2016

Guiding Sixth Grade Language Development in Mathematical Content Acquisition through Student Centered SIOP Instruction

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Submitted in Partial Fulfillment of the Requirements for the Degree

Master of Science in Education

School of Education and Counseling Psychology

Dominican University of California

San Rafael, CA

May 2016

Signature Sheet

This thesis, written under the direction of the candidate's thesis advisor and approved by the Chair of the Master's program, has been presented to and accepted by the Faculty of Education in partial fulfillment of the requirements for the degree of Master of Science. The content and research methodologies presented in this work represent the work of the candidate alone.

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Acknowledgments

Thank you Madalienne Peters for all of your help and sticking with me even through the writer's block. Your eagerness to help and ability to provide so much support with constructive feedback was most appreciated. Stephanie, I could not have done this paper without you. You are my muse whose feedback and guidance was exceptional.

I would also like to thank my Beginning Teacher Support and Assessment coach, Cindy. You helped hone my teaching skills with your vast knowledge of pedagogy. Thank you to my Mother and Father who provided emotional support as well as being supportive parents. Lastly I would like to thank Matt for sticking with me through this process.

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Abstract

Mathematics is considered a universal language for students. However, now common core standards require students to explain their conceptual understanding through words, numbers, and verbal explanations. Student proficiency in the universal language is impeded when they do not speak the primary language. It is difficult for the teacher to teach both the academic language and mathematical concepts when the vocabulary is not accessible to all students. Conversely it is difficult for students to follow the pacing of the class while having to translate and gain a conceptual understanding of the subject. The purpose of this study is to increase student mathematical achievement in group work using specific SIOP practices to improve English Language Learners math skills as measured by formative assessments. The participants consist of two sixth grade classes, a total of 60 students, with two students that only speak Spanish. The students meet daily with the teacher/researcher for roughly 50 minutes each day. This is a non-experimental design using both qualitative and quantitative data by using evidence based practice of group work, as part of a Participatory Teacher Action Research. The teacher/researcher instructed students how to use specific SIOP practices in small groups where the students taught each other.

Keywords: English Language Learners, 6th grade, mathematical practices/vocabulary, SIOP strategies

Chapter 1 Improving Achievement

The setting is a sixth grade suburban middle school mathematics class. The new curriculum our school has adopted requires the students to work in teams, in which they are given word problems to work backwards in order to discover the formula (mathematical equation). Many students are frustrated with new team work environment and every problem is a word problem. Students that grasp the concept are frustrated with having to wait for their fellow team members to catch up. Students, who formerly thought of math as their best subject but struggle with reading, now find math difficult. Finally, the same frustration is exhibited by English Language Learners (ELLs) compounded by their frustration with the language barrier.

Statement of Problem

To meet the new mathematical common core standards, the district has adopted a new curriculum in which students are expected to work in teams to solve word problems. Mathematics is considered a universal language. Globally people are always able to communicate using numbers. However, with the new curriculum, College Preparatory Math (CPM), the teaching approach is no longer uses just the universal language of numbers. Those that do not speak or read the language are now struggling in the one class where they used to feel less like an outsider. Students are now required to explain their conceptual understanding through words, numbers, and verbal explanations.

It is difficult for the teacher to teach both the academic language and mathematical concepts, when the vocabulary is not accessible to all students. Conversely, it is difficult for the student to follow the pacing of the class while having to translate and gain a conceptual understanding of the subject. Direct teaching is rarely practiced in the class; learning is emphasized through team discussions based upon word problems. Students express their

conceptual understanding through the use of manipulatives, diagrams, verbally, and written words.

Purpose Statement

The purpose of this study is to improve ELL mathematical skills by using specific Sheltered Instruction Observation Protocol (SIOP) practices within group work as measured by formative assessments. This study is designed to develop an effective strategy(s) that has the potential to streamline the teaching/learning process to improve all students' learning achievement in mathematics.

Research Questions

From the teacher's perspective, what are the effects of select SIOP strategies on all students' conceptual understanding? From the ELL perspective, which SIOP strategy if any helped the most? Is there a specific strategy or does one have to use multiple strategies for another student to fully grasp a conceptual understanding?

What SIOP strategies will students adapt to help their ELL classmates conceptually understand? Will these strategies improve all students' learning in mathematics?

Definition of Terms

SIOP strategies refers to, Sheltered Instruction Observation Protocol that include eight strategies, ELL stands for English Languages Learners. These students are fluent in another language, primarily Spanish, and do not know any English.

Theoretical Rationale

Based on this new curriculum, the ELL students must depend more on their teammates/peers to learn the subject matter along with the language. Therefore, this study is based on the Social Engagement Theory by Bandura, in which people learn from one another, via observation,

imitation, and modeling. The theory focuses on four mediational processes: attention where behavior has an influence, retention on how well behavior is remembered to be later imitated, reproduction in which they perform imitation, and motivation, the desire to keep performing or learning (McLeod, 2016).

In addition, this study focuses on the ethical teacher's code: professional educators want all their students to succeed, understand they are responsible for the students learning and therefore, create a safe environment to make mistakes and express themselves, strives to bring out students full potential and wants to do a good job in general (Association of American Educators, 2016). Lastly, this study focuses on the Community Practice based research.

Assumptions

Through the credential program, Beginning Teacher Support and Assessment (BTSA), observational time, and real life experience, I have found that there is not one correct way of teaching. In order to be a successful teacher one must incorporate multiple teaching strategies. As not all people learn the same way, not all teaching strategies work for every student or classroom.

Technology is a great tool that offers access to a variety of websites and applications to aid both the teacher and the student. Although it allows students to practice their mathematical skills and offers teaching videos, it does not provide students with the ability to ask questions or receive help when they are struggling with the concept. For technology to be more successful, it must not be the only form of teaching, but co-pedagogy.

School is the primary place for learning and teaching, however it is not the only place. In order to learn the academic language as well as the mathematical concepts, students must practice at home.

