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Instructional Practices Associated with Science Proficiency of English Language Learners

Sherly Yadira Soto-Ortiz
Walden University

Walden University

College of Education

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Sherly Soto

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Abstract

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MA, Universidad del Turabo, 2004

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Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

The study addressed the gap in fifth-grade science proficiency between English language learners (ELLs) enrolled in two different science programs in a large school district in the Southeast United States. The Inspire program was implemented in 125 schools, while a combination of Inspire and Promoting Science among English Language Learners (PSELL*)* developed to facilitate science learning for non-English learners, was implemented in 25 schools. A concurrent mixed-methods case study design was used to examine how instructional practices of each program were (1) aligned with the instructional framework of the Sheltered Instructional Observation Protocol (SIOP), (2) how the two programs supported the acquisition of content-specific learning for fifth-grade ELL students (qualitative), and (3) whether there was a difference in science proficiency between ELLs who participated in one program or the other program. Thematic analysis based on SIOP was used to analyze the qualitative data from the six teacher interviews, three teachers from each science program. Data from the Florida Comprehensive Assessment Test were used to compare the proficiency levels of the 96 fifth-grade ELLs in the two schools. Teaching practices in the combined Inspire + PSELL program were more closely aligned with the SIOP framework. A Mann-Whitney U test revealed a significant difference in achievement between students taught with Inspire (Md = 39.93, n = 28) and those taught with Inspire + PSELL (Md + 52.03), U = 712, z = -2.579, p = .010, r = .30) in favor of Inspire + PSELL. The finding was consistent with the qualitative study. The study may bring positive social change in district policy for fifth-grade science by expansion of the more effective science program or through staff development of the teaching strategies aligned with PSELL and SIOP.

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Dedication

This study is dedicated first to God to give me the knowledge and strength to follow my dream. Second, my husband and soul mate Lionel Delgado for his support during this most challenging time. His way of keeping me happy through the tough times was wearing many hats, such as support person, caretaker, chef, husband, and companion. His ability to take on the task of preparing dinner, doing the laundry, and even grocery shopping was phenomenal. For all the support, I am honored to be his wife. Third, I dedicate the hard work and effort that went into this degree to my son, Edward Gabriel, and my daughter, Alanis. May this endeavor serve as a model for them to follow; if you work hard, you can reach your goals, knowing that determination is the key to success. I want my children to know that accomplishments are based on effort, hard work, and determination. Fourth, I dedicate this work to my dear mother, Carmen, who made some great sacrifices to make me who I am today and to my father Manuel, neither of them were able to finished high school, but always taught me the importance of school and work hard to reach my goals in life. Thanks for always believed in me.

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Section 1: The Problem

English language learners (ELLs)are the fastest growing and lowest performing group of students in the state of Florida (Florida Department of Education [FLDOE], 2018). The United States Census Bureau (2016) reported that 24.9% of the population in Florida is identified as Hispanic or Latino. In the context of Florida state statistics, an ELL is defined as any individual who does not speak English as the primary language. However, within the context of the school setting, ELLs are defined as those students who have been identified through formal assessment as insufficiently proficient in English and therefore require targeted instruction to meet their needs. It is this population of formally identified English language learners that are referred to as ELLs throughout this study.

The large central Florida county district, which is the focus of this project study, includes students who originate from 165 countries. These students speak 157 different languages and dialects. According to the school district's website, the student racial and ethnic distribution is 42% Hispanic, 26% White, 25% Black, 5% Asian, and 2% multicultural. Students who are formally identified ELLs comprise 15.9% of the student population.

The State of Florida annually assesses the science proficiency of all fifth- grade students, with the Science Florida Comprehensive Assessment Test (FCAT), a test aligned with the fifth grade Florida State Science Standards (FLDOE, 2018). Proficiency is score by the state above which a student is deemed to be proficient in a subject. The state-set proficiency benchmark score is the same for all subjects tested. The state reports both state and district test results in terms of the percentage of students above and below the set proficiency benchmark level. Individual test results are also made available to districts and parents in terms of the proficiency benchmark level. Fifth grade is the first of two grades in which the State of Florida requires assessment of science proficiency, the other being eighth grade. In 2018, the FLDOE reported that on the fifth- grade FCAT in 2017-2018, 53.3% of the district's fifth graders scored at the proficiency level in science compared to 54.9 % statewide. The state reported that this represented an increase statewide in the fifth grade science proficiency rate of 3.8% and for the district a 4.1% increase over the 2016-17 assessment results (FLDOE, 2018).

However, the target district FCAT results for 2017-2018 showed that only 17.5% of fifth grade ELLs tested at the proficient level compared to 59.9% for non-ELLs. State levels of proficiency were comparable for ELLs and non-ELLs, 17.0% to 58.8%, respectively in 2017-2018. Since the district demonstrated a proficiency gap of 41.8% between ELLs and non-ELLs, the state required the district to adopt a new textbook or curriculum program to close the proficiency gap. While both the district and the state reported marginal gains for ELLs and non-ELLS in 2017-2018, the achievement gap between the two populations decrease by only 0.5% and 1.1%, respectively (FLDOE, 2018).

The state also requires annual assessment of student proficiency in fifth grade of mathematics and English language arts in addition to science. In 2017-2018 the state reported the district's fifth grade proficiency benchmark rate was 58.8% in mathematics, and 54.7% in English language arts; compared to the overall state's proficiency rate of

60.7% in mathematics and 54.8% proficient in English language arts. However, in 2018, the FLDOE reported that the proficiency gap between ELLs and non-ELLs state-wide was 41.8 percentage points in science, 41.4 percentage points in English language arts, and 27.7 percentage points in mathematics. At the district level, the state reported achievement gaps between fifth grade ELLs and non-ELLs as 42.4 percentage points in science, 41.3 percentage points in English language arts, and 26.3 percentage points in mathematics (FLDOE, 2018). It would seem reasonable to expect a greater achievement gap between ELLs and non-ELLs on language arts assessments, since ELLs in regular classrooms are in various stages of learning English; however, while there is a measurable gap between ELLs and non-ELLs in language arts and mathematics proficiency levels, the greatest gap between the two populations of students state-wide and at the district level is in science proficiency (FLDOE, 2018).

The FLDOE found the district's continuing gaps in proficiency levels between ELLs and non-ELLS in English language arts, mathematics, and science unacceptable with the greatest concern being the gap in science (FLDOE, 2018). In response to the deficiency in science proficiency of ELLs, the district adopted and implemented two different fifth grade science programs. Promoting Science Among English Language Learners (PSELL), developed by the New York University (2011), was implemented by fifth grade teachers in 25 elementary schools in the school district beginning in the fall of 2012. Fifth grade teachers in the other 100 district elementary schools continued to use the Florida Science Fusion program, which the district re-adopted in 2012 (Houghton Mifflin Harcourt, 2017). Each science program included separate textbooks, curriculum guides, teacher instructional guides, and formative and summative assessments. However, despite the continuing record of low science standardized testing scores for ELLs, no formal studies of how either science program was aligned with the instructional needs of ELLs was conducted.

In 2017, the district adopted a new fifth grade science program, Inspire Science (McGraw Hill, 2017), to replace the Florida Science Fusion Program to be used for all students. This adoption was to align with the Next Generation Sunshine State Standards (NGSSS). Teachers implemented the new program in all 125 elementary schools in the fall of 2018. However, fifth grade teachers in the 25 schools who had been teaching with PSELL (New York University, 2011) were expected to continue to simultaneously implement a combined program of PSELL and the new Inspire Science Program (McGraw Hill, 2017).

The Local Problem

The problem was the lack of understanding of how each of the two fifth-grade science programs provides or does not provide textbooks, curriculum guides, instructional strategies, classroom assessments aligned with research-based practices for ELLs and if there is a difference in achievement of the state-set proficiency benchmark for ELLs between the two programs. According to Hunt and Feng (2016), ELLs who lack academic language will struggle with understanding of spoken language and therefore struggle to succeed and perform competitively with non-ELL students. This issue is especially relevant in the learning of science because of the amount of content-specific vocabulary required in the science curriculum and assessments (Weinburgh, Silva, Smith, Groulx, & Nettles, 2014). Cummins (2016) differentiated between basic interpersonal communication skills (BICS), and cognitive academic language proficiency (CALP). Cummins (2016) defined BICS as the social language that students require to communicate with their peers. Therefore, BICS can be developed outside the classroom. On the other hand, CALP is the language primarily learned in the classroom and is critical for academic success.

Rationale

The purpose of this concurrent mixed method case study was to explore to what extent each of the two fifth grade science programs provides or does not provide textbooks, curriculum guides, instructional strategies, classroom assessments aligned with research-based practices for ELLs and determine whether there was a difference in achievement of the state-set proficiency benchmark for ELLs between the two programs. FCAT 2018-2019 proficiency results for ELLs in the study schools, participating in each the two science programs, were compared to add further insight into the two programs and case study.

There are several indicators that one or both of the district-adopted science programs may not be sufficiently addressing academic language learning acquisition of ELLs as evidenced by continuing low level of proficiency shown for the district's ELLs on the State's FCAT assessment of fifth grade science proficiency. According to the FLDOE (2018), 17.5% of ELLs tested as proficient, compared to 59.9% of for non-ELLs, a difference of 41.3 percentage points. The district level gap between science achievement for ELLs and non-ELLs as assessed by the FCAT, exceeded that of the state (FLDOE, 2018).

Another indicator of possible problems associated with science instruction in the district is that the proficiency gaps between ELLs and non-ELLs in other content areas are not as great as those gaps in science. In 2018, district proficiency gaps between ELLs and non-ELLs for mathematics and English language arts were 26.3 percentage points and 41.3 percentage points, respectively. However, neither the mathematics nor the English language arts achievement gap was as great as the 42.4-point gap between ELLs and non-ELLs in science (FLDOE, 2016b).

Scott, Schroeder, Tolson, Huang, and Williams (2014) conducted a 5-year longitudinal study of fifth grade science instruction in Texas and determined that Hispanics scored the lowest of the three ethnicities tested: White, African American, and Hispanic students. However, after 5 years of implementation of a new instructional science program, *5E Instruction Model*, in Region 4, African American students' average scores increased 163 points, Hispanic students' average scores increased 226 points, and White students' average scores increased by 192 points. The science Texas Assessment of Knowledge and Skills provided the standard for measurement of student achievement. This study provides support for the role curriculum and instructional practices can play in student outcomes in science, particularly for minority populations.

Reducing the achievement gaps between ELLs and non-ELLS is a critical component of state-required school improvement planning for the district. All schools in the state of Florida are required to develop a yearly school improvement plan.

Additionally, those schools designated as low-performing by the FLDOE must develop a yearly school improvement plan designed to target specific areas of need and to address low-performing populations including ELLs, special education, and minority students. Those schools identified as “needs improvement” and that fail to make yearly learning gains are further identified as schools in “corrective action.” Many of these schools are also identified as Title 1 eligible, as determined by federal and state free-reduced lunch qualification guidelines. According to the school district website, 93 schools out of 196 K-12 schools are considered Title 1.

This Title 1 designation was relevant because this study took place in Title 1 elementary schools within a public-school district in Central Florida designated by the FLDOE as “needs improvement.” In FLDOE’s public designation of district schools as “need improvement” the low proficiency level of ELLs was specifically cited. Based on the state-required improvement plan, the district adopted the new Inspire Science program for use in all 125 elementary schools and in 25 of those schools directed that PSELL program continue to be used in combination with the new Inspire Science program.

The problem was the lack of understanding of how each of the two fifth grade science programs provides or does not provide textbooks, curriculum guides, instructional strategies, classroom assessments aligned with research-based practices for ELLs and if there is a difference in achievement of the state-set benchmark for ELLs between the two programs.

Definition of Terms

The following terms and definitions were used throughout this study:

5E Instruction Model: A primarily student-led and inquiry-based science instruction model. The teacher is a facilitator, guiding the student through questions, investigations, experiences, and research. Students arrive at a deep understanding of fundamental science concepts. The model has five stages to follow: engage, explore, explain, elaborate, and evaluate (Rumel, Rye, Selmer, & Luna, 2017).

Academic language: The specific language associated with mathematics, science, language arts, and social studies. Academic language is used to describe content language related to a specific field. Some examples are the language of English literature, literary analysis, religion, philosophy, and science (Krashen, 2003).

ACCESS for ELLs: The language proficiency test used to determine ELLs' level of proficiency in English, which is administered to kindergarten through 12th grade students who have been identified as ELLs. The acronym ACCESS stands for Assessing Comprehension and Communication in English State to State for English Language Learners. The ACCESS test is aligned with the World-Class Instructional Design and Assessment (WIDA) English Language Development Standards, which assesses each of four language domains as well as the level of English language acquisition (WIDA, 2014).

Adequate yearly progress (AYP): Progress in student achievement that is measured from year to year; minimum levels of improvement as measured by standardized test chosen by the state; target set for overall achievement and for subgroups of students, including major ethnic/racial groups, economically disadvantaged students, limited English proficient students with disabilities (No Child Left Behind [NCLB], 2002, p. 22). NCLB was replaced by Every Student Succeeds Act (ESSA) signed by President Barak Obama in December 2015 (United States Department of Education, 2015). This law advances equity to create a law that focuses on the clear goal of fully preparing all students for success in college and careers.

Basic interpersonal communication skills (BICS): Language skills needed in social situations. It is the day-to-day language used to interact socially with other people (Cummins, 2000). BICS are the language skills students use to communicate in the school, community, and playground to survive in the environment.

Cognitive academic language proficiency (CALP): Refers to the formal academic learning. It is the language used in school when learning a specific subject. The level of language learning is essential for students to succeed in school. It may take from four to seven years of study to be proficient in academic English (Cummins, 2000).

Content specific. Science specific academic vocabulary embedded in fifth grade science standards, programs, textbooks, district curricula and FCAT assessment (Echevarría, Vogt, & Short, 2017).

Curriculum guide: The district adopted guide, which the district uses to delineate the curriculum and guide teachers in the implementation of a specific science program (University of New York, 2011).

English language learner (ELL*):* A person who is a native speaker of a language other than English and is learning English as a second language (Coady & Huckin, 2003).

In the context of this study, ELLs refer to students in the school setting who, based on testing, have limited English proficiency and require targeted instruction to be successful in the classroom in which the language of instruction is English (FLDOE, 2016a).

