Assignment #27: Final Research Report

NC State University

ECI 523

Teacher as Researcher

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**Activating and Captivating:**

Improving academic achievement for English language learners through

English language development in a first-year High School Science classroom

Introduction

 In the fall of 2013, I began teaching an “Academic-level” (meaning “non-Honors,” or “non-advanced”) Earth and Environmental Sciences (E/Env) course at the High School where I had been working for three previous years. It was the beginning of my fourth year of professional teaching experience and I had just gotten comfortable teaching within my specialty area of Chemistry. I had found huge success challenging the advanced 10th and 11th grade students that enrolled in this course and I had enough experience in both the course’s content and the typical struggles that students would face throughout their learning to be confident in my ability to help students reach high levels of achievement. Suddenly, instead, I found myself assigned to teach a course designed for students who had experienced little academic success in the past, were new to the rigor and expectations of the High School environment, and often came to the classroom with learning difficulties – attendance or behavioral struggles, health impairments, specific learning disabilities, or limited proficiency in the English language (or several of these combined!). These huge changes were only compounded by the fact that the course’s content was far outside of my scientific expertise, and I had no previous experience teaching any of these new content standards. I was a first-year teacher all over again…

I relied heavily on my peer teachers and members of my Professional Learning Team (PLT) to help me plan and adjust for these new challenges. I was honestly excited to teach a course that would expand my experience as a young teacher, but I was genuinely terrified of the combination of attempting to implement new classroom management strategies, a variety of support systems in and out of the regular instructional time to meet such a huge range of student needs, and all through content that I had little to no confidence in approaching. As the school year continued, I began to recognize that even the more experienced teachers I was working with struggled to meet all of these challenges effectively. In fact, as an entire school community, I was able to recognize for the first time that we had no centralized effort to support many of these struggling students or to meet the specific learning needs they brought to the classroom. I had been warned by other teachers of the “hopelessness” that fills many 9th-grade Academic-level classrooms and the insurmountable nature of these student’s academic “deficits.” I decided that I could use my inexperience to my own benefit (and to that of my students) and use my “ignorant willingness” to try some adventurous new strategies – I began chasing windmills.

While I tried a series of classroom routines that helped provide more structure for some students, and I used my school’s new tutorial period to work with students to make up missed assignments or to review old material with which they had struggled, I made very little progress in the first two months of working with my 13 English language learners (ELLs). While most of these students had some early (or even advanced) English language development (ELD), five students across my E/Env classes spoke no functional academic English. This was an incredibly intimidating challenge for me considering I only speak English, and these students represented five different native languages. How could I reach these students? What goals should I set for them considering that their final assessment for the course will be a standardized, state-wide test written only in English? I decided to seek out some specific, research-supported strategies that I could implement with the support of our school’s lead teacher for English for Speakers of Other Languages (ESOL) classes and assess using specific, measureable data. This action research study would allow me to (1) exercise teacher leadership among my professional peers, (2) utilize reliable ELD support strategies in my classroom, (3) provide more visible efforts within my classroom instruction to include students who struggle with the English language, and (4) measure the effectiveness of my implementation of these strategies as measured by student attitudes about the classroom and the required content and through analysis of specific formal assessment data.

Of the 20% of all American students who come to school from a home where the primary language is not English, half of these young people have not yet mastered the English language. The disconnect between academic language and native language for these ELL students – 80% of whom are native speakers of Spanish – has resulted in a dramatic achievement gap that educators have had little success in shrinking over the last two decades (Lee & Buxton 2013). With the increased reliance on high-stakes testing in schools in the United States, which overwhelmingly accentuate the academic-native language divide, non-native speakers of English have been the most negatively impacted subgroup of students (Short, Fidelman, & Louguit 2012). According to the National High School Center (NHSC), Hispanic students are four times more likely than their White peers to drop out of school and twice as likely as their Black peers not to receive a High School diploma: “Polic[ies] to promote academic achievement for ELLs is critical to improving educational outcomes and consistent with the goals of increasing high school graduation rates” (NHSC 2009).

