tends to avoid participating in class. Braylosqui would benefit from continued small group instruction and paired work. Praising him when he has a correct answer could benefit him also.

Appendix C

Professional Development Link

https://brockport.voicethread.com/share/12800035/