Elementary and Secondary Education Act (ESEA): authorizes state-run programs for eligible schools and districts eager to raise the academic achievement of struggling learners and address the complex challenges that arise for students who live with disability, mobility problems, learning difficulties, poverty, or transience, or who need to learn English.

Florida Comprehensive Assessment Test (FCAT): The Statewide Science Assessment measures student achievement for the NGSSS in science (FLDOE, 2017). Students enrolled in Grades 5 and 8 participate in the Statewide Science Assessment once a year. Student performance on Florida's Statewide assessments is categorized into five proficiency levels. Scaled scores range from 140-260.

Florida Science Fusion: Science Fusion is a science program designed for building inquiry and Science, Technology, Engineering, and Mathematics (STEM) skills and optimizing learning in the classroom or at home, on a laptop, tablet, or using a science textbook. The digital curriculum, virtual labs, hands-on activities, and write-in science textbook were designed to develop important critical-thinking skills that prepare students for success in future science courses and in the workplace (Houghton Mifflin Harcourt, 2017). The program includes a textbook, curriculum guide, formative assessments and recommended instructional strategies associated with the fifth grade science program. The program was implemented in 2012 in 100 of the district's schools, in kindergarten through eighth grade. It was replaced in the 2018-2019 school year.

Hispanic: The terms *Hispanic* and *Latino* appear throughout the literature to refer to individuals of Spanish-decent. However, the term *Hispanic* is used exclusively to report state test data for this group of students (citation from FLDOE). Thus, Hispanic will be used throughout this study to identify ELLs from Spanish-speaking families.

Inspire Science by McGraw Hill: Inspire Science is designed to assist the student to think critically and generate innovative ideas. Inspire Science integrates coverage of physics, chemistry, earth science, astronomy, and biology. Cross-curricular connections are embedded to promote student-led learning. This program is built on the 5E instructional framework and provides an in-depth, collaborative, evidence based, and project-based learning (McGraw Hill, 2017).

Limited English proficient (LEP): A student who was not born in the United States and whose native language is other than English; or was born in the United States but who comes from a home in which language other than English is most relied upon for communication; and has sufficient difficulty speaking, reading, writing, or understanding the English Language denying him or her the opportunity to learn successfully in classrooms in which the language of instruction is English (FLDOE, 2016a).

Next Generation Sunshine State Standards (NGSSS): These standards, developed by the Florida State Board of Education, established expectations and specify the core content, knowledge, and skills that K-12 public school students are expected to acquire at each grade level (FLDOE, 2008). Local district school boards are responsible to provide all the courses and appropriate instruction to ensure that students meet the State Board of Education adopted standards. At the end of each grade level school year, students demonstrate mastery of the standards (NGSS Lead States, 2013). The NGSSS were adopted by the Florida State Board of Education in 2012 and were created by the State Board of Education establishing the standards that specify the core content, knowledge, and skills that K-12 public schools' students are expected of acquire. Each district school board provides all the courses and appropriate instruction designed to ensure that students meet the State Board of Education adopted standards. The Statewide assessment measures student achievement for the NGSSS in Science.

The Sheltered Instruction Observation Protocol (SIOP): A research-based and validated instructional model shown to be effective in addressing the academic needs of English learners throughout the United States. The SIOP was developed by the three scholars, Echevarría, Vogt, and Short (2013), to make English language and content comprehensible for ELLs. It took years to develop and refine SIOP best teaching practice framework (Echevarría et al., 2013). SIOP guides English language teachers and regular classroom teachers in the use of strategies that have proven successful in helping ELLs to increase content and language literacy skills needed for understanding content-area text (Song, 2016). Echevarría et al. (2017) believe that the SIOP framework provides teachers with a well-articulated practical model of instruction. The SIOP model consists of eight interrelated components: lesson preparation, building knowledge, comprehensive input, strategies, interaction, practice/application, lesson delivery, and review and assessment (Echevarría et al., 2017).

The Promoting Science among English Language Learners (PSELL): *Scale-Up* project is a stand-alone, year-long, fifth grade science curriculum and professional development intervention (National Science Foundation, 2015). PSELL implementation involves three components. First, teachers receive science curriculum and materials, including consumable students' books, a teachers' guide, science supplies, and online supplements. Second, teachers engage in professional development workshops during the summer and throughout the school year. Third, teachers are provided support at school sites by a PSELL District Coordinator in the Central Florida School district. Teachers receive training once when they begin teaching the program.

PSELL is aimed at improving science achievement of all students with a focus on ELLs in the context of high-stakes assessment and accountability policy in science. PSELL focuses on three areas: state science standards, hands-on science inquiry, and language development for all students and ELLs in particular. There is a textbook, curriculum guide, formative assessments and recommended instructional strategies associated with the PSELL fifth grade science program. The school district adopted the PSELL with a research grant with New York University and National Science Foundation in 2011. The school district started with 11 elementary schools of the 125 in the school district. In the second year, 2012-2013, the district increased the use of PSELL to 30 elementary schools, and in 2017-2018 increased the use to 50 elementary schools. Beginning in the fall of 2018, teachers in 25 PSELL schools continued to use the PSELL program but in combination with the district's newly adopted Inspire Science program.

Sheltered instruction (SI): An approach for teaching content to ELLs in strategic ways that make the subject matter concepts comprehensible while promoting the students' language development (Echevarría et al., 2017, p. 5). SI was originally introduced by Krashen in the 1980s. It is an approach that uses second language acquisition strategies while teaching content. Krashen (2003) described *sheltered* as the instruction that provides refuge from the linguistic demands of regular classroom instruction, which is usually not comprehensible for English language learners. SI provides support to ELLs with the use of modified text, specially designed assignments, and consciousness of ELLs' linguistic needs (Echevarría et al., 2013; Krashen, 2003). This educational context provides a safe environment for ELLs to learn content and not feel threatened by native English speakers' using the language.

Vocabulary acquisition: The process of lexical storage and retrieval from memory (Ying, 2017).

World-Class Instructional Design and Assessment (WIDA): WIDA is a consortium of states, Wisconsin (WI), Delaware (D), and Arkansas (A), dedicated to the design and implementation of English Language Development Standards and assessment of each of the four language domains of Listening, Speaking, Reading, and Writing (WIDA, 2014). In its current use, the WIDA acronym stands for world-class instructional design and assessment. WIDA has five proficiency standards encompassing four language domains that denote how ELLs process and use language:

- Listening: process, understand, interpret, and evaluate spoken language in a variety of situations.

- Speaking: engage in oral communication in a variety of situations for a variety of purposes and audiences.
- Reading: process, understand, interpret, and evaluate written language, symbols and text with understanding and fluency.
- Writing: engage in written communication in a variety of situations for a variety of purposes and audiences (WIDA, 2014).

ACCESS for ELLs 2.0 is a standardized test aligned with the WIDA English Language Development Standards, which assesses each of the four language domains as well as the level of English language acquisition (WIDA, 2014).

Significance of the Study

In this concurrent mixed method case study, I explored teacher perceptions of the use of research-based instructional strategies, curriculum materials, and alignment with the SIOP instructional framework in each of the two different science programs and to determine if there was a difference in achievement of the state-set proficiency benchmark of ELLs between the two science programs. This large county school district was required by the state to provide targeted instruction to meet the specific needs of the 14.8% of students formally identified as ELLs. The study was used to identify the alignment or lack of alignment of science textbooks, curriculum, teaching instructional strategies, classroom assessment with the research based SIOP teaching practices for ELLs in each science program. The lack of identified alignment or lack of alignment of any factors may lead to changes in practices within one or both science programs, such as curriculum revision, development of supplemental student materials, professional development in research-based effective ELLs instructional strategies, better alignment of classroom assessments, or the adoption of a single district-wide programs. Identified actionable instructional strategies and practices from the study have the potential to guide change, modify, and/or supplement classroom practices that may affect the science proficiency level outcomes of thousands of fifth grade ELLs as measured by the FCAT. An increase in science learning proficiency would make a socially significant change for thousands of fifth grade ELLs in their perception of themselves and their self-confidence as students of science in subsequent science courses and preparation and for future science study.

Science academic vocabulary is an important component of FCAT assessment. Outcomes of this study may increase district teachers' understanding of the importance of the development of content-based academic language for ELLs. If teachers have a clearer understanding of the problem and possible strategies for vocabulary instruction for ELLs, then these students may be more successful.

Teacher preparation and on-going professional development in ELL instruction may also be identified by the district as an area of concern. According to Kolano, Dávila, Lachance, and Coffey (2014), there are limited existing data on the effectiveness of teachers-education programs that illustrate teachers are prepared to work with ELLs. Moreover, Irby et al. (2018) cited that ELLs, both children and adults, could potentially benefit from effective strategies in an academic setting. Findings from this study of strategies for teaching second language academic vocabulary may be of value to teachers in the field who teach ELLs within the regular classroom as well as administrators responsible for choosing science curriculums for elementary schools.

Research Questions

The problem was a lack of understanding of how each of the two fifth grade science programs provides or does not provide textbooks, curriculum guides, instructional strategies, and classroom assessments aligned with research-based practices for ELLs and if there is a difference in achievement of the state-set proficiency benchmark for ELLs between the two programs. The purpose of this concurrent mixed method case study was to explore to what extent each of the two fifth grade science programs provided or did not provide research-based practices for ELLs and to determine if there was a difference in academic outcome in terms of ELL proficiency between the two programs. The following research questions were used to guide this study:

RQ1 – Qualitative: In what ways does implementation of Inspire Science align with the best practices to support or not support the acquisition of content-specific science language of fifth grade ELL students?

RQ2 – Qualitative: In what ways does the implementation of the PSELL program combined with the Inspire Science program align with the best practices to support or not support the acquisition of content-specific science language of fifth grade ELL students?

RQ3 – Quantitative: What difference, if any, is there between the achievement of the state-set benchmark of science proficiency for fifth grade ELL students who are taught using only the district-adopted Inspire Science curriculum and those that are taught using a combination of the district-adopted Inspire Science and PSELL program?

Null hypothesis: There is no statistically significant difference between the state-set benchmark for science proficiency for fifth grade ELL students who are taught using only the district-adopted Inspire Science program and those that are taught using the combination of the district-adopted Inspire Science and PSELL programs.

Alternative hypothesis: There is a statistically significant difference between the achievement of the state-set benchmark of science proficiency for fifth grade ELL students who are taught using only the district-adopted Inspire Science program and those that are taught using the combination of the district-adopted Inspire Science and PSELL programs.

Review of the Literature

The purpose of this comprehensive literature review was to explore different perspectives on academic instruction. It is focused particularly on how teachers support vocabulary acquisition, lesson planning, and instructional strategies in general. Because this study focused on ELLs, I reviewed literature that focused on strategies in the acquisition of academic language for language instruction. Finally, I reviewed the literature on science instruction and assessments to build academic vocabulary.

Pertinent resources reviewed were drawn from Google Scholar, ERIC, ProQuest, the FLDOE website, EBSCOhost in the Walden University Library, and various educational websites. Different combinations of the following terms were used to search for this study: *ESOL, ELLs, ESL, vocabulary instruction, academic vocabulary, SIOP, science instruction for ELL,* and *teaching strategies*.

Conceptual Framework

The SIOP is a research-based instructional model that has been shown to be effective in addressing the academic needs of English learners throughout the United States (Echevarría et al., 2017). The SIOP (Echevarría et al., 2017) was developed to make English language and content comprehensible for ELLs and is based on Krashen's sheltered instructional approach and on the specially designed academic instruction in English (SDAIE) method used in California (Becijos, 1997; Cline & Necochea, 2003). These approaches promote the development of second language learning content subject matter. The SIOP model focuses on helping teachers make academic knowledge comprehensible to ELLs while simultaneously teaching academic language (Polat & Cepik, 2015). The model has a dual purpose: to systematically and consistently teach both content and language in every lesson (Polat & Cepik, 2015). It took three to four years to develop SIOP as a best teaching practice framework (Echevarría et al., 2017). SIOP evolved into a lesson planning and delivery approach, known as the SIOP Model (Echevarría et al., 2017).

Sheltered instruction is typically delivered by subject area teacher. The result of effective sheltered instruction is that ELLs can access the core curriculum and concurrently develop their academic English proficiency (Short, 2013). The main focus of the SIOP is language learning and support of vocabulary acquisition, background knowledge, and tasks needed to be successful in the science classes (Short, 2013). Additionally, the SIOP model offers a system that incorporates best practices for teaching academic English and provides teachers with a coherent method for improving the achievement of their students (Short, 2013). Teachers can integrate instruction of content concepts with academic language to develop students' skills in reading, writing, listening, and speaking. The concepts and language skills are aligned with state standards, and teachers use techniques designed to make academic topics accessible to students and to enable them to practice the use of academic language as it is employed in each subject area (Short, 2013).

SIOP is designed for use by regular teachers who have ELLs in their classrooms. SIOP evidence-based strategies can be implemented to assist ELLs to increase content and language literacy skills needed for understanding content-area text (Song, 2016). Echevarría et al. (2017) found that SIOP provides teachers with a well-articulated practical model of instruction. The SIOP model is a framework of research- based approaches used by teachers to integrate content and language instruction for students learning through a new language. Teachers need to make content accessible for students and develop skills in the new language (Echevarría et al., 2017).

Echevarría et al. (2017) explained that the SIOP model is composed of 30 features grouped into eight main components:

- *Lesson preparation* is the lesson planning process, where the teacher includes language objectives, supplementary materials, and creation of meaningful activities.
- *Building background* focuses on making connections with students' background experiences and prior learning, and development of their academic vocabulary.

- *Comprehensive input* is the idea that teachers should adjust their speech, model academic tasks, and use multimodal techniques to enhance comprehension.
- *The strategies* component emphasizes teaching learning strategies to students, scaffolding instruction, and promoting higher order thinking skills.
- *Interaction* involves teachers encouraging students to elaborate their speech and grouping students for appropriate language and content development.
- *Practice and application* provide activities to practice and extend language and content learning.
- *Lesson delivery* ensures that teachers present a lesson plan to meet the objectives and promote engagement.
- *The review and assessment* component reminds teachers to review the key language and content concepts.