All too often, classroom teachers, feeling overworked, undersupported, and unprepared to conquer language barriers, relegate the success of struggling non-native speakers of English to “someone else’s duty.” This is not out of laziness or a lack of empathy, but simply out of the struggle to balance the overwhelming range of demands placed on teachers to traverse ever more complicated achievement gaps. It is possible, however, and hopeful to believe that developing systemic approaches to supporting ELD for struggling ELL students, along with research-based, approachable classroom instructional routines will empower these same hardworking teachers to bridge these intimidating gaps (NHSC 2009). ELL students need ELD support across all subject areas, inside and outside of the English Language Arts (ELA) classroom and beyond the typical English for Speakers of Other Languages (ESOL) classroom. Science classes, and other vocabulary-intense courses, have an opportunity and responsibility to meet these students’ ELD needs by integrating specific strategies that address multiple forms of literacy, including reading, writing, speaking, listening, viewing, representing, and gesturing (Lee & Buxton 2013, Vacca, Vacca, & Mraz 2011, Roth in Saul 2004).

As teachers and schools have sought methods to mitigate the struggle for non-native speakers of English to succeed in learning and standardized assessment, and to support ELD across content-areas, Sheltered Instruction Observation Protocol (SIOP) model instruction has risen as a popular, successful, research-supported technique in English as a Second Language (ESL) and content-area classrooms (Short, Fidelman, & Louguit 2012). The SIOP model provides a “comprehensive instructional framework” that helps teachers design content-area lessons which integrate additional ELD support for ELLs, increases teachers’ awareness of highly effective practices for improving ELL student understanding, retention, and achievement, and allows teachers to observe the implementation of ELD support strategies in their own and others’ classrooms (Vacca, Vacca, & Mraz 2011). The SIOP model focuses on specific aspects of instruction that can be enhanced and adapted to better support ELD, including building ELL students’ background knowledge; ensuring that teacher input is comprehensible; utilizing, demonstrating, and reinforcing learner strategies for approaching many forms of text; enhancing the effectiveness of teacher-student interaction as well as that of practice and application within the classroom lessons; reflective strategies for teachers to gauge the effectiveness of lesson delivery before, during, and after instruction. The comprehensive implementation of these strategies is trusted to “deepen and broaden a learner’s ability to use a new language” as well as to “advance proficiency” and connect authentically to “learner needs and interests” (Short, Fidelman, & Louguit 2012). SIOP is an adaptation of what has long been referred to by researchers as “sheltered instruction.” Sheltered instruction programs have had large success in the ESL or ESOL classroom, adapting the English vocabulary and formats to a student’s level of English language comprehension, and the use of targeted gestures and pictures, graphics, and other visual aids to scaffold instruction, especially in a classroom including a variety of native languages and ELD needs (NHSC 2009). “Teachers often use a variety of instructional aides to let students who have limited skills in reading, writing, listening, and speaking ‘see’ challenging, and often abstract, content visually” (Vacca, Vacca, & Mraz 2011). These visuals are often used to provide context for new vocabulary and might include pictures, videos, audio-recorded sound effects, artistic representations of a concept or meaning, hands-on and collaborative activities, or teacher-modeled comprehension strategies. The greatest strength of sheltered instruction, such as SIOP model instruction implemented in heterogeneous content-area classrooms, is the opportunity for non-native speakers of English to participate and learn along side of and to communicate with their English-speaking peers.