Background and Need

The "traditional" teaching style of mathematics was teacher centered based; teachers direct all lessons and students learn on their own. According to the article by Suydam and Oskcrne, (1977), two thirds of class time was spent with teacher instruction focusing on the textbook with little to no supplemental material. Students were expected to sit, listen, and answer questions that required only a low level of cognitive process from students. Teachers would encourage brighter students more than the others.

In an interview with Veronica Callister, age sixty-nine retired nurse, she discussed her view of teaching approaches when she herself was in middle school. Students were not allowed to talk to one another and they were seated in rows. Class would begin with opening the textbook to a certain page where the teacher would stand in front of the class and give the lecture based on the lesson. It would include some examples on the board, teacher questioned who could give them the correct answer, and then they would practice problems on their own. There was only one "right" way to get an answer or it was considered wrong (Personal Communication, Nov. 30, 2015).

Summary

Mathematical teaching practices have drastically changed over the years. Classrooms are no longer teacher centered, where teachers stood in front of the room dictating how to solve mathematical concepts. Instead, classrooms are student centered. Students are given word problems that are designed for students to create models, make connections, and explain their work regularly. Students no longer memorize formulas, but discover the solution for themselves, which leads to more of a conceptual understanding of the particular mathematical concept. There

is no longer one right formula to solve a problem, allowing more students to access the curriculum.

Chapter 2 Review of the Literature

This section is an examination of the peer-reviewed research literature on supporting mathematics instruction for middle school students who have difficulty improving understanding and mastery. Information was gathered from academic library searches using online resources. Research information is organized as follows: Historical Context and Review of the Academic Research.

Review of Academic Research

Collaboration

The new curriculum the school has adopted focuses on group work in order to meet the new Common Core standards. Students are now being asked to solve problems that are designed to develop the mathematical method rather than being told which formula to use. In order to fulfill this practice, students are expected to work in teams of four and are each designated a specific role as facilitator, reporter recorder, task manager, or resource manager to help make working in teams more efficient.

This specific curriculum focuses on teamwork because there are multiple ways to finding a solution. As the saying goes, four heads are better than one or in this case four brains. According to the article by McQuerrey, (2016) teamwork is essential for students because it allows students to see multiple ways of going about a problem. In working in teams they are also learning the skills of compromise and collaboration. According to College Preparatory Mathematics (CPM) Educational program, cooperative learning is more effective than direct instruction and even more effective for student learning linguistic concepts. Students are able to create ownership of their learning because they are now trying to solve a problem with their prior knowledge rather than rote memorization with no understanding of why

(McQuerrey, 2015). Therefore in a similar way, when teachers collaborate efficiently, they are able to improve their own practice, by honing their skills, developing lesson plans, and more effectively meeting "all" students' needs.

According to the article by Ronfeldt, Farmer, McQueen, and Grissom (2015), teachers' ability to collaborate has a lot to do with their openness to collaboration, and the administrator's mindset to provide time for teachers to collaborate. Teachers that engage in better quality collaboration are more likely to improve their instruction, which therefore produces students with better achievement gains in math and reading. Ronfeldt et al. (20215), does acknowledge they are unaware of the certain types of collaboration that have a stronger impact on student achievement.

According to Elfers, Lucero, Stritikus, and Knapp (2013), general education teachers are facing new challenges in which they are now responsible for meeting the needs of EL students. Teachers are now responsible to not only teach the subject matter but the English language in the subject matter forcing teachers to adapt their instruction to address EL students' learning needs. To succeed they must work with their colleagues who also serve these specific students. In addition administrators need to provide professional development days focusing on ways to adapt their lessons. Implementing different specialized programs for English language learners does not replace the hours of instruction time that students are being taught by non-specialists. The study found for teachers to be successful the district needs to be in agreement providing support and momentum in pushing for changes that are necessary for high quality instruction in the classroom, otherwise it is left to only the ESL or bilingual coordinator to try to provide meaningful education to these students. In addition, supportive leadership in the central office is

crucial to ensuring adequate time and professional development is offered to their teachers in order to improve their instruction.

In the article by Slavit, Kennedy, Lean, Nelson, and Dueuel (2011), teachers that participate in collaboration and the necessary support for the purpose of improving student learning not only improve their teaching practices but also the culture and practices of their colleagues. Teachers need to be opened to change.

The needs focused on PD (Professional Development), administrative support, program-focused PD, and student learning assessments. For example, at Woodbridge, "As an instructional leader, I focused on managing the school by establishing roles, focusing on teams, and supervising teachers" (Principal Leadership, 2012, p. 77-78). The principal supported the staff by creating common planning times in which teachers created lesson plans together using differentiated instructional strategies.

It is my job as an instructional leader to introduce, promote, and provide resources to achieve our school goals. Continued professional development opportunities are happening at Woodbridge. The most recent development is the Sheltered Instruction Observation Protocol (SIOP), an instructional model that provides strategies to students who are in need of differentiated instruction because of cultural and linguistic needs. Coaching and advanced professional development is offered to staff members throughout the year (Principal Leadership, 2012, p. 78).

CPM's philosophy is to work in teams because there are multiple ways to go about a problem because not everyone thinks the same (CPM, 2015). Therefore there are multiple ways to go about learning how to serve ELL and therefore many programs and people to learn from. The article by Short, Cloud, Morris, and Motta (2012), examined the developed cross-district

curriculum for ELL between two urban districts in Rhode Island. The article was written as a model for educators seeking align ESL standards with English Language Arts (ELA) standards. The district funded this project because the schools are being targeted as non-official and there was not much data at the time of proficient pedagogy for ELLs. A professor at Rhode Island College, the main teacher training institution in the state, who was concerned about the underperformance of ELLs and had previously worked with both districts suggested that the two work together on a reform initiative based off of the *Double the Work*. It is based off of six research-based strategies: Listening Comprehension and Note-Taking Skills, Discussion Skills, Vocabulary Development, Reading Comprehension, Wide Reading, and Systematic Writing Assessment and Development.