Furthermore, Short (2013) stated that the SIOP model offers a system that incorporates best practices for teaching academic English and provides teachers with a coherent method for improving the achievement in students. Teachers incorporate instruction to develop concepts with academic language in the areas of reading, writing, listening, and speaking (Echevarría et al., 2017). The SIOP model served as the framework for the study to understand if fifth grade science textbooks, curriculum guides, instructional strategies, classroom assessments and practices in the district's two science programs support or do not support cognitive academic science language acquisition of ELLs.

English Language Learners

Florida statutes define an ELL as an individual who was not born in the United States and whose native language is a language other than English; an individual who comes from a home environment where a language other than English is spoken in the home (Pew Hispanic Organization, 2016). About 4.8 million Hispanics reside in Florida, 8.7% of all Hispanics in the United States. Florida's population is 24% Hispanic, the sixth largest Hispanic statewide population share nationally (Pew Hispanic Organization, 2016).

The total population of students in this central Florida county school district is 183,021, with 24,968 of these students are identified as ELLs, or 15.9 % of the students. NCLB, signed in 2002, requires states to test students in reading and math in Grades 3-8 and End of Couse (EOC) during high school. All students are expected to meet or exceed state standards in reading and math by 2014 (Office of Superintendent of Public Instruction, 2011). The major focus of NCLB was to close the student achievement gap by providing all children with fair, equal, and significant opportunities to gain a high-quality education. These required the establishment of state academic standards, a testing system that meets federal requirements and accountability requirement as the Adequate Yearly Progress (Office of Superintendent of Public Instruction, 2011).

NCLB has had positive and negative impacts on education programs (Echevarría et al., 2017). On the positive side, ELLs are part of the school improvement conversations, with attention to provide better educational opportunities for the learners and monitoring their language proficiency growth and academic progress (Echevarría et al., 2017).

The negative effects of NCLB are that it set standards high for all students including ELL students, who must take standardized tests that have not been designed or normed for ELLs. This is a problem for ELLs because most students are tested in English before they are proficient in the language (Echevarría et al., 2017). In 2018, Congress reauthorized ESEA now referred to as Every Student Succeeds Act (ESSA); however, no significant changes were made regarding provisions for ELLs.

According to the National Clearinghouse for English Language Acquisition (2011), the K-12 native speaker population remained relatively steady, whereas the ELL population increased by over 51% between 1997-2009, totaling close to 5.5 million. Thousands of Puerto Ricans have poured into Florida since Hurricane Maria, a massive hurricane that hit Puerto Rico in September 2017. More than 215,000 families have arrived through Port Everglades, Miami, and the Orlando area, increasing the numbers of ELL students in the public schools. The local impact of this post-storm migration resulted in more than 2,500 Hurricane Maria victims enrolled in the target school system, part of the greater Orlando area.

Cognitive Academic Language Proficiency

Cummins (2016) differentiated between BICS, the basic interpersonal communication skills used with peers, which can be developed outside the classroom, and CALP, the subject-specific academic language critical for academic educational success, which is developed primarily in the classroom. According to Cummins (2016), the greatest challenge for ELLs is the development of academic language, which may take between 7 and

10 years. Cummins' theory of second language acquisition has been used by other researchers to develop methods to help in the acquisition of academic language. Academic vocabulary involves the use of higher-level vocabulary, more complex sentence structures, and more sophisticated forms of expression than everyday conversation (Echevarría et al., 2017).

Vocabulary acquisition is a critical component of academic vocabulary and is a primary reason ELLs will struggle with understanding spoken language (Hunt & Feng, 2016). ELLs find that their most challenging obstacle is vocabulary in accessing information from texts and grade level content at the same time they are learning English (Hunt & Feng, 2016). Research beginning with Cummins (2016) and continuing through studies by Hunt and Feng (2016) Wilson, Fang, Rollins, and Valadez (2016), and Echevarría et al. (2017) support the importance and difficulty of learning academic vocabulary for ELLs in order to be successful in the school setting.

In contrast to native speakers of English, ELLs have limited opportunities to engage in meaningful classroom conversations. Many different patterns may lead to learners engaging less frequently in academic discourse in classroom such as a lack of high expectations for English learners to engage, not enough time devoted to oral language, limited academic and content vocabulary, lacking background knowledge in a curriculum, or high stress level experienced when needing to speak in a whole group setting (Wilson et al., 2016).

Science Vocabulary

The Common Core State Standards and the Next Generation Science Standards require students to understand and produce academic language that appears in informational text (August, Artzi, & Barr, 2016). Vocabulary is as critical domain of academic language, but ELLs come to the classroom with greater deficits in English vocabulary than their English-proficient peers (August et al., 2016). Achieving equitable science instruction for all will require close considerations of the need of ELLs who constitute a growing segment of the school age population.

The needs of ELLs were once only a regional concern of gateway states, such as California, Florida, and New York. However, meeting the needs of ELLs has become a national concern, as record growth of ELLs sweeps through an increasing number of states in the South, Midwest, and Northwest. Thus, educators have expressed growing concerns about the importance of developing academic language for all students, with special emphasis on ELLs (National Clearinghouse for English Language Acquisition, 2011).

Vocabulary knowledge is an important determinant of reading comprehension and is a foundation for the development of academic language (August et al., 2016). Both the Common Core State Standards for English Language Arts and the Next Generation Science Standards (NGSS Lead States, 2013) put a premium on developing academic language in content area classrooms. In science, ELLs face the challenge of acquiring science knowledge and academic English, often without the scaffolds needed to be full participants in those science activities (Bravo & Cervetti, 2015). Students need to be exposed to science discourse activities to make sense of academic science vocabulary (Bravo & Cervetti, 2015). Fugi (2014) stated that vocabulary is the key to passing standardized tests, such as science state test.

Academic language is not encountered in everyday conversation and therefore requires explicit teaching of new concepts within content areas. In addition, science texts contain more complex academic language and vocabulary than texts in any other content area (Helman, Calhoon, & Kern, 2015). Academic language in science is oriented toward identifying the linguistic features that will have implications for ways teachers can assist students in acquiring the language skills necessary for success in science classes (DiCerbo, Anstrom, Baker, & Rivera, 2014). In addition, Echevarría et al. (2017) stated that science vocabulary learning can be used to develop children's language, and increased knowledge of language goes hand in hand with the development of scientific ideas. Furthermore, students learn science better if they engage in literacy-related activities.

The framework for K-12 Science education stresses that as students participate in inquiry and be engage in the practices of science that includes active discourse around a scientific model or phenomenon (Weinburg et al., 2014). Science content requires contextualized and guided scaffolding support to help students succeed academically (Echevarría et al., 2013; Lee, Quinn, & Valdes, 2013). For example, students need to be proficient in reading instructions and comprehending the meaning of technical vocabulary associated with an experiment to successfully complete the assigned task (Polak, & Cepik, 2015). These procedural linguistic competence and contextual clues are especially important for ELLs if they are to perform steps of an experiment in the right order. Thus, gaining comprehensible input and developing higher proficiency in academic language and content would be unrealistic without an integrative and inquiry-based science teaching approach such as provided by the SIOP model (Daniel & Peercy, 2014).

Another reason for the use of SIOP-like models is that in order to understand expository materials, “students must also understand various language functions (e.g., describing, reporting) to promote scientific inquiry” (Polak & Cepik, 2015, p. 7). Additionally, such science teaching requires that students pay special attention to the integration of receptive and productive skills that facilitate the learning of both basic and academic proficiency. Academically oral communication and writing are important for ELLs. For instance, in science classes, specific types of productive academic skills, including (re) formulating questions, making hypotheses, writing and presenting observations, and writing and explaining procedures of the experiments, need to be taught. The SIOP model promises the evaluation of classrooms environments and instructional procedures that are conductive to the implementation of the afore-mentioned forms of integration (Echevarría et al., 2013).

In addition to general second language acquisition proficiency, one must learn the science register to comprehend the content offered in a science class because certain terms with general meaning (e.g., matter, energy) also entail technical uses that are unique to scientific contexts (Polak & Cepik, 2015). The fact that the science registers technical vocabulary and student’s knowledge of Science content are inseparably intertwined, context-embedded and integrative vocabulary and science teaching can be critical. Models like SIOP have been argued to provide the social context in which students actively engage in negotiation of meaning through multimodal strategies and hands-on experiences that involve academic content learning with peers as a community of learners (Echevarría et al., 2017).

Strategies for Teaching Vocabulary

Vocabulary knowledge is a crucial factor in school success for ELL with lack of vocabulary. ELL students faced academic challenges because they lack knowledge of multiple meanings for a word, background knowledge of multiples meanings for words, background knowledge, and information about word contexts (Helman et al., 2015). Effective vocabulary instruction consists of teachers-directed instruction that provides both definitional and contextual information, involves students in active and deep processing of words, review words in various contexts, and involves student in discussion of word meanings (August et al., 2016). The embedded vocabulary instruction involves the provision of brief definitions of targeted words, which appear next to the target vocabulary in the text (August et al., 2016). In addition, vocabulary knowledge in science expands when students have frequent opportunities to encounter new words and are provided examples that are representative of the word in rich contextual settings (August, Artzi, & Mazrum, 2010; Rupley & Slough, 2010).

Another teaching strategy is teaching using prior knowledge. Fuji (2014) stated that ELLs' prior learning plays an important foundation for their learning of English and scientific knowledge. In addition, ELLs who have scientific knowledge and literacy skills in their native language can often translate these skills into English and explained that some strategies of transferring from their native language to English language are the use of cognates and multilingual glossary.

The ability of communicate effectively about science topics is now an important objective of science education. The NGSSS emphasize the importance of student involvement in classroom science discourse (Avenia, Haas, & Hollimon, 2016). The standards state that students should engage in asking, questions, constructing explanations, arguing from evidence, and communicating information (NGSS Lead States, 2013).

In order to use language effectively in science, students need to add such scientific meanings to their communicative vocabulary. Explicitly speaking is a strategy used to scaffold grammatical aspects of students' science language development. The strategy is embedded within inquiry-based science learning and draws key principles of second language development, the explicitly speaking can be also used across grade levels (Avenia et al., 2016). In order to help students, communicate about science relationships and negotiate the language demands of standardized tests, teachers need to support acquisition of the grammatical constructions that are often used to express scientific relationships. Teachers can use different strategies to support ELLs language, such as awareness, modeling, supported practice, and integration (Avenia et al., 2016).

Tretter, Ardasheva, and Bookstrom (2016) explained the brick-and-mortar approach as a strategy that teachers should use to help ELL students acquire science vocabulary. The use of brick-and-mortar approach to construct knowledge, same way teachers should use a brick which is the tool and a mortar because it will stay with the student. To help students grasp the language structure, the teacher first uses nonscientific examples to explain the concept, after several examples; then students use their science journals. Another strategy is to use sentence frame, where students know the concept by non- scientific examples where later they will be able to transfer the new concept into a frame sentence in using the scientific terms (Tretter et al., 2016).

A research project was conducted by Halwani (2017) in a Central District of Nassau County which found that visual aids are important for the development of a second language. Visual aids and multimedia are usually used as scaffolding for the students with different ways in different levels (Halwani, 2017). In addition, multimedia and visual aids help students to greatly improve their skills in mastering a foreign language. These can improve the education process such as: facilitating the learning process and make it more effective, teachers can help students' learning by monitoring and evaluating their performance, and teacher has the capacity to create an interesting lesson through the computer, and technology been a powerful tool for teachers to introduce the lesson and give better illustrations (Halwani, 2017).

Professional Development

Rigorous professional development is essential to implement the SIOP model (Short, 2013). Short (2013) stated that educational reform requires rigor from the students with a focus on high standards. The rigor for students should be matched by rigor in professional development provided for teachers, with a focus on empirically validated interventions focused on the knowledge and skills teachers need to work with ELLs

(Short, 2013). Professional development should be job-embedded in presentation and practice, explain the theories that undergird the intervention, engage the school administrator, provide teachers time to practice the use of interventions, and employ a means to measure teacher implementation (Short, 2013).

Other contributing factors to the low academic achievement of ELLs in science is the lack of different strategies to implement to teach ELLs and the absence of appropriate assessments and curricula tailored for this population (Rubinstein-Avila & Lee, 2014). Furthermore, teachers must have the appropriate knowledge on how to teach academic vocabulary to teach all students the acquirement of content area vocabulary (Rubinstein-Avila & Lee, 2014).

Currently, teacher-educators face the challenge of supporting pre-service teachers (Weinburg et al., 2014). In addition, teachers need to have positive perceptions toward ELLs, appreciation of cultures, differences and recognizing the importance of encouraging ELLs' participation in class (Rubinstein-Avila & Lee, 2014). Moreover, Kolano et al. (2014) stated that the limited existing data on the effectiveness of teachers' education programs illustrate that teachers are unprepared to work in ELLs. Teachers who in the past have been used to teach to homogenous populations, now have the challenge to meet the needs of students who are culturally and linguistics diverse. Echevarría, Richards, Canges, and Frances (2011), stated that teachers should provide opportunities for students to interact with each other and discuss lesson information, concepts, and vocabulary. In addition, vocabulary knowledge in science expands when students have frequent opportunities to encounter new words and are provided examples that are representative of the word in rich contextual settings (August et al., 2016; Rupley & Slough, 2010).

Scott et al. (2014) found at the start of a 5-year longitudinal study of fifth grade science in Texas that Hispanics scored the lowest of the three ethnicities tested White, African American, and Hispanic students. However, after five-years of implementation of a new instructional science program in Region 4 African American students' average scores increased 163 points, Hispanic students average scores increased 226 points, and White students average scores increased by 192 points. The science Texas Assessment of Knowledge and Skills provided the standard for measurement of student achievement. This study provides support for the role curriculum and instruction can play in student outcomes in science, particularly for minority populations.

Scott et al. (2014) designed a longitudinal study in Texas of a fifth grade science curriculum based on the 5E model. This instruction model is based on constructivist learning theory, accounting for the structure and organization of the Model (Scott et al., 2014). The five phases of the instructional model are Engage, Explore, Explain, Elaborate, and Evaluate (Scott et al., 2014). Teachers were provided with training and curriculum materials to implement the model. The science Texas Assessment of Knowledge and Skills provided the standard for measurement of student achievement, and scores of fifth grade students taught in the Region 4 in Texas (Scott et al., 2014).