The success of sheltered instruction models has been largely due to its emphasis on two key, yet too often taken-for-granted, aspects of instructional content and the learning process: content vocabulary development and the building and activation of students’ prior knowledge related to the content (Short, Fidelman, & Louguit 2012). As long lists of content standards and calendar and schedule constrictions force teachers to make difficult decisions about how to most effectively use their precious instructional time, authentic activities and classroom discussions that activate, assess, and build what students’ already know about an important concept become more and more infrequent. This elimination of the first two steps – *E*ngage and *E*xplore – of the “5*E*” inquiry-based learning cycle (Westervelt 2007) leads to the already long lists of important terms – some visibly posted and communicated, others implicit in the teacher’s instructional language – more frequently including words that many students have little to no clear understanding of, even by the end of the teacher’s instruction. The development and understanding of key content vocabulary and the consistent activation and building of background knowledge are inextricably intertwined, especially in the Science classroom and even more so for non-native speakers of English. Teachers have become more aware of this connection over time, even as the importance of student exposure to and comprehension of a wide variety of text resources has grown with the national implementation of the Common Core State Standards (CCSS). “Vocabulary knowledge is fundamental to the comprehension of text and is most effective when it relates new words to students’ existing vocabulary and background knowledge” (Marzano ctd. in Wessels 2013). ELL students need classroom activities planned early in a content unit that are intentionally designed to be active, engaging, flexible, and sheltered to help develop context and terminology that will be important for their continued learning. Since ELL students “are less likely to have the vocabulary needed to comprehend informational text…instruction that helps build both general academic and content-specific vocabulary knowledge is particularly critical while promoting language development. Even [ELL] students who appear fluent in English frequently need assistance in learning the academic language of science” (Wessels 2013).

Effective strategies for “actively engaging [ELL] students in the science vocabulary learning process” include manipulative tools like foldables, graphic organizers like DOTS and U-C-ME charts or word meaning diagrams, science demonstrations and discrepant event inquiries, and reading comprehension tools like anticipation guides and questioning strategies (Lee & Buxton 2013, Wessels 2013, Grant & Fisher 2010). Carefully considering ways to limit specific vocabulary lists is another important strategy for helping ELLs successfully learn new key terms for understanding an important concept. Fisher and Frey (ctd. in Grant & Fisher 2010) outline characteristics of effective vocabulary terms, including that the words must be representative, repeatable, and transportable. The authors go on to add other aspects of vocabulary that are useful for excluding words from specific lists, such as how capable students might be of understanding its meaning on their own through contextual or structural analysis. Supporting ELL students’ development of a “semantic network” should be the primary goal of all vocabulary instruction, helping students connect these key terms to previously learned ideas, facts, or concepts – their own activated, built, and experienced *background knowledge*. As students work through the science vocabulary learning process, teachers must assess their understanding and development. Beck, McKeown, and Kucan (ctd. in Grant & Fisher 2010) recommend a continuum of “word knowledge” that stretches from no knowledge of the term at all, to “rich, decontextualized knowledge of a word’s meaning, its relationship to other words, and its extension to metaphorical uses.” If the goal of all science teachers is to promote this “rich” word knowledge among their students – including their ELL students – the role of science vocabulary development and the building of experiential background knowledge must be intentional, explicit, and ever-present in their instruction.

If science instruction for non-native English speaking students is to be centered on the development of a broad, deep understanding of science content vocabulary (as the research previously mentioned mandates), ELLs must be provided authentic opportunities to engage in active, student-centered, inquiry-based activities in the science classroom. These activities are necessary in order to reveal the context of the new science concepts, as well as to activate and, for many ELLs, build the prerequisite background knowledge they need in order to achieve a rich understanding of the content. Miriam Westervelt (2007), a teacher researcher supported by grant funding from the Smithsonian Museum of Natural History, recognizes a conflict in science teachers’ transition to inquiry-based learning and the pressures of increasing academic achievement for ELLs. According to Westervelt, even as science educators have embraced inquiry in their lesson planning and daily instructional routines, creatively tackling concerns of access and resource equity as well as adjusting to the importance of scaffolding and greater attentiveness to student needs as they are asked to engage in learning that is more demanding and more complex than they have previously experienced, teachers’ confidence has been shaken at the prospect of struggling to implement inquiry-based instruction through a language barrier with ELL students. Research-aware science teachers trust that inquiry-based instruction leads to deeper learning; experienced science teachers understand that inquiry requires active, constant support from a facilitating teacher as it demands more critical thinking and introduces more cognitive dissonance than traditional, teacher-centered instruction. Science teachers struggle then to adapt this more “high maintenance” method of instruction to the compounded needs of ELLs. Sadly, many teachers choose to give in to the pressures of a communication barrier and, rather than offer ELLs the same opportunities for active, inquiry-based learning, most often replace these activities with rote, text-based resources (or even remove inquiry from the classroom altogether). Westervelt’s analysis of the inquiry-ELD conflict is mirrored in the work of other researchers (Lee & Buxton 2013, Short, Fidelman, & Louguit 2012, NHSC 2009).