Participants consisted of two types of teachers, veterans that wanted to improve their instruction and new teachers with not much experience (Short, et. al., 2012). This had never been tried before, but they were hoping it would unite the schools and acknowledge that other teachers were struggling with the same concerns. In addition the students would encounter the same curriculum regardless which school they attended.

The first year, teachers were given 6 days of professional development in which teachers studied, practice, and incorporated into their lesson plans the six AL2 strategies. This helped teachers get to know one another, see the commonalities in their students and instruction, and share struggles with solutions. In addition, the professional development specialists supported the teachers in the classroom through observations and coaching throughout the school year. With the observations, the professional development specialists would design specific activities at workshops for further professional growth of teaching ELL. The second and subsequent year teachers attended professional development for sheltered content instruction (SIOP) model,

which helped make content accessible to ELL learners. Again there were classroom observations and coaching. The ESL directors focused on helping teacher write the content and learning objectives for their lesson.

Group Work

Jansen studied students' telling about their experiences with small-group work in two sixth grade mathematics classes. If group work is successfully implemented it can promote conceptual understanding of mathematics, reasoning skills, procedural fluency, and possibly a positive disposition towards mathematics. Students are able to make more progress together than they would, working alone on challenging problems, concepts, or tasks. When examining both classes, Amanda Jansen found the lower achieving students enjoyed working in teams when they believed their opinion/efforts mattered and whether or not they believed mathematical competence was improvable (2012).

In order to set up successful group work, the teacher must scaffold the students' learning and not force student discussions (Marshman & Brown, 2014). Questions are designed so that students can use their prior knowledge and allows for an opportunity to investigate by making conjectures to test, discuss, and refine. To ensure students are on task, there is an expectation for to reflect on their ideas and make changes to their thinking if necessary. Group work was successful because students had to be actively thinking during discussions in order to respond to questions and statements. Most of the framework was focused on collective argumentation through mathematical

When students think mathematically they make meaningful connections with prior knowledge and experiences to plan solution pathways to set problems. They also make decisions about which mathematical knowledge to use when following these pathways. When students

think mathematically they are expected to represent, explain, and defend solution pathways in different ways and to challenge the solution pathways of others discussions where students were allowed (felt safe) to express, re-consider, and share an idea (Marshman & Brown, 2014, p. 71).

Explicit Strategies

As of January 2002 the United States public school system change drastically because of the signing of the No Child Left Behind (NCLB) Act. The schools were now expected to meet the needs of all students; all students were to receive access to the curriculum and were required to meet all grade level standards. School districts were held accountable for the achievements of the school and if the expectations were not met within two years they would face severe consequences such as school closure, firing the teachers, providing of supplemental educational services, and implementation of certain corrective actions would take place. The Act was enforced so that all students would receive an equal education; however the schools that underwent the most hardships had a high level of English language learners and students with low socioeconomic backgrounds (2001).

These challenges were because there was a shortage of English language teachers along with successful resources that truly helped ELLs, specifically in mathematics. In response an education technology company, Digital Directions International (DDI) created supplemental mathematical curriculum program that delivers sheltered instruction in an online environment. Freeman and Crawford examine the Help with English Language Proficiency (HELP) Math program directed for middle school students. This program designed their lessons based on SIOP strategies (visuals, repetition, synchronicity, and building on prior knowledge) for ELLs that focus on mathematical vocabulary and academic content through interactive lessons. Through field-test across four states, the study examines the challenges and successes of this supplemental

curriculum. One major challenge is the time allocated to students and teachers to implement the program, some schools provided an extra elective period, or after-school intervention, while others embedded the program during regular instructional time (2008).

Examining the hardships ELL students face with learning academic math content in a non-native language; three years later Freeman studies the effectiveness of one particular online supplemental digital mathematical intervention program, HELP that was designed to develop ELL students' skills and knowledge regarding math. She found the program to be successful and the two essential factors that contributed were the three main components of learning environments (content, pedagogy, and method) and Professional development, based on the helping the teacher implement the supplemental online curriculum. The approach to teaching and learning, which was tested in this study, is the importance of making an explicit connection between a particular technology (HELP Math), a specific content, *math*, an educational approach (scaffolding and sheltering instruction, etc.) in a specific context (secondary ELL) (Freeman, 2012).

Two years after Freeman's solo article, Crawford (2013) conducted a study with 396 middle schools ELL students, that measured the mathematic achievements of online supplementary mathematics curriculum (HELP and other technology-based programs) designed for ELL's who spoke Spanish as a first language. Crawford found that students with lower English language Proficiency levels performed slightly better using the HELP Math program. Students that benefited the most from the online supplemental curriculum were those at the highest level of English Proficiency using the other programs (33% SuccessMaker, Accelerate Math, and 35% using Plato Courseware, SkillsTutor, Kid's College, Destination Math, and 321 Math). Therefore, the students would not rely as much on the Spanish or SIOP strategies.

Mathematics classes at our school focus on problem solving, reasoning, and communication, that is, using specific academic language to express mathematical knowledge, and therefore ELL are faced with added challenges. Slavit and Ernst-Slavit (2007) offer different strategies to increase ELL academic mathematical performance similar to the SIOP strategies, for example, introducing the new vocabulary in a creative manner, using manipulatives, graphic organizers, pictures, and specific activities that relate to the definition. Group work allows students to practice with their peers and opportunities to hear and use mathematical language.

Most importantly teachers must provide a classroom environment that allows for risk taking and mistakes. People learn more from making mistakes than memorizing formulas and always getting problems correctly the first time. Math is particularly difficult for ELL because there are many different words used to describe one particular operation + which is defined as sum, adding, and the total of. In additions the language is not usually used as social language and hence is difficult to practice outside the classroom.