The results from the standardized state test from fifth grade science showed that the greatest achievement gap was for the Hispanics among the three ethnicities tested White, African American and Hispanic students. The investigators found that after five years of implementation of the 5E model in the Texas schools district the achievement gap was close between ethnicities groups. The curriculum facilitates teachers the process, prompting them with facilitation questions and supplying background information (Scott et al., 2014). After the implementation of the 5E model, African American students' average scores increased by 163 points, following the Hispanic students with an increase of 226 points, and the White students' average scores increased by 192 points.

Implications of the Research

The goal of this research was to gain greater understanding of how fifth grade science textbooks, curriculum guides, instructional strategies, classroom assessments and practices, in the district's two science programs, support of do not support cognitive academic science language acquisition of ELL and to determine if there was a difference between the achievement of the proficiency benchmark of ELLs in the two programs. An implication was the possibility to contribute to the existing body of profession specific strategies for teaching and assessing vocabulary in second language learning classrooms. Another implication is the possible effect on policy decisions concerning program adoption that have a positive academic effect on ELLs. The study may also contribute to meeting the state requirements, not only in required school plan formulation, but in higher proficiency levels of ELLs. Finally, this study may provide insights that can be useful for other districts, program, developers, educators, researchers, and other stakeholders who are seeking guidance concerning how to improve ELLs academic science achievement

Summary

This study investigated the importance of understanding of how each of two fifth grade science programs provides or does not provide textbooks, curriculum guides, instructional strategies, classroom assessments aligned with research-based practices for ELLs and if there is a difference in achievement of the state-set proficiency benchmark for ELLs between the two programs. The use of the SIOP research-based education practices has been shown through research to assist English Language Learners to build language content proficiency in the science class needed to become proficient. The use of research-based practices has also been shown to provide a basis for how teachers can successfully overcome the academic deficiencies of ELLs in the mainstream setting. This study may have implications for districts, program, developers, educators, researchers, and other stakeholders who are seeking guidance concerning how to improve ELLs academic science achievement. The next section of the study provides an overview of the mixed-methods qualitative and quantitative research design approach, study participants, data collection strategies and data analysis and results.

Section 2: The Methodology

The purpose of this concurrent mixed-method case study was to explore to what extent each of the two fifth grade science programs provided or did not provide research-based teaching practices shown to be effective with ELLs and whether ELLs in the program with the greater research congruence met the proficiency benchmark set by the state for science, with greater frequency than ELLs in the less research-congruent program.

Documentation of the student problem, which underlies the study, rested on evidence of the low science benchmark achievement of ELLs and the negative effect such low achievement had on the district and schools. The SIOP model served as the conceptual framework for studying the efficacy of teaching practices and textbooks in each of the science programs (Echevarría et al., 2017).

Data for both the qualitative and quantitative parts of the study were collected within one school year. Qualitative semistructured interviews were conducted during the second semester, as was qualitative SIOP coding analysis of the textbooks used in each science program. The quantitative state academic benchmark proficiency data for students were provided by the school district administration in late spring of the same year. The interview data, textbook analysis data and the benchmark achievement of ELLs provided the basis for validation of the findings through triangulation of three sources of data.

This section addresses the methods and design of the research and provides criteria for selection of participants, number of participants, measures taken to protect study participants, data collection procedures and instruments, my working relationship with participants, study limitations, data analysis, findings, and conclusions.

Research Design and Approach

Rationale for Design

A case study is one of five qualitative approaches. These qualitative approaches include ethnography, narrative, phenomenological, grounded theory, and case study. The ethnography approach was inappropriate since it would have required immersion of self into a field study to make observations of the culture and the need to build a rapport or empathy with respondents to understand the data. Nor did data collection warrant a narrative research or phenomenological research approach, as this case study was not a phenomenon event and there were quantitative data that could be used to analyze the results. Grounded theory, another qualitative approach, was not appropriate for this research study as the outcome of this research study was not to develop a theory.

A case study was the appropriate approach for this study because it allowed for the most comprehensive review of the science programs in use in the classrooms, while the quantitative analysis of student outcomes provided further understanding of the academic value of the programs for the district ELLs. The qualitative portion of the case study also provided context for a unique situation or story within a setting, in this instance, the implementation of two distinct science programs within the same district. The aim of case studies is to gain a rich, detailed understanding by examining aspects of the case in detail (Thomas, 2017).

The concurrent mixed-methods design, as identified by Creswell and Creswell (2018), is a study where quantitative and qualitative data are collected during the same stage, although priority may be given to one form of data over the other. The purpose of gathering concurrent data is to use qualitative and quantitative data to more accurately understand the variables between the programs. Qualitative methodologists (e.g., Babbie, 2016; Ravich & Carl, 2016) differentiate between design and quantitative standards of rigor (generalizability, validity, and objectivity). Babbie (2016) stated that the terms *validity* and *trustworthiness* are most used and evoke the importance of ensuring credibility and rigor in qualitative research.

Mixed-methods research designs, which strategically combine aspects of qualitative and quantitative methods, can be an additional way to seek qualitative rigor and validity (Ravitch & Carl, 2016). A mixed-methods design can help establish validity through triangulation of data depending on the research questions and allows for the emergence of insights based on the framework and types of qualitative and quantitative data that are collected and analyzed. The concurrent mixed-method was the appropriate research design for this study because the goal was to examine the alignment of instructional practices, which have been shown to be academically effective with ELLs, in two science programs and determine if there was a difference in outcomes for ELLs associated with a particular program.

Design and Approach

The purpose of this concurrent mixed-method case study was to explore to what extent each of the two fifth grade science programs used in the district provided or did not provide research-based teaching practices shown to be effective with ELLs and to qualitatively determine if students in the program with greater congruence to the model met the state proficiency benchmark/standard to a greater extent.

The qualitative portion of the case study was designed to address the alignment of teacher practices and textbooks used in each science program with research-based academically effective instructional strategies for ELLs as identified in the SIOP framework (Echevarría, 2017). Semistructured interviews of classroom teachers from each science program provided qualitative data concerning teacher instructional practices.

Program 1, Inspire (McGraw Hill, 2017), is purported to be aligned with the Florida State Science Standards and is intended to be used by all students. The program includes a textbook, lesson plans, teacher guide and support materials. Program 2, Inspire + PSELL (New York University, 2011) uses the Inspire textbook but is purposefully supplemented by the teachers with the PSELL science program, which aims to improve science achievement outcomes of all students, with a focus on ELLs in the context of high-stakes assessment and accountability in science. The PSELL program includes a textbook, curriculum guide, formative assessments, and recommended research-based instructional strategies for the fifth grade science program. Coding of the two science textbooks used in the two programs was based on the SIOP elements and provided a second source of qualitative data.

The SIOP framework congruency analysis of the interview data, identification of the textbooks' SIOP elements used in the two science programs and quantitative analysis of student science proficiency outcome benchmarks between the programs provided the basis for triangulation of the data to enhance the credibility of the study.

Setting and Sample

This study was conducted in a large central Florida school district. The district includes 125 elementary schools and has a total elementary student population of 85,083 students. The ELL population makes-up 15.9% of the district students, speaking 157 different languages and dialects as their primary language. The district is the 10^{th} largest district in the nation and has more than 13,000 instructional staff. Instructional and classified personnel make up 93% of the district workforce. The district earmarks approximately 74% of their operating budget for schools, learning centers for students with special needs, and learning communities.

Creswell and Creswell (2018) stated that homogeneous samples can be useful when studying small subgroups, because the participants share key characteristics or have experience addressing a specific problem. Purposeful sampling was conducted in this study, first by the district's Research and Evaluation department in the selection of 50 similar Title 1 K-5 elementary schools with similar percentages of ELLs, which used either just Inspire or the combination of Inspire (McGraw Hill, 2017) and PSELL (New York University, 2011) from the district list. I randomly selected 10 schools, five using each of the science programs. From these schools, three teachers representing each of the science programs volunteered to participate in the study. Interviewing the teachers who agreed to participate in the study provided a limited number of participants but provided the opportunity to gain information from various teachers of each science program and across multiple school sites.

Quantitative data were the state-provided assessed benchmark nominal score level for each of the 96 ELLs in the fifth grades in the two sample schools. State FCAT Science test scores in Florida are reported as "level" (nominal) scores ranging from 1 to 5. Level 1 or 2 indicates an inadequate or below satisfactory level of science proficiency. A fifth grade student is considered proficient by the state if the scaled score is greater than 200, which is a Level 3. A Level 4 or 5 is considered above satisfactory or higher degrees of mastery, respectively (see Appendix D). Schools and districts are judged by the state based on the percent of students who meet the state passing benchmark of Level 3.

Qualitative Teacher Participants

First, I completed a district research request online application. The completed application was then submitted to the district's research approval team, which had 45 days to respond. The research and evaluation department required that Walden University's Institutional Review Board (IRB) submit approval of the study prior to finalizing district approval. Evidence of Walden University IRB approval (#06-05-19-062482) was submitted to the district's research and evaluation department. Once the district's research and evaluation department received all documentation, they granted approval and provided a list of 50 Title I schools, 25 Title I schools using Inspire + PSELL and 25 Title I schools using only Inspire. From the district list, I randomly selected 10 schools, five using PSELL+ Inspire and five using just the Inspire science program. The district's research and evaluation department sent emails to the 10 selected schools asking the principal to participate in the study. From the five possible Inspire science program schools, only three principals accepted the participation request, and from the five Inspire + PSELL schools, two principals accepted the participation request.

The district research and evaluation department then provided the names of fifth grade teachers in the schools, number of years each had taught fifth grade and confirmation that they had ELLs in their classes. I sent email invitations to the 21 fifth grade teachers who met the criteria of at least one year of teaching in the district and who had ELLs in their fifth grade classroom. Included in the email was an offer of a gift card of $10.00 as a thank-you for participation. Six teachers accepted the invitation to be interviewed, three from one school teaching only Inspire and three from one school teaching the combined Inspire + PSELL science programs. I sent follow-up emails to teachers who had not responded; however, no additional teachers volunteered to be interviewed concerning their instructional practices.

Teachers who agreed to participate in the study were sent a consent form with detailed information based on IRB requirements. The original study proposal sought to interview a range of three to six teachers from each science program; however, even after multiple recruitment attempts, the sample size was six teacher participants; three from one school teaching Inspire and three from one school teaching the combined Inspire + P-SELL science program, the minimum number originally proposed.

Participant Demographic Data and Professional Development Experience

The primary qualifying criteria for participation was that each teacher had to have at least one full year of teaching fifth grade science with ELLs. However, at the beginning of the interviews the participating teachers were individually asked about their degrees, years of teaching, and specific training they had received concerning teaching ELLs as well as the training received for the science program they were using. The three Inspire science program teachers all had master's degrees, while only two of the Inspire + PSELL teachers had advanced degrees. All participating teachers had more than one year of fifth grade teaching experience. The experience of the Inspire teachers ranged from 2 to 7 years, while the experience of the Inspire + PSELL teachers ranged from 2 to 8 years (see Table 1).

Table 1

Demographic Data of Teacher Participants

Participant ID	Grade taught	Years of teaching	Highest level of education	Science program
Teacher 1	5	7	Masters	Inspire
Teacher 2	5	2	Bachelor	Inspire
Teacher 3	5	5	Masters	Inspire
Teacher 4	5	8	Masters	Inspire + PSELL
Teacher 5	5	2	Masters	Inspire + PSELL
Teacher 6	5	6	Masters	Inspire + PSELL

The teachers were asked to describe any training/professional development they had previously participated in related to identifying and addressing the needs of the ELLs in their classrooms. All of the participants had completed the total of 15 semester hours or 300 in-service credit points in courses learning how to assist English Language Learners in the mainstream classroom, which is required by law of all primary Language Arts/English Teachers in the State of Florida (FLDOE, 2018). The only additional training the Inspire teachers had was the required attendance at a two-hour Inspire program orientation session on how to use and manage the Inspire curriculum during the first year of implementation. The teachers reported that these sessions did not include any specific references to teaching ELLs. After this initial orientation to the Inspire program no further training was provided for the Inspire teachers, nor had the teachers attended any other workshops geared to teaching ELLs. In addition to participating in the Inspire orientation sessions, the teachers who also used PSELL in their science classes, received multiple days of specific initial training in using PSELL to meet the needs of ELLs and were required to attend once-a-month PSELL training meetings where they discussed program implementation and differentiation of the science programs and instructional strategies to meet the needs of the ELLs in their classes.

Ethical Considerations and Data Security

Documentation was collected according to the guidelines of Walden University's IRB. Educators who met the selection criteria were contacted by e-mail to notify them about the purpose of the study, their role, benefits to them, solicit any questions or concerns and request participation. Confidentiality procedures and contact information were personally shared by me with the participants who agreed to be interviewed. Participant names and locations of employment remained confidential before, during, and after the interviews. Participants were given an identifying code known only to the researcher. All recognizing factors were and will be kept confidential. Each participant signed a consent form prior to participating in the study. Participants were informed that they could be released from involvement at any time during the study. Benefits and potential risks contained in the informed consent portion of the interview were reviewed with participants again before the interview. I assured participants that all information would be kept confidential and contributors were protected from any privacy harm, sensed force, social or economic loss, or psychological stress. Each participant signed a consent form prior to participating in the study. At the beginning of the interview, I reiterated that their identity would be kept confidential and emphasized the importance of sharing their honest perceptions of their instructional practices, in order to gather credible data to develop the project.

All student-specific identifiers (name, student ID number, birthdate) were removed by the district administrators prior to releasing the student data to the researcher for analysis to maintain student confidentiality. Data provided by the district were maintained in a separate locked file in the researcher's house. All data will be maintained in a locked file for five years at which time the data will be shredded and destroyed.

Role of the Researcher

To produce a valid and purposeful study, I tried to set aside personal experiences to view the perceptions of others and create interview questions that were to the best of my ability void of personal biases. Issues related to power can also pose a challenge. I hold the position of classroom teacher in another school district and have no evaluative nor influential control over the participants. My position as a science teacher in a non-study district school enabled me to relate to the study topic but not to the participants.

At the same time, shared understandings of relevant information and expectations, on the part of researcher or participant, may affect explicit discussions or may make discussion of critical topics uncomfortable (Babbie, 2016). Effort was made to ensure the neutrality of position before interviews. Babbie (2016) noted that shared experience may be preferable in qualitative research specifically a perception on the part of the participant that the researcher shares a desire to rectify a universal concern within the organization. The relationship between the participants and myself was developed and maintained through email, interoffice mail, phone, and scheduled face-to face individual meetings.