Recognizing this struggle, Westervelt (and other researchers) suggest several approaches to integrating more ELL-friendly inquiry-based activities in the science classroom. “Scaffolded inquiry” (Maata, Dobb, & Ostlund ctd. in Westervelt 2007) is a scheme utilized to introduced students to the specific skills and thinking processes demanded by inquiry-based learning. By providing clear and easily understood expectations and extra structure for the activity, along with built-in visual aids to support communication and understanding, students with even the most limited ELD can engage in active, inquiry activities. Over time, these extra supports can be removed as ELLs gain more confidence in the new language, in working with one another, their peers, and their teacher, and in working independently in the new language. Teachers who intentionally plan activities early in the course that allow for more scaffolding and then provide opportunities for slowly, appropriately removing those scaffolds over the remainder of the course create a structure in which ELLs and teachers alike can experience success in inquiry-based instruction.

In this teacher action research study, a beginning teacher will seek to implement research-based strategies to activate and build the background knowledge of ELL students in an Academic-level Earth and Environmental Sciences course, and to support the understanding and retention of key content vocabulary. Several instructional strategies will be used in concert with one another, all targeted to increase each student’s academic achievement; there will be an attempt to include inquiry-based activities throughout this study. The overall effectiveness of these strategies will be measured according to qualitative student surveys and teacher reflections as well as quantitative formal assessment data. The central research question will be, “**Will a targeted increase in instructional emphasis on building background knowledge and key content vocabulary increase the academic success of English language learners?**”

Methodology

 To respond to the research question, a treatment group (12 formally identified ELL students with varied native languages, across the teacher researcher’s two Earth and Environmental Sciences classes) received sheltered instruction over the course of a single unit of study (covering the rock cycle, weathering and erosion, characteristics of soils, and the mass movements of these rocks and sediments). Throughout the unit (about three weeks), the teacher researcher recorded brief, written notes describing the perceived effectiveness of support strategies and lesson implementation, as well as student responses and engagement in the sheltered instruction lessons. Student post-interviews were conducted separately by an ESOL teacher who regularly provides support instruction for these ELL students; these interviews focused on student awareness of the implementation of new strategies, their perceptions of these strategies and the teacher researcher’s efforts to provide greater support during primary instruction, and students’ feelings about their own success in the class. A control group (9 formally identified ELL students with varied native languages, across another teacher’s two E/Env classes at the same High School) received typical instruction (with no targeted sheltered instructional strategies) over the same time period, covering the same course content. Additional student surveys were conducted to include the control group, as well as a post-interview of the “control” teacher, conducted by the teacher researcher. A summative assessment (a “unit test” of all selected response items, primarily created by the “control” teacher) was given to students in both the treatment and the control group. Students’ scores from this assessment were compared to gather quantitative data measuring the impact of the sheltered instructional strategies on academic achievement.

 The teacher researcher and the supporting ESOL teacher were the only participants that were aware of the research study while it was conducted; the control teacher was informed during the post-interview with the teacher researcher. (*Note*: Collaborative work among the teacher researcher, the control teacher, and the supporting ESOL teacher is frequent and positive in this professional learning team.) Results of the action research study were analyzed by the teacher research and the supporting teacher, and will eventually be shared among all of the High School’s E/Env teachers.

 Both quantitative and qualitative methods were used to analyze the resultant data. Quantitative analysis was conducted by comparing average unit test scores of the treatment and the control groups, as well as average unit test scores of the classes (as a whole) that included the treatment and the control groups. Prior to analyzing the summative assessment results, three specific test items were selected by the teacher researcher as “indicator questions” for closer analysis. Individual student results for these specific test items were examined in order to identify other patterns that might exist in the data. Qualitative analysis was conducted by the teacher researcher and the supporting ESOL teacher together, focusing primarily on student survey results. Student responses were examined in order to identify answers to two related questions:

 (1) To what extent were ELL students aware that the teacher researcher was implementing new strategies targeted to support their understanding?