Pascopella (2011) focuses on the different types of successful strategies for English language learners different schools in the United States use. Past president of the Association of Latino administrators and superintendents And superintendent of the San Francisco Unified School District states that the successful future of ELLs depends on strong districts and community leaders who are willing to push for the best programs. The article mentions five school districts, each with their own approach and including combinations of programs. Dual Language: Receiving instruction in both English and another language. Each day is designed to the specific language and the native and non-native English speakers work together to learn the content. They provide instructional coaches and sample lessons plans. The second, Newcomer: Program used before students enter other English Language Programs, that meet the academic

and transitional needs of newly arrived immigrants. Third, which our school district has adopted, Sheltered English: Taught in English, teachers use physical activities, visual aids, and environment. It is important to have the language objective visible. Fourth, Structured English Immersion: All instruction is in English. Teachers attend specialized training in meeting the needs of all ELL students. Lastly, Instructional delivery model: Tiered intervention, which targets whatever lessons the students are struggling to learn. They are put in appropriate language acquisition classes. For example, if you are new to the country with no English skills, may have three periods of intense language acquisition daily.

The school in which I conducted this study strongly favors SIOP strategies and therefore I will be focusing my study on teaching students SIOP strategies to help one another. SIOP strategies stress visuals and manipulatives which correspond to the CPM philosophy of learning. The idea is to relate to the student's background and use real life situations, all again relate to CPM philosophy. Because the text involves extensive reading, it is important for the students to learn SIOP strategies to help explain their conceptual understanding of the mathematical practices.

Chapter 3 Method

Research Approach

This research study involves a mixed method approach that involves both quantitative and qualitative data. This is a participatory action research study (PAR). I am the teacher of record, here after referred to as researcher, for a 6th grade middle math in an affluent school area north of San Francisco. It is participatory because it includes the active involvement of the teacher and the students. The action is trial and error, which is focusing on teaching students who are new English Speakers in a math class to learn the mathematical standards for 6th grade curriculum as well as English. This research includes collecting data that is both quantitative and qualitative, documenting actions in classroom, and reflecting on adapting new approaches.

By gathering information derived from the strategies used in the class and their relative success to improve students' success, my teacher practices, and through reflecting on the resulting data. The important part of PAR is improving and empowering the students in one class and the way they're educated to influence other teachers to go outside their own classroom and learn from each other.

Ethical Standards

This paper adheres to the ethical standards for protection of human subjects of the American Psychological Association (2010). This research involves evaluating teaching practices as part of the researchers responsibilities as instructor of record for 6th grade students. Additionally a proposal was developed and reviewed by my faculty advisor and approved. This study involves evaluating classroom practices, teacher strategies and student learning for the purpose of improving ones practice.

Sample and Site

The site is a targeted Title I school with a Program Improvement (PI) status of one year. The site includes eight hundred student and thirty-six teachers. The student to teacher ratio varies by grade level, subject, and school year. This year most Core content area classes average less than thirty students. Less than one percent of the students are homeless and thirty-nine percent receive free and reduced lunches. Newcomer/Beginner level language learners have a two period block of English language development as well as an ELD intervention class as their elective; all other identified EL students have the ELD intervention class as their elective. The school supports teachers in professional development by using staff meeting time to provide on-site professional development. Site funds are also used to support professional development opportunities for teachers in areas such as AVID, Project Based Learning (PBL), Technology, Science, etc.

This study focuses on two eleven year old boys. Both are new arrivals to the United States. One is from El Salvador (student A) and the other is from Mexico (student B). Both are able to read Spanish so they can use the Spanish textbook. They are polite and come into class and say “hello” and “goodbye" every day with a smile.

Student A’s school year in Mexico was January through November. He came to the United States in June of 2015, only completing half of fifth grade, with his mother, father, aunt, and three cousins, ages 4 14 and 15, because four people near his neighborhood were killed. When our school year began, his grandmother was able to come over as well. All eight of them live in the same apartment in the same school neighborhood but one. After school, he takes the bus home and then plays soccer with his cousins. His mother works until 8pm and father, the only one who speaks English works till 11pm. His favorite class is English Language because it is a class made up of only Spanish speakers and they work on learning English. I have observed

that the math class is sort of trying for him and he has a hard time following along. He is shy and does not reach out for help very much because he is still new to the country and is his first time in a foreign countries classroom. He seems to be suspicious of others because 7th graders (I had taught in 5th grade) came in at lunch and spoke Spanish. Student A thought the older students were making fun of him because of their tone of voice was funny/sarcastic but they were really being friendly. Classmates from the English Language class came in and translated, which showed that my classroom was a safe environment because student A trusted his classmates.

Student B is very different from Student A. He speaks two different languages, Mayan and Spanish, and is currently learning how to speak English. He lives in an apartment with his Mother, Father, brother (5 years old), sister (6 years old), an Aunt and an Uncle located close to other Aunts and Uncles. For fun he plays soccer and is the goalie, likes to watch TV (is able to do on the weekend), and his favorite movie is Harry Potter. After school he goes home to clean his apartment and then do school work. He is Catholic. Student B's favorite subject is math because he likes fractions and does not find anything difficult about that subject. On weekends he likes to go places with his father. His father and Uncle speak English. Student B has a hard work ethic and values his education demonstrated by the fact that he checks his grades regularly, seeks help from both his peers and teachers, practices his English outside of school, and has even asked to be in after school intervention for math.

Access and Permissions

The researcher is a teacher of record at a public school. I am in my 2nd year teaching in same school district, 1st year at this site. I have completed a teacher credential program and have a preliminary license to teach in the state of California. I have a multiple subject credential and temporary single subject credential in math.

The principal was informed of the nature of the research. I have informed my principal that I am conducting a study in my classroom that is part of my normal teaching practice and responsibility as teacher and received his permission to do so. See appendix A (letter to principal).