I am not employed by this school district; however, I am committed to this local problem since I am an ELL as well as a teacher of ELLs. Ross (2017) iterates the benefits for a study when establishing rapport building and possible advantages of examination of data with in-depth knowledge of social context. During this study, I held no evaluative nor influential control over participants. At the same time, shared understanding of relevant information and expectations, on the part of researcher or participant, may affect explicit discussions or may make discussion of critical topics risky or uncomfortable (Chavez, 2008; Ross, 2017).

Data Collection Strategies

Qualitative Instrumentation

The SIOP is a research-based instructional framework that has been shown to be effective in identifying research-based strategies which are effective is meeting the academic needs of English learners throughout the United States (Echevarría et al., 2017). SIOP (Echevarría et al., 2017) was developed to make English language and content comprehensible for ELLs and is based on Krashen's sheltered instructional approach and on the specially designed academic instruction in English (SDAIE) method used in California (Becijos, 1997; Cline & Necochea, 2003).

Research has shown that these approaches promote the development of second language learning of content subject matter. The SIOP model focuses on making academic knowledge comprehensible to ELLs while simultaneously teaching academic language (Polat & Cepik, 2015). The model has the purpose to guide teaching of both content and language systematically and consistently in every lesson (Polat & Cepik, 2015). SIOP evolved into a lesson planning, instructional delivery approach and model for assessing teaching practices (Echevarría et al., 2017).

SIOP is designed for use by regular subject matter teachers who have ELLs in their classrooms. SIOP evidence-based strategies can be implemented in the classroom to assist ELLs to increase content and language literacy skills needed for understanding content-area text (Song, 2016). Echevarría et al., (2017) found that SIOP provides teachers with a well-articulated practical model of instruction, that is composed of 30 features grouped into eight main components or elements, earlier explained in detail.

Furthermore, Short (2013) stated that the SIOP model offers a system for assessing the incorporation of best practices into teaching academic English in the classroom and provides teachers with a coherent method for improving the achievement of students. The SIOP model served as the framework for the study to provide data to understand how and if fifth grade teachers practice within the district's two science programs support or do not support instructional practices aligned with research-based SIOP effective practices for ELLs to support content-specific science language acquisition.

The interview instrument for this study was developed from the SIOP observation model instrument (see Appendix C). The original SIOP instrument was designed to be used in the classroom to observe and evaluate teachers (Echevarría, 2017). For this study, the SIOP observation instrument components statements were reworded to make them compatible with the personal interview format. For example, for the SIOP Component 4 "Strategies", the description in the observation model states, "Provides ample opportunities for students to use strategies such as questioning, scaffolding or tasks to develop higher order thinking." This was re-worded in the form of a question as follows:" "Can you give me an example of how Inspire promotes higher-order thinking for ELLs through questioning, scaffolding techniques, or tasks?" This method was used to create each interview question derived from each of the SIOP components in the observation instrument. A matrix was created (see Appendix C) using the SIOP observation components, the corresponding interview questions, and how it was related to the research questions (see Appendix G). Key words and phrases in the SIOP component were identified and used to create the interview question that corresponded to the specific content of the criteria. The finished interview instrument was tried by the researcher with two colleagues, prior to being used with study participants. Permission to use the SIOP Framework was requested and granted (see Appendix E).

Further qualitative data was collected through examination of the two science textbooks used in the programs. The textbook for the two science programs were examined and coded based on the SIOP components.

Qualitative Data Collection Strategies

Interviews with the six fifth-grade science teachers who accepted the invitation to participate in the study and be interviewed, three from one school teaching only Inspire and three from one school teaching the combined Inspire + PSELL science programs, were conducted in the spring of 2019. Follow-up emails had been sent to teachers who had not responded; however, no additional teachers volunteered to be interviewed concerning their instructional practices. Three teachers from each program were the minimum number proposed in the study.

One-on-one semistructured interviews were conducted to collect qualitative data from each of the three teachers of each science program in order to gain insight into their perceptions of their individual practices; understand how they made sense of and constructed reality in relation to their experiences. Teachers were encouraged to provide verbal examples and show documents such as lesson plans to support their perceptions of their practices. I provided a hard copy of the Acknowledgment of Participation to participants. I reiterated to the participants that their responses and identity would be kept confidential and emphasized the importance of honest perceptions in gathering credible data to develop the project-study. All confidentiality procedures and university IRB contact information were shared with each teacher participant. Participants were given an identifying code (e.g. Teacher 1, Teacher 2, etc.) Each interview lasted approximately 60 minutes, which was within the planned time range. All interviews were recorded and transcribed verbatim from the recordings. No additions or changes were made to any response provided by any of the participants. In addition to the teacher interviews the two textbooks used in the science classes were examined and coded based on alignment with the SIOP instructional components in each chapter (see Appendix H).

Quantitative Instrumentation

Once the district's Research and Evaluation department received all documentation, they granted approval and provided a list of deidentified student science test results for each participant school. Test data from the 2018-2019 administration of the Florida Comprehensive Achievement Test (FCAT) 2.0 for fifth grade science was provided for ELLs in each school. The development of the state test was authorized by the legislature and approved by the Florida governor in 2008. Florida mandates that students in fifth and eighth grade take the Statewide Science Assessment known as FCAT 2.0. For the Grade 5 Science FCAT, a percentage of points by cognitive complexity level is structured similar to a bell curve with a slight skewed to the left or the right (FLDOE, 2018). Data were not available for the 2019-2020 school year because all state testing was cancelled due to the Covid-19 school closures as of March 16, 2020. It is unknown if testing will resume during the 2020-2021 school year due to the inconsistencies in instructional delivery due to the continuing Covid-19 crisis. For the Grade 5 Science FCAT, a percentage of points by cognitive complexity level is structured similar to a bell curve with a slight skewed to the left or the right (FLDOE, 2018).

Students' scores are depicted by the state in proficiency benchmark levels. The fifth grade assessment scaled scores range from 140 to 260. The scaled scores are then segmented by the state into proficiency levels ranging from 1 to 5. Levels 1 or 2 indicates an inadequate or below satisfactory level of science proficiency. A fifth grade student is considered proficient by the state if the scaled score is greater than 200, which is a Level 3. A Level 4 or 5 is considered above satisfactory or demonstrates higher degrees of mastery, respectively (Appendix G). The state further dichotomized the student data into "Proficient" and "Non-Proficient. The percentage of students in each category within the district and within each school is used by the state to determine the standing of the district and schools in the state and to determine whether corrective action plan is required by schools.

Quantitative Data Collection Strategies and Participants

Data for the quantitative portion of the study, were the 96, fifth grade ELLs in the schools in which interviews were conducted, who met the proficient benchmark or did not meet proficient benchmark in science, as determined by the FCAT administered to all fifth grade students in the state in the spring of 2019. There were 68 ELLs in the Inspire school and 28 ELLs in the Inspire + PSELL school. A power analysis based on the sample sizes and a significance level of 0.05, using G*Power 3.1, yielded a minimum detectable effect size of $d = 0.3$. That is the two-group means should differ by at least .3 standard deviations for an effect to be detectable. Cohen (1988) considers for a two-sample study an effect size between $d = 0.20$ and $d = 0.49$ as a small effect size.

The Inspire school had more fifth grade classes than the Inspire + PSELL school, which accounts for the difference in ns. Data were not provided for individual teacher classes (as per study agreement with the district). The benchmark data were analyzed and interpreted during the summer following the school year when the state made the proficiency data available to the district for each student and then the district made the data available to me.

I codified the district provided student data for the two schools based on the student achievement of or lack of achievement of the state established benchmark. This coding is consistent with how the State of Florida uses the percentage of students with at least minimal benchmark proficiency to determine the status of schools and school districts and to report the assessment results to the public. These coded data were used to determine if there was a difference in proficiency benchmark achievement of ELLs between the two science programs.

Qualitative Data Analysis

Ravitch and Carl (2016) stated that qualitative data analysis is a vital part of all qualitative research. Research starts with the collection of quality information. The collected information is then organized and analyzed to draw conclusions on the themes of the research. Qualitative data analysis is the process of examining qualitative data to derive an explanation for specific phenomenon. Qualitative data analysis provides understanding of research objectives by revealing patterns and themes in your data (Ravich & Carl, 2016).

The qualitative portion of the case study aimed to provide insight into the instructional teaching practices associated with each of the two science programs used in the district. The SIOP instructional practices model, which research had shown is associated with higher achievement of ELLs, served as the basis for understanding if teacher practices in one or other of the two science programs were aligned with SIOP effective teaching practices. The quantitative question asked if the teaching practices were more closely aligned with SIOP in one program or the other of the programs, in fact resulted in significantly greater achievement by ELLS of the state established science proficiency benchmark. Within the district neither science program had previously been studied to determine its effectiveness.

Coding Data

Merriam (2009) describes the importance of simultaneous data analysis and selection noting that the task can become not only overwhelming. Data collection and analysis is a process that includes ongoing “organization, reduction, consolidation, comparison and reconfiguration” (Sueter, 2012, p. 360). To obtain in-depth information on perceptions, insights, attitudes, experiences, or beliefs, interviews were used to gathering subjective perceptions on science teaching strategies use in the science classroom to support ELLs. Coding is a process of finding and labeling concepts, themes, events, and examples in transcript that speak to the research question (Rubin & Rubin, 2012).

For both research questions, RQ1 and RQ 2, the interview data were analyzed as soon as the interview was completed and transcribed. Once the interview was completed, I reviewed the recording and proceeded with the written transcription. I then re-reviewed the recording to check for accuracy in the transcribed interview. Coding was conducted following the completion of all six interviews.

The transcriptions were read and manually coded based on each of the seven components of the SIOP protocol (see Appendices G and H). According to Saldana (2016), manual coding involves someone reading the qualitative data and manually assigning a code. For this research, I was the one that manually coded the data collected from the interviews. The data collected were coded based on keywords in the SIOP components. For example, SIOP Component 1, Lesson Preparation, included the keywords “content objectives” and “language objectives.” A response containing any of these key words was coded as “Uses content/language objectives” or “Does not use content/language objectives.” The key words relating to “objectives” served as the coding identifier for this component SIOP matrix (see Appendix G). These responses were then translated into “yes”, “no” or “partial” alignment as noted in Table 2 below. Saldana (2016) stated that a pattern suggests a multiplicity of elements gathered into the unity of a particular arrangement. I coded the interviews by searching for characteristics of similarities and differences in words and phrases within the interviewees’ responses. Each transcription item was color-highlighted based on the SIOP coding to enhance the ease of analysis.

The transcriptions were reviewed several times to increase the accuracy of the questions/responses. The interview data were organized into a spreadsheet and I remained open to any answers and responses to identify SIOP elements as they emerged.

Participants responses were used to maintain focus on research-based experiential, teaching strategies, vocabulary strategies, used in the science classroom to support ELLs academic language.

In addition to the interviews the two textbooks used in the programs were examined to determine how the chapters aligned with the best teaching practices identified in the SIOP components and the provisions made for ELLs. Each chapter was manually coded using common words and SIOP elements to determine the congruence of alignment of the teachers' practices with the SIOP model (see Appendix H). For example, for SIOP component 3, "Comprehensible Input", did the techniques in the chapter suggest classroom activities that facilitate vocabulary development and comprehension.

Quantitative Data Analysis

The quantitative research question was what difference, if any, was there between the state-established benchmark for science proficiency for fifth grade ELL students who were taught using only the Inspire Science program and those that were taught using the combination of the district-adopted Inspire science and PSELL program?

The null hypothesis was that there was no difference between the state-established science proficiency for fifth grade ELL students who were taught using only the Inspire Science curriculum and those that were taught using the combination of the Inspire Science and PSELL program?

The data for the quantitative study consisted of nominal data of two variables. State-established science minimum proficiency benchmark scores proficient or not-proficient were gathered for each ELL in the two study schools. All fifth grade ELLs in the respective schools were included in the analysis, whether their individual teacher had been interviewed or not. A scaled score of better than 200 on the Science FCAT 2.0 was established as the standard by the state as the score benchmark for students to be considered proficient. ELL students from the Inspire only and ELL students from the combination Inspire + PSELL program were assigned a 1 if they had received a scaled score of 200 or less on the science test and a 2 if they scored higher than 200 on the science test. Students were also categorized by which science program school they were enrolled in.

The non-parametric Mann-Whitney U, 2-tailed test, using IBM SPSS Statistics software, was used to determine possible differences in proficiency between students taught in the two science programs. The non-parametric Mann -Whitney U Test was appropriate since the data were nominal, the independent variable had only two levels, it was a between-independent-subject design and there was no assumption of the direction or magnitude of the information (MacFarland & Yates, 2016). These data were used to compare the number of students proficient and not proficient for each school group.

Accuracy and Credibility

The goal of this mixed-method case study was to answer the research questions as articulated. Case studies involve studying a case of contemporary or real-life events (Ravitch & Carl, 2016). Case study research may employ multiple data sources including observations, interviews, documents, and artifacts. Interviews were conducted with fifth-grade science teachers to address RQ1 and RQ2. The research questions were based on the SIOP conceptual framework. The purpose was to explore teachers' perception of the use of research-based instructional strategies, curriculum materials, consistent with the SIOP instructional framework in each of the two different science programs. The data for RQ3 were obtained from the 2018-2019 standardized state science test benchmark scores provided by the Research Department of the school district for fifth-grade students and analyzed using the Mann Whitney U test. Differences in achievement of the state-set proficiency benchmark of ELLs between the two science programs were compared.

Employing a single strategy does not guarantee accuracy and credibility. However, there are multiple measures researcher can employ to help support validity (Ravitch & Carl, 2016). Data triangulation, involving the two qualitative data sources and the quantitative analysis, were used to clarify and ensure accuracy and credibility in my research.

Limitations

One of the criticisms of the case study is the limited generalization of the findings. While this study included multiple units of measurement, multiple participants, and multiple schools there are identifiable limitations. First is the fact that the study was conducted in only two of 125 elementary schools in the district. The teacher participants were selected on three common variables: at least one year of teaching fifth grade science, ELLs in their classrooms and teaching in a Title I schools, findings may not be generalizable across teachers.