 (2) Did the implementation of sheltered instructional strategies lead to an increased sense of inclusion in the class, or an increased sense of self efficacy among ELL students?

 When analyzing the quantitative results, the summative assessment data for any ELL student who was absent during the unit of study for more than one full class period was removed from the ELL-only values; absences were not considered when calculating holistic data for all students. “Indicator questions” were not selected until after the summative assessment had been completed by all participating students. In collecting qualitative data, three students from each of the treatment and control groups were identified and interviewed by the supporting ESOL teacher; the teacher researcher was not informed of which students from the treatment group were to be interviewed until after the study’s implementation and the interviews had been conducted. Each of these measures was taken in an attempt to prevent bias introduced by the teacher researcher and to ensure the reliability of the study’s results.

Findings

*Quantitative results:*

 Overall, there was a distinctly positive gain in student achievement among ELL students in favor of sheltered instructional strategies. The increases in student achievement among ELL students are present across levels of cognitive complexity, with the greatest increases at the lowest level (Table 2). The positive impact on student achievement can even be seen in the summative assessment scores of non-ELL students that were also exposed to sheltered instructional strategies designed to enhance science vocabulary development and to activate and build relevant background knowledge.

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| **Table 1: Summative assessment scores across treatment and control groups, as an average of percentages of test items answered correctly** |
|  | Students in **treatment group** (n=10\*) | Students in classes including **treatment group** (n=54) | Students in **control group** (n=8\*) | Students in classes including **control group** (n=62) |
| Averagesummative assessment score: | **57.6%** | 83.1% | **34.9%** | 71.4% |
| \* Adjusted to exclude ELL students absent for more than one full class period during the instructional unit of study. |

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| **Table 2: Percentage of correct responses to selected “indicator questions” across treatment and control groups, and alignment with categories of requisite cognitive complexity** |
|  | Level of **cognitive complexity**, as measured by **Revised Bloom’s Taxonomy**(Anderson & Krathwohl 2001) | Percentage of students in **treatment group** who answered **correctly** (n=10\*) | Percentage of students in classes including **treatment group** who answered **correctly** (n=54) | Percentage of students in **control group** who answered **correctly** (n=8\*) | Percentage of students in classes including **control group** who answered **correctly** (n=62) |
| Indicator question **#1** | **Remembering** | **100%** | 97% | **63%** | 82% |
| Indicator question **#2** | **Understanding** | **70%** | 81% | **50%** | 77% |
| Indicator question **#3** | **Applying** | **30%** | 69% | **25%** | 69% |
| \* Adjusted to exclude ELL students absent for more than one full class period during the instructional unit of study. |

 As shown in Table 1, the average summative assessment score for the treatment group reflects a positive impact of more than twenty percentage points when compared to the control group.

 It is important to note that neither the control group nor the treatment group achieved a “passing” average score of 70% or greater. The treatment group did, however, include four students who achieved individual summative assessment scores at or above 70% (two of whom scored at or above 80%, which could reasonably represent content mastery). There were two students in the control group who achieved individual summative assessment scores at or above 70% while none in this group achieved “mastery” at 80% or greater. The lowest individual summative assessment score from the treatment group was 37% (establishing a range of 37 percentage points) while the lowest individual score from the control group was 13% (a range of 64 percentage points).

 Table 2 shows the percent of students from both the treatment group and the control group who answered specified indicator questions correctly; these questions were selected to reflect increasing levels of cognitive complexity for comparison across research groups. The data show a 37 percentage point impact in the treatment group for assessment items that require low cognitive complexity. This impact diminishes substantially as the complexity of the assessment items increases to a moderate level. There were no questions included in the summative assessment that required high cognitive complexity.

 The data also show a positive impact in the average scores of students who participated in the treatment group lessons but are not formally identified as ELL students. While the impact reflected in the data is substantially smaller than that for the treatment group, a correlation can be identified between the implementation of sheltered instructional strategies and increased student achievement for students that are native speakers of English. This positive impact also diminishes with increasing cognitive complexity, with no measurable impact present in the data as students approach moderately complex summative assessment items.