Data Gathering Procedures

To collect data I used a variety of assessments and verbal/physical cues. Each student received a notebook at the beginning of the year in which they are to use for class note, class work, as well as homework. Checking this notebook throughout the study allowed me to see how much progress each focus student has made. Before the chapter assessment, students were given check in problem, short mini questions based on mathematical standards that students demonstrate their conceptual understanding. I began checking to see if the focus students could perform the problem without help from me or given hints. The chapter assessment was created by the sixth grade math team and consists of sixty percent old material and forty percent materials. This allowed the teachers to see the mastery of conceptual understanding over time, since the old material never goes away. The tests was provided in Spanish and adapted so that all the extra information that paints the picture was removed and replaced with a picture so that the student could focus on the math. In addition, I sat beside them with a Chromebook to communicate if there were any questions.

Physical and verbal cues were recorded with frequent thumbs signs, up, middle, or down. Was able to see the progression by observing how well they got along with their classmates and what strategies their teammates are helpful. Will also be observing the others students willingness to use these SIOP strategies.

Other tools used to gather data included online math tools, BrainPop. The focus students will also be filling out a mathography, where they tell me about themselves and where they describe the areas in which they are struggling in and succeeding in. Lastly I attended Professional Development conferences to further my teaching practices, and adjust or include to my pedagogy.

Data Analysis Approach

Over the course of the study I analyzed different narrative notes, content analysis, and their ability to read and understand the language. Using their notebooks, check-ins, and tests I was able to monitor the progress of mathematical content. As the writing/work increased and confidence built, the less graphic organizers I provided. Physical cues of thumbs up, middle, or down, helped guided me on the next steps during the lesson, such as, let them be, reteach, or should I attend to their team first for further guidance. Lastly, I observed/monitored English vocabulary growth and ability to read and understand the language by recording the frequency of volunteering answers. The more confident the student felt in their abilities with the mathematical concepts as well as their English skill, the more likely they were to volunteer.

Asilomar Conference

The end of 2015, I attended a math at Asilomar. One workshop offered, discussed the strategies with for working with the English Language Development (ELD) classes. In math classes they focus more on the subject, and ELD spend time with reinforcing the vocabulary. They stressed the need for the lesson objective to be displayed, visuals used, as well as manipulatives in order for all students to access the curriculum. The speakers also addressed the difficulty for the student of having to learn both the mathematical concept (with vocabulary) and the English language. In addition each speaker emphasized the use of SIOP strategies.

During a meal, I was able to have a conversation with the two people at other schools that use the same curriculum that is adopted at my school. I was hoping for some new collaborative insights, regarding the question, “How do you help those students that do not speak any English?” “What about those students that do not speak Spanish, but maybe Farsi?” Their answer, “Make a group of three, one that is fluent in both English and Spanish, and another student that knows some or little that can help explain the concepts. They are in a team of three instead of four because then the teacher can be a part of the team at times. Also use the Spanish textbook or online version”. Unfortunately, the second question about the student speaking Farsi, was never answered. This conversation informed my approach to gathering and analyzing information in my study of using SIOP strategies to increase mathematical understanding whose student is not fluent in the English language.

Chapter 4 Findings

Description of Site, Individuals, Data

For students to learn how it feels to be in the shoes of the English Language Learners, I thought the best way was to teach a lesson in a language that no one knew, in this case, Dutch. In order to complete this process, I left the question from the previous lesson unfinished so that I could use this "Dutch" lesson the following day to answer the question. The first step was to choose the SIOP methods I thought I could use:

1. Lesson Preparation

a. Clearly define content objectives - *conceptually understand Venn-diagram and to understand that if you change the area, the perimeter can but does not always change.*

b. Clearly define language objectives – *area and perimeter*

c. Select content concepts that are appropriate to learners' age and educational background -*6th grade standard*

d. Use a variety of supplementary materials to make the lesson clear and meaningful (graphs, visuals, underlining) – *graphs, pictures, drawings, numbers, hand gestures with words, underlining and pointing*

e. Use authentic and meaningful activities and integrate them into lesson concepts.

2. Building Background

a. Explicitly link concepts to students' background experiences

b. Explicitly link past learning to new content – *started the question yesterday where the perimeter did change*

c. Emphasize key vocabulary

3. Comprehensible Input

a. Use speech that is appropriate for students' proficiency level

b. Clearly explain academic tasks

c. Use a variety of techniques to make content clear (model, use visuals, demonstrations, and hands-on-activities) – *many visuals and hand gestures*

4. Learning strategies

a. Provide ample opportunities for students to use strategies

b. Consistently use scaffolding techniques throughout the lesson – *visual and auditory*

c. Include a variety of questions types that promote higher-order thinking skills

5. Interaction

a. Provide students with frequent opportunities for interaction and discussion between teacher and student and among students and encourage extended student discourse about the lesson concepts – *if a student understands then have them repeat and another student repeat what they said*

b. Carefully configure the grouping of students to support language and content of the lesson – *already in groups*

c. Consistently provide sufficient wait time for student responses

d. Provide ample opportunities for students to clarify key concepts in their native language – *do not move on till they know what I am talking about*

6. Practice and Application

a. Provide hands-on materials and/or manipulatives for students to practice using new content knowledge

b. Provide activities for students to apply content and language knowledge in the classroom

c. Use activities that integrate all language skills (reading, writing, listening and speaking)

7. Lesson Delivery

a. Clearly support the content objectives in lesson delivery
b. Clearly support the language objectives in lesson delivery
c. Engage students 90 percent to 100 percent of the time
d. Pace the lesson appropriately to students' ability level

8. Review and Assessment

a. Include a comprehensive review of key vocabulary
b. Include a comprehensive review of key content concepts
c. Provide regular feedback to students on their output
d. Conduct assessments of student comprehension and learning of all lesson objectives throughout the lesson

I decided to write out the numbers rather than word form because the idea of teaching is to make learning accessible to all students and to demonstrate how numbers are a universal language. After I chose the strategies I could incorporate into my lesson, I wrote out a script with each sentence being translated into Dutch underneath, so that I knew what I was talking about and could find my spot, as shown below:

Do now

het nu doen , zegt

Draw a graphical representation that shows thirteen people in a class have brothers only, 11 people have sister only, 7 have both brothers and sister, and 3 have neither brothers nor sisters:

Teken een grafische voorstelling die dertien mensen in een klasse toont broers slechts 11 mensen zus alleen , 7 hebben beide broers en zus , en 3 hebben geen broers of zussen. zusters

Which graph would you choose to represent this data?:

Welke grafiek zou je kiezen om deze gegevens te vertegenwoordigen ?