Another criticism of the case study method includes the limited generalization of what is observed from a single entity across different situations. This case study included comparisons across multiple units of analysis, including staff and programs that yielded findings that might be transferred across contexts. However, there are identifiable limitations. First is the fact that this case study was conducted in a single school district. While the participating educators represented multiples schools, they functioned within the same guidelines, policies, and procedures directed by the district Science Department in the study site. Also, I only examined two schools within the district, one using Inspire Science program and the other one using the combination of Inspire + PSELL.

Interviews are a data collection method that have limitations regarding the ability to reflect accurately the interviewee's perspectives. Although the descriptive and interpretive work gave this study strength, it also prevented it from being free from bias, because all interpretations and analyses are filtered through one's worldview, values, and perspectives. The teachers' answers to the interview questions might have been biased in that they were insecure about their lack of knowledge of understanding of best practices with ELLs. The teachers may have felt stress or apprehension when being interviewed due to necessity to follow district requirements and guidelines.

Rubin and Rubin (2012) asserted interviews can be used to strengthen the validity of the interpretation if they are conducted with various participants. This study was limited to two similar elementary schools within one school district in Central Florida. Only three teachers from each of the two science programs accepted the invitation to participate in the study for a total of six participants thus limiting the information regarding teaching that may have been obtained from a larger participant group, number of schools, or geographical location. Finally, there is the limitation in terms of the two science programs used by teachers in the study. While each of the science programs is widely used in other school districts, many districts might use only one of the programs or an entirely different science program.

Data Analysis Results

Findings for this study were based on analysis of qualitative and quantitative data. Qualitative data were drawn from semistructured interviews conducted with three fifth grade teachers who taught science using the district adopted Inspire program and from three fifth grade teachers who taught using the district adopted combination Inspire + PSELL program. Data from the interviews were coded to identify patterns of teaching congruent or alignment with SIOP effective practices for teaching ELLs. A second source of qualitative data was the analysis of the two textbooks used in the programs to determine their alignment or lack of alignment with SIOP research-based effective teaching strategies, particularly for ELLs. The third source of data, quantitative data, were state test proficiency benchmark nominal scores for the total population of 96, fifth grade ELLs taught in the two science programs in the two schools. Triangulation of the three independent sources of data provided evidence of the validity of the results.

Qualitative Data Analysis Results

The purpose of this concurrent mixed method case study was to explore to what extent each of the two fifth grade science programs provides or does not provide textbooks, curriculum guides, instructional strategies, classroom assessments aligned with research-based practices for ELLs and determine whether there was a difference in state-established proficiency level for ELLs between the two programs. FCAT 2018-2019 proficiency results for ELLs in the study schools, participating in each the two science programs were compared to add further insight into the two programs and case study.

Echevarría et al. (2017) identified research-based instructional elements, which when used by regular classroom teachers have been shown to meet the special learning needs of ELLs in mixed non-ELLS and ELLs classrooms. The instructional components, known collectively as SIOP identifies interrelated instructional components, which include: Lesson preparation, Building Background, Comprehensible Input, Teaching Strategies, Interaction, Practice/Application, Lesson Delivery, and Review and Assessment. Lesson delivery was not included as part of the data gathering or analysis process in the study since it required direct classroom observations, which were beyond the scope of the study. SIOP served as the framework for the study. The findings of reported practices by the Inspire Science teachers and Inspire + PSELL teachers, based on the SIOP best practices framework are summarized below.

RQ1 – Qualitative Inspire Science program findings. The first research question was in what ways does implementation of Inspire Science (McGraw Hill, 2017) align with the SIOP best practices to support or not support the acquisition of content-specific science language of fifth grade ELL students?

The three Inspire teachers had participated in the state required 15 hours of training related to teaching ELLs, as part of Florida's teacher certification process. They had also participated in a two-hour session held by the district which focused on implementing the Inspire program. However, the teachers shared that there was no mention of modifying the Inspire program to meet the needs of ELLs or any other atypical population and that they were expected to implement the program as written.

Interview questions were developed from SIOP observation instrument (see Appendix B). Changes in wording from the SIOP observational instrument were made to adjust the from an observation format to the question format used in the interviews (Appendix C). Participants were encouraged to expand on their responses and to provide examples. Teachers who responded to a question with a simple "yes" or "no" where asked to elaborate their response. Most teachers fully responded to the questions and often provided examples or other clarifying remarks, which enabled me to synthesize the overall meaning of the answer. Following are the findings by SIOP instructional component.

Science lesson preparation – Inspire. Lesson preparation is the initial component of the SIOP model. It includes the development of class objectives to meet the needs of ELLs as well as adaptations in materials and language to ensure they are appropriate for ELL learning. The Inspire science teachers verbalized that they solely used lesson objectives provided by the Inspire publisher to guide their lessons. None of the teachers developed separate objectives to meet the specific needs of the ELLs in their classes. Teachers explained that the Inspire science program did not specifically provide language development objectives and the teachers did not add language objectives in their science lesson plans. For example, Teacher #1 stated, "I use the same lesson objectives for all of my students, including my ELL's." "I don't make any changes to the content objectives that the district provides me." All three teachers expressed the opinion that it was the expectation of the district that they implement the Inspire Science program in the same manner for all students.

Teachers valued the many hands-on activities materials provided by the Inspire Science program, including the kits which contained needed materials for the activities. However, none of the teachers made modifications to these hands-on activities to meet the diverse needs of ELLs. The teachers noted the inclusion of real-world simulations, and graphic organizers provided in the Inspire science program were for use by all students. Material were not modified for ELLs. For example, a modification might have included simplified directions for better understanding of the activities by ELLs.

Science building background – Inspire. To be aligned with the SIOP Model teachers need to know what students already know when introducing new material and make provisions to meet individual learning needs. Vocabulary is particularly important in the case of ELLs in order for them successfully grasp new concepts and link them to previously covered material. The Inspire science teachers cited the program's real-world problems and the probes as ways to gain and use background knowledge of students in general; however, the activities were the same for all students. Two teachers offered that Inspire science does not provide adaptations for the diversity and language level of proficiency for ELLs.

Teacher #1 stated "I use some activities in the book for background knowledge, they are called the real-world problems and real scenarios, those can give me an idea of what the students already know". Teacher #3 volunteered that "the Inspire book does not provide any adaptation for ELLs."

Comprehensible input – Inspire. A variety of instructional techniques, such as modeling, visuals, hands-on activities, demonstrations, gestures, and body language, are required to make content clear to ELLs. Speech and explanations need to be appropriate for the English proficiency level of the students, for example direction given at a slower rate, with clear enunciation and use of simple sentences for beginning ELLs.

Inspire teachers praised the Inspire science program for the provision of hands-on activities and materials to be used by the students during science laboratories (experiments). Students participated in hands-on activities two to three times a week. The use of hand-on materials provided opportunities for ELLs as well as other students in the class to gain greater understanding of content. However, the hands-on activities were the same for all students; there was no evidence of accommodations for ELL students to make concepts clear. None of the teachers adapted their speech to meet the diverse language needs of ELLs. There was no evidence of visuals used in the classroom to support ELL students.

Teacher #1 stated "The Inspire book provides hands-on activities that I can use with all students and the district provides the teacher with a kit full of materials to support the experiment (hands-on) activities in the classroom." Teacher #2 stated that "the students participate in the hands-on activity/experiment once or twice a week and all activities are aligned to state science standards." None of the teachers made modifications to the hand-on activities to meet the diverse needs of ELLs. The teachers expressed the opinion that it was the expectation of the district that they implement the Inspire science program as designed.

Teaching strategies – Inspire. Teaching strategies such as scaffolding, use of a variety of tasks and questions to development of higher order thinking and purposeful language learning skills are important components of the SIOP model and successful student learning. The teachers relied on questions provided in the Inspire book. Most of the questions required short answers. Exit slips were frequently used to determine student knowledge of the content of the lesson. The teachers felt that the use of exit-slip promoted higher-order thinking for all students. Students were expected to answer the questions using the academic terms they learned in the science lesson. The teachers did not think that the Inspire program provided for the development of language learning skills.

Interaction- Inspire. It is important that students be provided with ample opportunities to interact with the teacher and with other students to elaborate on and clarify concepts. Group configurations can be used to support language and content objectives of the lesson. Inspire Science teachers explained that the Inspire book does not specifically suggest group activities. However, all of the teachers planned for collaborative structures to strengthen student engagement. The teachers had students work in groups of four, and the students interacted with each other to answer the questions provided by the Inspire program. In forming collaborative groups consideration was not given to the particular needs of ELLs. Students were expected to answer questions using the academic terms they learned in the science lesson. The activities were not differentiated based on student needs. For example, Teacher #1 stated “I prepare my classroom where my students are sitting together in groups of four and they interact with each other to answer questions.” Teacher #2 stated “I use cooperative learning strategies with my students, such as think-pair-share, turn and talk, group collaborations, pair collaborations.” Teacher #3 stated “I use cooperative strategies in my classroom; however, the Inspire book does not suggest any of these strategies, I am the one that creates them in class.”

Practice/application - Inspire. The SIOP model emphasizes the importance of practice using hands-on materials and manipulatives to support the learning of new material and review of key vocabulary. The teachers introduce new vocabulary at the beginning of the lessons. Students were expected to apply newly learned vocabulary while working with the hands-on activities. Students write responses to questions provided in the text as “exit slips.” Activities were provided that integrate language skills (reading, writing, listening, and speaking). Teachers provided a **c**omprehensive review of key vocabulary for all students.

Teacher #1 stated that “There is no specific instructions from the Inspire book that tells me or the student how to apply new content, I am the one that has to give those instructions for the students.” Teacher #1 provided an example “I tell the students you need to answer the question using the vocabulary that you just learned.” Teacher #2 explained “each lesson has a package for each student but is the same for all, with close reading and questions that they need to read and answer, each standard and big idea has one package, they use terminology and the students have to decode what they read.”

Teacher #3 explained that “Inspire incorporates science vocabulary. I encourage my students to use the process of elimination to answer and choose the correct answer.” Teacher #3 further stated that “the students use the vocabulary to answer the questions, and during the labs the students are expected to use the science vocabulary.”

Review and assessment - Inspire. SIOP emphasizes the need for teachers to provide comprehensive review of concepts taught, the need to assess learning of all lesson objectives and provision of regular feedback to students on their learning. Inspire teachers reported that they regularly provided feedback to students on their work and assessed student comprehension and learning of lesson objectives (spot checking of responses throughout the class). Formative assessment included verbal feedback during the lesson and answers to short response questions provided in the text. Summative assessment was primarily done through uniform student submitted exit- slip questions.

Teacher #1 stated “At the end of the lessons the student must answer a question, the student will write the answer on a piece of paper that I collect and grade. They are called exit-slips. I grade them and based on their answers I know if the student mastered the lesson or not.” Teacher 3 stated that “Every assessment is provided by the science department from the school district, we cannot create our own assessments.”

RQ1 summary of qualitative Inspire Science findings. Practices of the Inspire teachers bore little in the way of congruence with three of research-based components of the SIOP model, Lesson Preparation, Building Background, and Teaching Strategies. Practices in the other four SIOP components of Comprehensible Input, Interaction, Practice/Application and Review and Assessment, while not differentiated for ELLs included some types of activities which were aligned at least in part with the research-based needs of ELLs, such as hands-on activities, real-world simulations, and use of cooperative groups (see Table 2). None of the teachers provided an example of differentiation of instruction for ELLs for any of the seven SIOP components.

Teachers using the Inspire science program relied on the teacher edition of the text to provide lesson objectives, content, activities, and assessments. The textbook for the program made no provisions for differentiation of teaching practices and content to meet the needs of ELLs. Teachers were clear in the interviews that they were expected by the district to implement the identical program, as developed by the publisher, for all students in their classes. The two-hours of orientation in the use of Inspire program prior to implementing the curriculum reinforced the expectation of the district that teachers were expected to follow the program as provided. The emphasis that the district appeared to place of “sticking” to the program, likely accounted for the similarity of responses of the Inspire Science teachers. No training was provided concerning meeting the needs of English language learners in their classes.

RQ2 – Qualitative combined Inspire/PSELL Science program findings. The second research question was in what ways does the implementation of the PSELL (University of New York, 2011) program combined with the Inspire (McGraw Hill, 2017) science program align with best practices to support or not support the acquisition of content-specific science language of fifth grade ELL students?

Interview questions were developed from SIOP instructional components (see Appendix C). Changes in wording from the SIOP observational instrument were made to adjust from an observation format to the question format used in the interviews (Appendix E). Participants were encouraged to expand on their responses and to provide examples. Teachers who responded to a question with a simple “yes” or “no” where asked to elaborate their response. Most teachers fully responded to the questions and often provided examples or other clarifying remarks, which enabled me to synthesize the overall meaning of the answer to either (see Table 2). Following are the findings by SIOP instructional component.

The Inspire + PSELL teachers had completed the total of 15 semester hours or 300 in-service credit points in courses learning how to help ELLs in the mainstream classroom, which is required by law of all primary language arts/English teachers in the State of Florida (FLDOE, 2018). The Inspire + PSELL teachers participated in the two-hour Inspire implementation training. In addition to participating in the Inspire orientation sessions, the teachers who also used PSELL in their science classes, received multiple days of specific training in using PSELL to meet the needs of ELLs and were required to attend once a month PSELL training meetings where they discussed program implementation and differentiation of the science programs as well as instructional strategies to meet the needs of the ELLs in their classes.

Inspire + PSELL lesson preparation. Lesson preparation is the first component of the SIOP model. It includes the development of class objectives and objective specifically to meet the needs of ELLs, as well as making adaptions in materials and language to ensure they are appropriate for ELL learning.

Inspire + PSELL teachers reported that they adjusted their lesson plans by defining objectives and creating student friendly "chunking" of objectives for the ELLs in their classes. Teachers provided specific language objectives; supplemented lessons with visuals, videos and graphic organizers designed to increase ELL students' understanding of vocabulary, videos and graphic organizers to strengthen ELL students' vocabulary and background knowledge. Teachers used Inspire curriculum resources materials, lesson plans and PowerPoints provided by the district but adapted them to build background knowledge for ELLs. Teachers received support from the PSELL program materials that provide mostly hands-on activities and appropriate reading passages. Inspire and PSELL, both provide science kits with materials for the hands-on activities. The teachers selected activities two or three times per week, which they believed were appropriate for ELLs as well as others in the class. Students were encouraged to apply new vocabulary during hands-on activities to the new concepts they are currently learning.