*Qualitative results:*

 Student interviews were conducted by the supporting ESOL teacher and occurred on the school days following students’ completion of the summative assessment. Two students were interviewed from each of the treatment group and the control group; the interviews were conducted in a one-on-one setting. Audio and video recordings were not used in order to prevent participating students from feeling intimidated by their surroundings. Individual student performance on the summative assessment was not considered in the selection of students to be interviewed, nor were their assessment scores discussed during the interviews. The supporting teacher was unaware of summative assessment data and had no specific conversations with the teacher researcher regarding the implementation of the sheltered instructional strategies. The supporting teacher was provided with an attendance list for each class day in the unit of study prior to selecting students to be interviewed.

 The supporting teacher recorded handwritten notes during the interviews which were largely casual conversations in order to ensure the comfort and openness of the students. An extensive conversation occurred after the interviews wherein the supporting teacher shared the results of each student interview with both the teacher researcher and the control teacher. This meeting is where most of the reflection and formal data analysis occurred.

 The student interviews for the treatment group revealed clear answers to each of the interest questions that were previously identified. Treatment students explained that they were very much so aware of new instructional routines implemented by the teacher researcher, especially those targeting the continual development of understanding of key vocabulary terms. One student from the treatment group – “Daniel,” identified as an “ESL 2,” meaning that he has limited utility of the English language but is able to communicate casually in broken sentences – noted that he felt much more confident completing the summative assessment because he could “actually understand most of the words” in the test items. Daniel went on to say that the words he understood in the test questions were many of the words his E/Env teacher – the teacher researcher – had repeatedly used with visual aids to explain. Another treatment group student – “Selena,” identified as an “ESL 3,” meaning that she is confident conversing casually but struggles to put her verbal communications into complete, written ideas – said that she “really liked” the visual cues that were displayed in the classroom throughout the unit, some illustrating individual key words while others illustrated complete sentences. (Selena also has an identified specific learning disability in reading comprehension, struggling to interpret and understand any English text longer than two to three sentences.) Selena explained that her teacher often speaks too quickly for her to understand during class, even if she knows what all of the words mean; when her teacher speaks quickly and adds new words that she does not recognize, she “stops listening.” According to Selena, using the visual aids while talking “slowed down” the way her teacher talked about important ideas. Treatment group students did not indicate that they recognized the teacher’s “new” strategies were specifically directed at them, or their ELL peers.

 As new instructional strategies were not introduced into the control classroom, student interviews for the control group were conducted with a slightly different focus. These students were asked to discuss how they feel their E/Env teacher helps them translate between the new English language vocabulary they are using in class and their native Spanish (both of the control group students that were interviewed come from families where Spanish is the primary language of communication). The two control group students – both identified as “ESL 2” ELLs – indicated that there are many words they hear in class or see on formal assessments or class assignments that they recognize from the teacher’s pre-printed class notes, but still do not understand. One of the students explained that he uses the Spanish-English glossary in the back of his E/Env class textbook when his teacher assigns a vocabulary-oriented task (which is apparently most often copying definitions out of the textbook). The other student who was interviewed, who currently has a failing grade in the control teacher’s E/Env class due to exceptionally low test grades (including the lowest score across all participating students on the unit test examined in this research study), said that she sometimes actually understands three or four of the assigned vocabulary terms for any single unit, but, on unit tests, gets so anxious when she encounters other terms that she is less familiar with that she skips many of the questions, submitting her assessments with items left unanswered.

 Students in both the treatment group and the control group were also asked to discuss how they felt talking in their E/Env classes, with other ELLs, with their non-ELL peers, and with their teacher. From the treatment group, Selena reported that, while she often uses Spanish in class and mainly talks with other Spanish-speaking students, she did feel more comfortable talking with non-ELL students in English during this unit. During one activity in particular, when Selena found herself at a work station with only English-speaking students, she claimed that she felt comfortable enough to speak out in the small group, using the English language content vocabulary. Daniel did not report such confidence in talking to his English speaking classmates, but he did state that he spoke less Spanish and more English during this unit than he normally does. The supporting ESOL teacher felt that these responses were representative of the different ELD levels of these two students; she also connected both treatment students’ comfort using Spanish in the E/Env classroom to the teacher researcher’s pattern of allowing and encouraging his ELL students to communicate in their native language during independent work time in the classroom. (This is not the case in all of the ELL students’ classes.)