Venn diagram, histogram, dot plot, stem and leaf:

Venn-diagram , histogram , dot plot, stengel en blad

Yes. Venn diagram because there are comparing two categories that can overlap. People who only have brothers, people who only have sister, people who have both brothers and sister, and lastly people who do not have either a brother or sister:

Ja. Venn-diagram , omdat er het vergelijken van twee categorieën die kunnen overlappen. Mensen die alleen broers , mensen die alleen zijn zus , mensen die beide broers en zus , en tot slot mensen die niet beschikken over een broer of zus.

Now let’s begin our lesson today.

Laten we nu eens beginnen met onze les van vandaag.

Yesterday we worked on answering the question: If you changed the area, would that also change the perimeter?

Gisteren hebben we gewerkt aan het beantwoorden van de vraag: Als u het gebied verandert , zou dat de omtrek ook veranderen ?

Problem two dash forty helped us answer that question:

Probleem twee dash veertig hielp ons antwoord op die vraag .

In part a. of the problem we found this figure to have an area of one hundred one square centimeters.

In een deel van het probleem vonden we dit cijfer naar een gebied van honderd één vierkante centimeter.

And a perimeter of forty two centimeters.

En een omtrek van tweeënveertig vierkante centimeter.

In part b. of the problem the area would be one hundred plus one plus one which equals one hundred two.

In deel B. van het probleem zou het gebied honderd plus een plus een is gelijk aan die zijn honderdentwee.

The perimeter if we label the figure is forty two centimeters.

De omtrek als we bestempelen het cijfer is tweeënveertig centimeter.

So did the area of the shape change? Yes

Zo ook op het gebied van de verandering vorm ? ja

What about the perimeter? No it did not.

Hoe zit het met de perimeter ? Nee, dat niet.

Going back to our question earlier, “If you change the area, would that also change the perimeter?” That would be no.

Gaan terug naar onze vraag eerder : "Als je het gebied te veranderen , zou dat de omtrek ook veranderen ?” Dat er geen zou zijn .

But now let us look at part c.

Maar nu laten we eens kijken naar een deel c.

Here they say, what if we added a new one block to a different part of the hundred block, would it change the perimeter?

Hier zeggen ze wat als we een nieuwe blok toegevoegd aan een ander deel van de honderd blok , zou het de perimeter te veranderen?

Looking at this picture the lengths are ten centimeters, nine centimeters, one centimeter, one centimeter, one centimeter, eight centimeters, one centimeter, one centimeter, one centimeter, and ten centimeters. That gives us a perimeter of forty four centimeters. The perimeter did change depending on where you placed the one block?

Kijkend naar deze foto de lengtes zijn tien centimeter , negen centimeter, een centimeter , een centimeter , een centimeter , acht centimeter, een centimeter , een centimeter , een centimeter , en tien centimeter . Dat geeft ons een omtrek van vierenveertig centimeter . De omtrek deed veranderen afhankelijk van waar je het één blok geplaatst?

So changing the area can change the perimeter but does not always.

o het gebied te veranderen kan de omtrek veranderen, maar niet altijd .

Now let us move onto problem two dash forty one.

Laten we nu op probleem twee dash eenenveertig bewegen.

Here we are going to answer the question, if we change the perimeter, will the area change too?

Hier gaan we aan de vraag te beantwoorden , als we veranderen de perimeter , zal het gebied veranderen ook?

Part a. asks us, what different combinations of Base Ten Blocks could you use to make a figure with an area of one hundred one centimeters squared?

Deel een ons vraagt , wat verschillende combinaties van Base Tien Blocks kan je gebruiken om een figuur met een oppervlakte van honderdeneen centimeters kwadraat te maken?

One way: 1 hundred block and 1 one block.

Een manier : 1 honderd blok en 1 een blok.

Could also do 10 ten blocks and 1 one block.

Kon ook doen 10 10 blokken en 1 een blok.

Or 1 hundred 1 one blocks:. Of honderdeneen één blokken.

There are three different ways, now in teams answer part b. which asks you to create a shape with Base Ten Blocks that has an area of one hundred one centimeters squared with the *largest possible perimeter*. How can you tell there is no larger perimeter possible?

Er zijn drie verschillende manieren , nu in teams beantwoorden onderdeel b , die u vraagt om een vorm met Base Tien blokken die een oppervlakte van honderdeneen centimeter kwadraat met de grootst mogelijke omtrek heeft te maken. Hoe kan je vertellen er is geen grotere perimeter mogelijk?

A perimeter of two hundred four centimeters is possible if 10 ten blocks and 1 one block are stretched out end to end:

Een omtrek van 204 cm is mogelijk als 10 10 blokken en 1 een blok worden uitgerekt begin tot eind .

Back to the question if we change the area, does it change the perimeter? Yes it can.

Terug naar de vraag of we het gebied te wijzigen , is het de omtrek te veranderen? Ja, dat kan.

Now try problem two dash forty two on your own:

Nu proberen probleem twee dash tweeënveertig op uw eigen.

You are working with an area of one hundred ten square centimeters:

U werkt met een oppervlakte van honderd tien vierkante centimeter .

What is the smallest perimeter, what is the largest perimeter?:

Wat is het kleinste omtrek , wat is de grootste perimeter ?

Then I created note cards with a list of words or phrases for questions that I thought the students might ask me and how I might respond. For example, to get their attention I usually use three, two, one to grab the class's attention; yes and no; quiet please, and hello.