Teacher #4 stated "we follow the district lesson plans; however, I adapt my lesson plan for my student trying to make it comprehensible." "I create a lab-slip where the students fill multiple choice questions, open-ended questions, and also chart or diagrams to fill in the blanks to use vocabulary." "For my ELL students they have a similar sheet that I create for them, which is more comprehensible." Teacher # 5 stated "Both curriculums have content objectives; however, I adjust my plans to make language understandable for my students." "The content objectives are called learning targets, which is what the student is expected to do at the end of the lesson."

Inspire + PSELL building background. Teachers need to know what students already know when introducing new material and make provisions to meet individual learning needs in order to be aligned with the SIOP Model. Vocabulary is particularly important in the case of ELLs in order for them successfully grasp new concepts and link them to previously covered material.

Inspire + PSELL teachers explicitly linked concepts to each student's background and past learning. Opportunities were provided for students to use learning strategies emphasizing key vocabulary for ELLs by introducing, writing, repeating, and using the vocabulary in context for students to understand. Teachers provided support with reading passages from Inspire and real-world situations from PSELL for ELLs. Teachers provide individual support for students during labs.

Teacher # 4 stated "I always build background knowledge for my students with questions according to the lesson." "PSELL provides academic vocabulary for each lesson, and worksheets in which student can use vocabulary. The list of vocabulary words is at the beginning of each lesson, they come in three languages, English, Spanish, and Creole." Teacher #6 stated "PSELL provides worksheets and graphic organizers for the ELL students to complete."

Inspire + PSELL comprehensible input. SIOP research-based studies support the use of a variety of instructional techniques, such as modeling, visuals, hands-on activities, demonstrations, gestures, and body language, are required to make content clear to ELLs. Speech and explanations need to be appropriate for the English proficiency level of the students, for example direction given at a slower rate, with clear enunciation and use of simple sentences for beginning ELLs.

Teachers consciously used speech they believed was appropriate for ELL students' English proficiency level. A variety of techniques were used to make the content concepts clear (modeling, visuals, hands-on-activities, demonstrations). Inspire and PSELL both provided hands-on activities such as experiments. Teachers created differentiated worksheets to promote active participation in class of ELLs based on their language abilities. Teachers encouraged students to respond using native language prior to responding in English. Teacher # 4 stated

> Both of the programs provide hands-on activities and real-world situations where students interact with the content, that is the way I made them interact with new vocabulary the day before of the lab, during the lab, and after the lab, they are expected to use the new vocabulary.

Teacher #5 stated "Both Inspire and PSELL do a great job with hands-on activities." "I adjust my lesson plan and search for resources that will help my students, I chose the best of the materials to do hands-on labs in science."

Inspire + PSELL strategies. Teaching strategies such as scaffolding, use of a variety of tasks and questions to develop higher order thinking and purposeful language learning skills are important components of the SIOP Model and successful student learning. Opportunities provided for students to use different learning strategies such as problem solving, predicting, summarizing, and categorizing were reported by teachers.

Additionally, PSELL provided a variety of questions and tasks to promote higher order thinking skills. Scaffolding techniques were consistently used to support understanding.

Teacher # 5 stated “With science everything is higher-order, students need to take this concept that they are learning about and put it into this real-words situation and that is what science all about; talking to their peers, and answering questions.”. “Inspire promotes higher-order thinking with the readings that students have to read and then answering questions, and PSELL promotes higher-order thinking during the labs and the worksheets that they use during labs that comes from PSELL book, if I want then to interact with something else, I create the worksheets myself.”

Inspire + PSELL interaction. It is important that students be provided with ample opportunities to interact with the teacher and with other students to elaborate on and clarify concepts. Group configurations can be used to support language and content objectives of the lesson. Teachers created guiding questions based on student’s English language level and used collaborative structures to create opportunities for interaction. ELLs gained support not only from the teacher but also from their peers in these collaborative structures as they hear the new vocabulary used in multiple formats. Students used lab slips to process their understanding with differentiated guided questions and to demonstrate learning. Teacher #6 stated “I provide my students many opportunities to express themselves according to the material presented in class.” “I use different strategies such as think-pair-share, talk to your partner, and they can answer questions together.”

Inspire + PSELL practice/application. The SIOP Model emphasizes the importance of practice through the use of hands-on materials and manipulatives to support the learning of new material and review of key vocabulary. Hands-on materials and/or manipulatives from Inspire and PSELL provided for student practice and application using new content knowledge. Teachers provided activities for students to apply content and language knowledge in the classroom. Activities that integrated all language skills (reading, writing, listening, and speaking) were provided. There was comprehensive review of vocabulary.

Students used hands on activities two or three times a week to expose them to new concepts after initiating prior knowledge. Students were exposed to new vocabulary with visual support for ELL students. During hands-on activities, students answered differentiated guided questions. Teachers used collaborative structures to promote engagement. Students were asked to apply their learning to guided questions and to make predictions about outcomes.

Teacher #4 stated "I promote writing with the use of lab-slips, these come from the Inspire book; the PSELL curriculum also provides writing opportunities after each hands-on activity in which students can express their observations." "Teacher #6 mentioned "my students complete labs two to three times a week that correlate with the standards, the labs are a combination of both programs."

Inspire + PSELL review and assessment. SIOP emphasizes the need for teachers to provide comprehensive review of concepts taught, the need to assess learning of all lesson objectives and provision of regular feedback to students on their learning.

Teachers provided **c**omprehensive review of key academic vocabulary. Regular feedback was provided to students on their work. Assessment of student comprehension and learning of all lesson objectives (spot checking of responses throughout the class). Formative assessments were used by the Inspire + PSELL teachers during the lesson, at which time they provide verbal feedback. Students with similar responses were broken into small group centers to correct misconceptions. Students were asked to link their new concept learning while reviewing concepts, and then were given a summative assessment through “exit slip” questions.

Teacher # 6 stated that the “PSELL program has better opportunities to write and explain their thinking. I also create some worksheets to provide verbally feedback to student if they are in the right track or if they need to correct something. I create worksheets and the student needs to fill in the blanks to provide visuals to help ELL student, in addition, I differentiate the level of difficulty with the worksheets I create. Some students will get to answer the questions form, and some others such as ELL will get the form to fill in the blanks, I adapt the worksheet for my students.”

RQ2 summary of qualitative Inspire + PSELL findings. Teachers using the combined Inspire + PSELL programs reported lesson preparation, building background, instructional strategies, interaction, practice and application and review and assessment practices congruent with the seven SIOP elements associated with the support of the ELLs in their classes (see Table 2). They reported and gave examples of how they differentiation instruction based on the individual needs of the ELLs in their classes. None of the teachers mention any restrictions by the district concerning modification of

Inspire Science or PSELL. The teachers had had multiple days of training in using PSELL to identify and meet the needs of ELLs and they were required to meet monthly to plan and discuss implementation of the programs. Instruction practices that were the subject of the PSELL training were research-based and aligned with SIOP. It is likely that the Inspire and PSELL training and the monthly teacher meetings accounts for the consistency among the teachers in their approach to instruction.

Table 2

Qualitative Data SIOP Congruence by Teacher Participant Codes

SIOP components	Teacher participants					
	Inspire 1	Inspire 2	Inspire 3	Inspire /PSELL4	Inspire /PSELL5	Inspire /PSELL6
Lesson preparation	No	No	No	Yes	Yes	Yes
Building background	No	No	No	Yes	Yes	Yes
Comprehensible input	Partial	Partial	Partial	Yes	Yes	Yes
Strategies	No	No	No	Yes	Yes	Yes
Interaction	Partial	Partial	Partial	Yes	Yes	Yes
Practice/ application	Partial	Partial	Partial	Yes	Yes	Yes
Assessment/ feedback	Partial	Partial	Partial	Yes	Yes	Yes

Qualitative Textbook Analysis

In order to further understand the alignment or lack of alignment of SIOP best practices with classroom practice a textbook analysis was performed using the SIOP components analyze Inspire and PSELL texts. The texts were analyzed to determine the congruence of alignment of the SIOP model components if present in the texts (Appendix

H). For example, for SIOP Component 3. Comprehensible Input, text was provided PSELL in each chapter suggesting techniques for facilitating vocabulary development. In the Inspire textbook the vocabulary provided for the students was limited, provided only in English, and with no pictures or illustrations to support comprehension. On the other hand, the PSELL book, provided an extensive vocabulary, in three different languages, English, Spanish, and Creole, and pictures to support comprehension. Table 3 shows an example from each textbook. Inspire and PSELL, from the Properties of Matter Chapter of each book.

Table 3

Properties of Matter Vocabulary

Inspire	P-SELL English	P-Sell Spanish	P-SELL Haitian Creole
matter	1. atom	atomo	atom
weight	2. chemical changes	cambio quimico	chanjman chimik
volume	3. chemical reaction	reaccion quimica	reyaksyon chimik
atom	4. combine	mezclar/combinar	konbine/kole
atomic theory	5. condense	condensar	kondansasyon
	6. dissolve	disolver	fonn/deleye

7. element	element	eleman
8. evaporate	evaporar	evapore
9. freeze	congelar	friz

The Inspire text provided implied objectives, hands-on suggested activities, and chapter subject content readings; however, the book did not provide for differentiation of instruction for any sub-groups. No mention of ELLs was found in any chapter. The analysis showed that the text was aligned with the practices reported by the Inspire teachers. The text did support hands-on activities as an important teaching strategy for teaching ELLs, rather it was assumed that all fifth grade students would understand the same instructions and that the activities would produce the same results.

Analysis of the PSELL (Appendix H) showed that it was closely aligned with the SIOP components and provided for differentiation based on the level of English acquisition of the ELLs in the classroom. The PSELL text was developed by the New York University based on the research of practices shown to be effective with ELLs as was SIOP and the focus of the text was on differentiation of instruction based on student need, especially the needs of students with limited English ability.

RQ3 Quantitative Research Data Findings

RQ3 – Quantitative: What difference, if any, is there between the state-established level of science proficiency for fifth grade ELL students who are taught using only the district-adopted Inspire Science curriculum and those that are taught using a combination of the district-adopted Inspire Science and P-Sell program?

The quantitative research question addressed what difference, if any, was there between the state-established benchmark for science proficiency for fifth grade ELL students who were taught using only the Inspire Science program and those that were taught using the combination of the district-adopted Inspire science and PSELL program?

The null hypothesis was that there was no difference between state-established science proficiency for fifth grade ELL students who were taught using only the Inspire science curriculum and those that were taught using the combination of the Inspire science and PSELL programs?

The data for the quantitative study consisted of nominal data of two variables. State-established science minimum proficiency benchmark scores were provided by the state and then to the district and then to the researchers, for each ELL in the two study schools. All fifth grade ELLs in the respective schools were included in the analysis, whether their individual teacher had been interviewed or not. A scaled score of better than 200 on the Science FCAT 2.0 was established as the standard by the state as the score for students to be considered proficient. ELL students from the Inspire only and ELL students from the combination Inspire + PSELL program were assigned a “1” if they had received a scaled score of 200 or less on the science test and a “2” if they scored higher than 200 on the science test. Students were also categorized by which science program school they were enrolled in.

The non-parametric Mann-Whitney U, 2-tailed test, using IBM SPSS Statistics software, was used to determine possible differences in proficiency between students taught in the two science programs. The non-parametric Mann -Whitney U Test was appropriate since the independent variable had only two levels, it was a between-independent-subject design and there was no assumption of the direction or magnitude of the information (MacFarland & Yates, 2016). These data were used to compare the number of students proficient and not proficient for each school group.

A Mann-Whitney U test revealed a significant difference in achievement of Inspire ($Md = 39.93$, $n = 28$) and Inspire + PSELLK (Md + 52.03), $U = 712$, $z = -2.579$, $p = .010$, $r = .30$ (a post hoc power test). The results of the non-parametric Mann-Whiney U Test showed that there were significantly ($U = 712.00$, $p = .010$) more ELLs from the Inspire + PSELL program who met the state proficiency standard than ELLS from the Inspire Science program.

The quantitative findings support that ELL students whose teachers used Inspire science combined with the PSELL program were significantly ($p = .01$) more likely to meet the science proficient benchmark than ELLs whose teachers used only Inspire Science. However, the effect size of $r = .30$ was small. Therefore, the null hypothesis was rejected, that there was no difference between the achievement of students taught with only Inspire and those taught with the combined Inspire + PSELL programs. The findings are consistent with the qualitative findings that showed a high degree of congruence between the teaching practices of Inspire + PSELL teachers and the research based SIOP model.

Table 4

Proficiency Percent in Science Programs

Science program	Total students	ELLs	Proficient ELLs	Proficient non-ELLS
Inspire	94	28	11%	19%
Inspire + PSELL	127	68	21%	71%

Validity of Data

The construct validity of the project study was achieved in part by analyzing teachers answers from interviews. The interview questions pertained to the teachers' practices aligned with SIOP model of effective practices for teaching ELLs. The interview questions, modified from the SIOP observation instrument, were designed to gain insight into which of the SIOP strategies within the seven domains of the SIOP model teachers were implementing in the science classroom to deliver and facilitate instruction to all students including ELLs. These interviews were coded based on key words in the SIOP components. The researcher created a SIOP Component Matrix (see Appendix G) based on participants' answers. These responses were then converted into "yes", "no" or "partial" as noted in Table 2 above.

The second source of qualitative information was the analysis of the Inspire and PSELL textbooks. The textbook analysis used the SIOP components to access congruence of each chapter for both books. Each chapter was manually coded using SIOP common words and themes to determine the congruence of alignment of the teachers' practices with the SIOP model components of effective practices to teach ELLs (see Appendix H). For example, the Inspire textbook provision of new vocabulary for the students was limited, provided only in English, and contained no pictures to support comprehension. On the other hand, the PSELL book, provided an extensive vocabulary, in three different languages, English Spanish, and Creole, and pictures to support

The third part of triangulation, the academic achievement of the students in each program, while small in effect size, showed that ELL students in the Inspire + PSELL classes scored significantly higher in terms of science proficiency on the Standardized Science Florida Test (FCAT). Triangulation of the three sources of data (two qualitative and one quantitative) supports that the Inspire + PSELL program was more congruent with SIOP research-based practices for ELLs and was associated with greater ELL student proficiency.