 Both control group students indicated that they speak very little in all of their classes, including the E/Env class, because they are uncomfortable using English to communicate. (Both the supporting ESOL teacher and the control teacher later described each of these control group students as “very quiet.”) When asked if he would feel more comfortable using Spanish in the classroom instead of English, one of the control group students indicated that he would be much more likely to speak out in class if he could talk with his teacher in Spanish. (The other ELL students in his E/Env have much more advanced ELD and speak a variety of native languages, not including Spanish. Thus, he does not have the opportunity to use Spanish to communicate in class, even if he desired.) The second student mentioned negative social interactions as an inhibitor for her in-class communication. Claiming that other Spanish-speaking students in her E/Env class do not “like” her, she explained that she would not choose to communicate in Spanish because she would have to talk to students with whom she does not feel comfortable. She went on to say that she does have two friends in her E/Env class, but that they only speak English; she explained that she liked to sit with these other female students, but chooses to work near them quietly with very little talking. In a separate post-interview, the control teacher stated that he would like to find ways to make these (and all of his ELL students) feel more comfortable speaking in the classroom, but struggles to bridge the same social tensions and communication barriers the control group students mentioned in their interviews. It seems that all participants in the control classroom are frustrated by the circumstances that they struggle through together on a daily basis.

 Overall, due to out-of-class social interactions and a lack of students who share the same native language, the control classroom does not facilitate a highly communicative culture. This is very different than that described by the two treatment group students, who are each enrolled in E/Env classes with several friends that share the same native language. This stark difference in classroom culture may substantially contribute to the quantitative patterns measured in the treatment and control groups.

Discussion

 While the quantitative data seems to reflect a large, positive impact on the student achievement of ELLs in favor of sheltered instructional strategies, there also seem to be other complex differences at work in the results of this action research study when placed in the context of the qualitative data. This is an indication of possible exaggeration present in the quantitative data of this study. It is the conclusion of the research participants that the initial quantitative impact of sheltered instructional strategies is significantly lower than this study’s data reflect. To further examine these impacts, a second action research study is planned that will include the continued implementation of sheltered instruction in the original teacher researcher’s classes as well as initial implementation of these same practices in the original control classes. The results of this second study will be compared to those for the control classroom of this original study in order to better understand the impact on ELL student achievement of the social inhibitors previously discussed. It is predicted that the impact of continued sheltered instructional strategies in the original teacher researcher’s classes will grow over time. It is also predicted that, as students are supported with sustained sheltered instruction within a specific content area (in this case, Science), the positive impact of greater vocabulary development will reach into higher levels of cognitive complexity, signified by higher frequency of responding correctly when answering assessment items targeting the application, analysis, and even evaluation levels (Anderson & Krathwohl 2001).

 The results of this action research study have demonstrated that, regardless of classroom culture, targeted emphasis on content vocabulary development and the activation and building of authentic, meaningful, relevant background knowledge have the potential to hugely impact the achievement and the English language development of English language learners in science classrooms. While sheltered instructional routines have been supported by research, I have now seen the impact that these can have on a daily basis in my own classroom. The use of key visual aids that continually reinforce important science vocabulary terms has made a noticeable improvement in the engagement, confidence, and achievement of all nine of my current ELL students.

 This study has also led to constructive conversations among science teachers in my school community, especially among those with whom I share a PLT. Through this action research study, I have built a meaningful, collaborative relationship with a key resource – my school’s lead ESOL teacher. This work has also led to active work with one colleague in particular – the original control teacher – to develop a more vocabulary-centered, ELD-aware E/Env course for our school. I have learned that my ELL students are incredibly aware of their own learning needs, but struggle to communicate these with teachers. As content-area teachers become more aware of research-supported strategies for increasing the ELD of language learning students, these strategies will become more prevalent in our classrooms. Now that I have sought out explicit instructional routines that are designed to support my students’ language development, I have a responsibility to model these strategies in my own teaching, share their impacts with other teachers, and serve as a resource for other teachers who desire to more appropriately support their ELL students.

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