For the "do now" I drew the pictures next to the key words (brothers, sisters, both, none, and class) so that students could try to interpret what was written on the board, while I checked on their homework. Then I printed out pictures the students could relate to such as Mario and Luigi because they are known as brothers and then two sisters, and a picture of desks so that when I read the "do now" aloud I would hold up the pictures to each word.

Next I rewrote the question from yesterday in Dutch. On another board I wrote the problem number from yesterday's lesson along with a diagram and two words in different colors indicating area as one color and perimeter as the other. Underneath I wrote out the second question from the previous lesson, which had been assigned as homework. Once we answered the question some students were asked to come up to the board to show how they got their answer. I pointed to the question from the previous day which they all had recorded in their notebooks, and read it aloud. To help decipher I referred to the date from yesterday so they could look it up in their notebooks.

Once the lesson was completed, we had a class discussion based on the delivery of the lesson. In particular, which parts of the lesson that helped them understand the learning objective for the day?

For the lesson I only spoke in Dutch using these specific SIOP strategies, all three class were able to answer the question, “If the area changes, does the perimeter change too?” from the previous lesson. Once the lesson objective was completed, I stopped speaking Dutch and had a class discussion on the purpose of the lesson, how they felt, and which strategies worked.
In Student A’s classroom, one student said, “How are we supposed to learn math and a new language at the same time?” This question led the class into the discussion about how Student A very probably feels all the time in the class. Student B’s class struggled with the lesson because the majority of the students were too focused on what language I was speaking and what the homework was, rather than on the lesson itself.

Overall the students expressed frustration because they did not know what I was saying during the lesson. As we discussed techniques that helped students understand what I was talking about, they recorded techniques in their notebooks as I wrote their ideas on the whiteboard. Strategies that we came up with were: the use of pictures (if they do not have printers they can draw pictures or use pictures from other sources), numbers, pointing, writing out the algorithm (showing all work), pointing to key words and the diagram that relates to it. As a result, the majority of the students said that pictures helped them understand what some of Dutch words meant.

I had let my principal and department chair know of my plan for the Dutch lesson and it’s point, as well as other colleagues in my department. My department chair came in to watch and then suggested that the principal and vice principal come into the room to observe the lesson. Subsequently, I was asked by my department chair to give a short demonstration to the rest of the math department.

The plan for the next day's lesson was to discuss which strategies from the Dutch lesson the day before could be used in a groups going forward. Questions included: does this only help English Language Learners, or do some of these strategies help all the students?

Themes

During the Dutch day, students found the pictures and diagrams to be the most helpful for deciphering the language. Next was pointing and gesturing while talking because then they were aware of the topic I was talking about.

Collaboration is a vital part of the learning and teaching process. It is not to promote the idea of everyone doing the same thing. It is a process for teachers to gather together and create a lesson plan together sharing strategies and ideas. In order for it to be successful the people involved need to be open to new suggestions and willing to make adjustments for improvement to take place. While everyone must teach the same concept, not everyone has to follow the same lesson strategy. Just as there is no one right way to learn a concept, there is no one way to teach. Therefore in true collaboration teachers need to let go of the need for credit or ownership and focus on the main goal which is to find the most effective way to help students conceptually understand the topic at hand. There should be no judgment or competition because everyone is trying to achieve the same goal.

Chapter 5 Discussion /Analysis

Summary of Major Findings

The most important finding was that the success of each student depends heavily on the students themselves. How willing were they to work harder than other students so that they could be successful? Student A only practiced English and math during school and rarely sought help from peers or teacher(s). However, student B practiced outside of school and asked to be put into an afterschool math class. When struggling in class, student B was not afraid to ask for help and was determined to receive an education.

Having the students keep all their notes and homework in one notebook, allowed me to see their progress overtime, which for Student B was quite impressive. Student A is still struggling because he is still missing some basic math skills, but I can see in his notebook he is trying to participate in class. In the beginning I had to sit next to the students to translate the tests into Spanish with my computer. Now I do not have to translate and as they progressed I was able to include graphic organizers in the test if they understand the algorithm. I used the check-ins to sit with the student and see how they were doing individually, and would assist if needed.

Comparison of Findings to the Literature

There were various strategies found in research to help ELLs succeed in a math classroom, suggesting that there is no one "right" way to teach ELL students. Crawford (2013) examined a variety of supplemental mathematic programs. From her study she found, the program that best fit the student was based on the student's level of the English Language. Pascopella (2012) mentions five successful school districts, each with their own approach on how they are successfully helping ELLs. Although SIOP strategies were addressed, four other strategies were too. The same strategies do not always work for every ELL, one must use a variety.

Regarding collaboration among staff, one cannot stress the importance that more heads are better than one. As Elfers, Lucero, Stritikus, and Knapp, (2013) stated that teachers are responsible for teaching the subject matter, as well as adapt their lessons to meet the needs of all students including ELLs. They mention working together with colleagues more likely improves instruction. Fellow colleagues or colleagues with the same school district provide teachers with the opportunity to plan and/or discuss similar struggles as well as help create solutions or decrease some challenges.

Ronfeldt, Farmer, McQueen, and Grissom (2015) addressed that for teachers to be successful, principals must provide PD days focusing on certain matters. In addition there must be time allowed to implement these strategies as well as follow through days for reflection. Therefore, providing follow through days/activities after specific Professional Development day(s) that includes all whom participated is more beneficial. It gives an opportunity for the teacher to implement their new strategy and discuss with a professional coach/ colleagues/ participants, on the next steps.

Limitations/Gaps in the Research

A major limitation in the research was my lack of experience as a teacher. As a second year teacher, at a new school, there is still much to learn and development needed. Having to account for 150 students and be able to reach all their needs is very difficult for any one person to achieve. Having to teach on the pace set by the department, left little time to focus on teamwork or room to implement new strategies in my own classroom. In addition, the school has adopted a new curriculum and, therefore, all the teachers are still getting used the new material as well as making accommodations/supplemental material.

Another gap was a lack of communication within the school. There was little to no opportunity made for co-planning with EL or Special Education teachers.

Implications for Future Research

For future research, I would start out the year with stronger modeling of team work and consistent follow through. This would promote natural student collaboration and inspire to form their own strategies for successful teamwork. To encourage this I may occasionally include a lesson presented in another language so that students will empathize or sympathize with ELL and will be more willing to work with them. I would continue to do lessons in other languages or warms ups to reinforce the understanding of the continued frustration of ELL learners in the class. In addition, use Google Classroom to give quick student surveys at the end of the class on which strategies they used to help their classmates and which strategies helped them learn the lesson objective for the day. This will enforce the idea that working together with four brains is better than one. Only the teachers are allowed to see the results of the survey, and it is helpful in seeing how most students learn. Do strategies depend on the student's learning or the specific mathematical concept? In addition, I would like to create a shortened textbook for ELL in Spanish that includes graphic organizers, and/or has English text as well. Supplemental homework would also be beneficial, until ELLs feel comfortable with the text.

Overall Significance of the Study

This study points out clearly that there really is no one right way to teach ELLs. To be an effective teacher, one must co-plan lessons with colleagues and other schools. Principals must strive to create a school environment that encourages team building among colleagues of all departments, provides time for lesson planning individually and with colleagues, and staff development days focused on specific strategies that include follow through days. Teachers need

to continue to observe and learn from one another past their own student-teaching days. They need to see that the problem of not meeting student needs are not unique to their classroom, but are shared, and work together to discover strategies to improve. There needs to be multiple online programs available for teachers to offer for extra tutorials to better fit the student, whether they are new beginning ELLs or level 3 CELDT ELLs.

About the Author

Leah Callister is a second year teacher at the middle school level. She is passionate in her commitment to her students and ever mindful of her mission to help them succeed. She is enthusiastic, innovative and adventuresome in her endeavor to make her classes engaging and meaningful to her students. Collaboration with her colleagues, openness to new ideas and methods of improving education help make her an excellent team member and advocate for both her students and her fellow teachers.

References

American Psychological Association. (2010). *Publication manual of the American Psychological Association*. Washington, DC: American Psychological Association.

Association of American Educators. (2016, 1994-2016) *Code of Ethics for Educators*. Retrieved from http://www.aaeteachers.org/index.php/about-us/aae-code-of-ethics.

Crawford, L. (2013). Effects of an Online Mathematics Curriculum for English Language Learners. *Computers in the Schools, 30*(3), 248-270. doi:10.1080/07380569.2013.805665 Retrieved from http:/search.ebscohost.com.

Coyner, E., Wootton, K., Hoey, B., etc. (2016, 2015). *CPM Educational Program*. Retrieved from http://cpm.org/

Ed.gov. (2016). *No Child Left Behind.* Retrieved from http://www2.ed.gov/nclb/landing.jhtml.

Elfers, A. M., Lucero, A., Stritikus, T., & Knapp, M. S. (2013). Building Systems of Support for Classroom Teachers Working With English Language Learners. *International Multilingual Research Journal, 7*(2), 155-174. doi:10.1080/19313152.2012.665824. Retrieved from http:/search.ebscohost.com.

Freeman, B. (2012). Using digital technologies to redress inequities for English language learners in the English speaking mathematics classroom. *Computers & Education, 59*, 50-62. doi:10.1016/j.compedu.2011.11.003

Freeman, B., & Crawford, L. (2008). Creating a Middle School Mathematics Curriculum for English-Language Learners. *Remedial & Special Education, 29*(1), 9-19. Retrieved from http:/search.ebscohost.com.

Getting Better Together. (2012). *Principal Leadership, 12*(9), 76-80. Retrieved from http:/search.ebscohost.com.

Jansen, A. (2012). Developing Productive Dispositions during Small-Group Work in Two Sixth-Grade Mathematics Classrooms: Teachers' Facilitation Efforts and Students' Self-Reported Benefits. *Middle Grades Research Journal, 7*(1), 37-56. Retrieved from http:/search.ebscohost.com.

Marshman, M., & Brown, R. (2014). Coming to Know and Do Mathematics with Disengaged Students. *Mathematics Teacher Education & Development, 16*(2), 70-88. Retrieved from http:/search.ebscohost.com.

McLeod, S. (2016, 2011). *Bandura – Social Learning Theory*. Retrieved from http://www.simplypsychology.org/bandura.html.

Pascopella, A. (2011). Successful Strategies for English Language Learners. *District Administration, 47*(2), 29-44. Retrieved from http:/search.ebscohost.com.

Ronfeldt, M., Farmer, S. O., McQueen, K., & Grissom, J. A. (2015). Teacher Collaboration in Instructional Teams and Student Achievement. *American Educational Research Journal, 52*(3), 475-514. Retrieved from http:/search.ebscohost.com.

Short, D. J., Cloud, N., Morris, P., & Motta, J. (2012). Cross-District Collaboration: Curriculum and Professional Development. *TESOL Journal, 3*(3), 402. Retrieved from http:/search.ebscohost.com.

Slavit, D., & Ernst-Slavit, G. (2007). Teaching Mathematics and English to English Language Learners Simultaneously. *Middle School Journal, 39*(2), 4-11. Retrieved from http:/search.ebscohost.com.

Slavit, D, Kennedy, A.,Lean, Z., Nelson, T., & Deuel A. (2012). Support for Professional Collaboration in Middle School Mathematics: A Complex Web. *TESOL Journal,*3(3), 402-424. Retrieved from http:/search.ebscohost.com.

Suydam, M. N.; Cstcrne, A. (1977). The Status of Pre-College Science, Mathematics, and Social Science Education 195-1975 Volume II: Mathematics Education. *Eric*. Retrieved from http://files.eric.ed.gov/fulltext/ED153878.pdf.