Project Justification

Inspire science teachers and Inspire+ PSELL teachers were required by Florida law to complete a total of 15 semester hours or 300 in-service credit points in courses related to learning how to help English Language Learners in the mainstream classroom (FLDOE, 2018). However, for most of the participant teachers this training might have taken place several years in the past. All teachers using the Inspire program book were required to attended two hours of Inspire training, which focused on how to use and manage the Inspire curriculum during the first year of implementation. Teachers who used Inspire only, did not provide evidence of any other ELL training besides the requisites mandated by Florida. Nor did their teaching practices or textbook differentiate instruction for ELLs. Further, their students were less proficient in science as measured by the FCAT at the end of the school year. On the other hand, Inspire + PSELL teachers attended multiple day training focused on teaching practices aligned with SIOP, practices that research has shown academically effective with ELLs. My study showed that these teachers who differentiate instruction and who use SIOP practices had ELL children in their classrooms who demonstrate significantly higher academic science proficiency.

One improvement strategy, which might be considered by the district based on my findings would be to adopt and purchase the PSELL program for the teachers now using only Inspire. However, the expense of providing additional science texts for students in 100 schools is not feasible.

Based on the findings of this study concerning training and implementation of effective teaching practices of ELLs by Inspire + PSELL teachers, but the lack of specific training and implementation by Inspire teachers of research-based effective strategies to meet the needs of ELLs in science, it is logical to conclude that there is a likelihood that the provision of specific training for the Inspire teachers in the SIOP teaching practices used by the Inspire + PSELL teachers holds the possibility of increasing the use of effective practices in Inspire classrooms and achievement level of ELLs in science. I recommend a 3-day professional development SIOP based development program for teachers that use only Inspire. Such a workshop should provide them with the knowledge and strategies needed to increase their confidence and their abilities to teach science to fifth grade ELLs in their classes. Such a workshop could be repeated multiple times as part of the district's staff development program to address the large number of fifth grade teachers in the district.

Summary and Conclusions

This concurrent mixed-method case study was designed to explore to what extent each of the district's two fifth grade science programs provided or did not provide instructional practices aligned with research-based SIOP effective practices for ELLs to support content-specific science language acquisition. The study was conducted in a large central Florida school district. The participating schools were Title 1 schools with a high ELL population using either the Inspire science program or a combination of Inspire + PSELL program. Semistructured interviews were conducted to collect data from participant teachers. Six volunteer science teachers agreed to participate in the research project, three teachers from an Inspire Science school and three teachers from a school using the combination of the Inspire Science +PSELL programs. The participants had full knowledge about the purpose and nature of the study prior to its commencement. They were informed of this prior to filling out a consent form for the study. An ethical research protocol was followed by providing pseudonyms for the teacher participants' so their identity and perspectives would be concealed in the findings of the study (Creswell, 1998; Rubin & Rubin, 2005). On the other hand, anonymous students' proficiency benchmark level data, for fifth grade students in the two schools, were received from the district and analyzed using the SPSS program Mann Whitney U test (p = 0.010) to satisfy the quantitative part of the project study.

The conceptual framework for this study was based on The Sheltered Instruction Observation Protocol (SIOP), a research-based instructional model that has been shown to be effective in addressing the academic needs of English learners throughout the United States (Echevarría et al., 2017). Sheltered instruction is typically delivered by subject area teacher. The documented result of effective sheltered instruction is that ELLs can access the core curriculum and concurrently develop their academic English proficiency (Short, 2013). The focus of SIOP is language learning and support of vocabulary acquisition, background knowledge, and tasks needed to be successful in the science classes (Short, 2013). SIOP identifies eight components for instruction to meet the academic needs of ELLs: lesson preparation, building background knowledge, comprehensible input, strategies, interaction, practice/application, lesson delivery, and review/assessment and informed the development of the interview questions for the qualitative data collection. Lesson delivery was not addressed in the study since it required direct classroom observation, which was beyond the scope of the study.

Qualitative interviews indicated that while the Inspire science program has many hand-on activities, reading passages for background knowledge, and visual supports, the program is a one design for all fifth grade students and is not specific to the needs of ELL students. In contrast, Promoting Science among English Language Learners (PSELL) was designed as an individualized program to meet the needs of ELLs in the regular classroom. Inspire + PSELL teachers used individualized objectives, worksheet, activities and assessments to meet the needs of ELLs. Students used both their native language and

English to understand concepts. Teachers of the Inspire and PSELL program adjusted the combined program to meet the individual needs of ELLs.

A congruency analysis of the Inspire and PSELL textbooks with SIOP Components was performed. Each chapter was manually coded using SIOP common words to determine the congruence of alignment of the books with the SIOP model of effective practices to teach ELLs (see Appendix H).

The components of the SIOP program are based on multiple research studies that document that the SIOP practices are associated with increased academic achievement. The local problem, which initiated this study, was the low science proficiency rate for ELLs as measured by the state FCAT test. The low achievement of ELLs in the district was also a specific concern of the FLDOE, which required the district to develop and implement a remedial plan to improve the achievement of ELLs in the district. No studies had been conducted within the district concerning the effectiveness of the district's science programs.

The case study examined the congruence of teaching practices and science textbooks in the district's two approved science programs with the research based SIOP Model. Because the practices included in the SIOP model were based on evidence of improvement of academic achievement of ELLs, it was consistent with the past SIOP research and the district problem of low ELL achievement, to include as part of the case study the determination of whether the most congruent science program was associated with a higher level of science proficiency.

Quantitative findings showed that students in the classrooms where teachers used Inspire in combination with PSELL had a significantly (p = 0.10) higher proficiency rate for ELL students. Therefore, the null hypothesis was rejected in favor of the alternative hypothesis: There was a positive difference between the state-established level of science proficiency for fifth grade ELL students who were taught using only the district-adopted Inspire science program and those that were taught using a combination of the district-adopted Inspire + PSELL program with those taught with the combination program showing greater proficiency.

Triangulation of multiple sources of data; analysis of SIOP congruency of teacher practices, analysis of the alignment of the textbooks used in the two science programs with the SIOP components, and the quantitative analysis of student FCAT 2018-19 science proficiency data between the programs, helped strengthen reliability and interval validity of the study.

Section 3: The Project

Introduction

In a large county in Central Florida, in a school district with 125 elementary schools, fifth grade ELLs measured by the state science assessment FCAT 2.0 met the state science proficiency benchmark more than 42 percentage points below that of non-Ells. The FLDOE (2018) found the performance of ELLs in the district deficient and required the district to submit a corrective action plan to remediate the deficiency. In response to the state requirement, the district adopted two science programs: (a) Inspire Science (McGraw Hill, 2017) for use in all 100 elementary schools and (b) Inspire Science in combination with PSELL in 25 of the elementary schools.

The purpose of this mixed-method case study was to explore how each of the two science programs supported or did not support acquisition of content-specific science learning and to determine whether either program was significantly more effective in terms of science achievement of ELLs. A part of the case study which might address the state mandate low proficiency schools to address the needs of ELLs.

Findings of the study showed that the implementation of the Inspire program in the district did not facilitate differentiation of instruction based on the needs of specific students, including ELLs and that teacher practices were poorly aligned with SIOP research-based practices shown in multiple studies to be effective with ELLs. In addition, it was found that Inspire teachers received only a two-hour orientation to the new science program and its materials. The basic goal of the PSELL program was to facilitate the differentiation of science instruction based on the need’s students, particularly ELLs. In the instructional practices of combined program, Inspire + P-SELL, teachers were closely aligned with SIOP elements of effective instruction. Inspire + P-SELL teachers had also been participants in multiday training sessions focused on practices aligned with the SIOP.

Whether one, both, or neither program's teaching practices were aligned with research-based practice previously shown in other studies to be associated with increased achievement, in order to complete the case study, the year-end science proficiency achievement of ELLs in each program were compared. The ELLs in the Inspire + PSELL program met the state benchmark at a significantly greater (p = 010) number than ELLs in the Inspire program. Although this study involved a small sample, the 68 ELL students in the Inspire + PSELL classes the ELLs were 21% proficient, whereas only 11% of the Inspire-taught ELLs were proficient. There were also positive results reported for non-ELL students, with 19% meeting the state-established proficiency level in the Inspire program, compared to the 71% of Inspire + PSELL non-ELLs meeting the state-established proficiency level.

The study data provided direction for development of a 3-day professional development project that could increase the fifth-grade science teachers' efficacy to teach ELLs, in classes using only the general science program, Inspire. Professional development was chosen as the genre for the project because it was the most appropriate, based on the study's findings. Professional development for fifth-grade science teachers will best support the outcomes of the study and impact teachers who have not had the training in working with ELLs.

Section 3 provides detailed information on the 3-full day professional development series that was created based on the outcomes of the study. A description of the professional development program includes goals, rationale for selection, synthesis of current literature related to professional development, program plan outline, existing supports and potential barriers, roles and responsibilities of presenters and program evaluation. The rationale behind the selection of a professional development training over other genres is also shared. Section 3 further provides a synthesis of current literature related to the chosen project genre. An implementation plan is outlined, which includes potential resources existing supports, potential barriers, a timeline, and roles and responsibilities of those involved. Finally, a plan to evaluate the professional development is included as well as implications for social change.

Description and Goals

The goal of this project is to (a) increase the understanding and ability of teachers to implement research-based strategies for effectively teaching academic science language to ELLs, (b) provide clarification and purpose for science teachers, and (c) support excellent practices in the science teaching of ELLs within the SIOP framework. The project will address a local problem at the local school district level. The district has a large proportion of students in the mainstream science classrooms with significant language barriers, gaps in prior educational experiences, and persistent deficiency in science achievement outcomes determined by proficiency scores on the Florida's Science FCAT 2.0.

The 3-day professional development workshop will occur during the summer because it is the time when the district provides professional development opportunities for teachers. Additionally, the training will take place prior to the teachers' lesson planning efforts for the upcoming school year, which will allow them to incorporate learned strategies into their lessons.

Rationale

The project genre selected for this study is a 3-day professional development workshop. The project entails use of adaptable strategies of the SIOP model, which are supported by research and experts in the field with specific guidelines for instruction (Echevarría et al., 2017). The research-based SIOP teaching strategies have been shown to be effective for increasing ELL student achievement and were found in my study to be associated with use by teachers using the combined science programs and with greater proficiency of their students. The project constitutes a relevant professional development course that is adaptable for all fifth grade science teachers in the school district.

In addressing the language gap to make academic content more comprehensible for ELL students, teachers need sustained professional opportunities in a specialized pedagogy such as sheltered instruction to support their students' language and literacy achievement. Sheltered instruction includes certain research-based indicators, instructional best practices, and strategies to help ELLs acquire English language development and achieve academic proficiency. Using a sheltered instruction approach includes the use of a wide range of scaffolding strategies to make content and concepts comprehensible for students (De Jager, 2019; Johnson, 2019).

The research-based strategies, which include hands-on activities, reading passages for background knowledge, and visual supports, should provide Inspire classroom teachers with the tools necessary to support ELL students in developing academic science vocabulary. This project is designed to assist teachers who teach using only the Inspire Science program how to use instructional strategies, classroom assessments and practices, within the Inspire program. Implementing research-based strategies will support science language acquisition of content-specific vocabulary for ELLs, which may increase the ELLs' proficiency in academic science vocabulary. Based on the study findings, such an increase in fifth grade student science vocabulary acquisition should support the districts need to meet the state's academic standards in science.

Teachers must, by Florida law, complete a total of 15 semester hours or 300 in-service credit points in courses related to learning how to help ELLs in the mainstream classroom. Once they receive an ESOL Endorsement they are not required to attend additional ESOL training unless they want to do it. The study found that Inspire Science only teachers did not apply strategies to meet the specific needs of ELLs. Inspire teachers attended only a two-hour orientation on how to manage the Inspire curriculum and associated materials. Inspire teachers did not receive any additional ESOL training other than what is required by the state. However, in contrast, Inspire + PSELL teachers attended multi-day training and monthly training sessions where they were taught how to implement the curriculum, work with hands-on activities, and use specific strategies to assist ELL students.

The professional development format is the most appropriate format to provide teachers with the knowledge and experience needed to increase their confidence and their abilities to teach science academic vocabulary to fifth grade ELLs in their classes. Teacher professional training is a way to support the increasingly complex skills students need to learn in preparation for further education and work in the 21st century (Darling-Hammond, Hyler, & Gardner, 2017). A thorough review of the literature was conducted, which informed the development of the professional development project for this study.

Review of the Literature

This literature review is a justification of how the genre of professional development is appropriate to address the findings supported by research. A review of the literature provided scholarly insight and understanding of current strategies to increase the efficacy of fifth-grade science teachers. Educational databases such as Eric, SAGE, and Education Complete were used to access peer-reviewed scholarly articles on the topic. A thorough search of the topic was conducted using several headings (i.e., *English Language Learners, professional development, science strategies, academic vocabulary, science academic achievement, SIOP*). Current literature provided a rationale on the appropriateness of professional development as this study's project, as well as guidance for content placement in the construction of the professional development sessions.

A Framework for K-12 Science Education and the Next Generation Science Standards (FLDOE, 2017) suggested that children learn science by actively engaging in the practices of science, which is aligned with the SIOP (FLDOE, 2017). Thus, teachers are urged to implement inquiry-based instruction that blends core science ideas, crosscutting concepts from science and engineering practices (Mentzer, Cerniak, & Brooks, 2017). However, this requires a shift in practices for many teachers away from instruction that covers content to structured inquisition that has children conduct investigations or complete projects. Teachers need to have the proper training to allow for varied answers based on students' findings.

Darling-Hammond et al. (2017) defined professional development as structured professional learning that results in changes to teacher's knowledge and practices, and improvements in student learning outcomes. Teacher professional development can increase teachers' interest as a critical way to support the increasingly complex skills students need to learn in order to succeed in the 21st century (Mentzer et al., 2017). Professional learning is a product of both externally provided and job-embedded activities that increase teachers' knowledge and help them change their instructional practice in ways that support student learning (Hammock, 2017). Bates and Morgan (2018) agreed by stating that teaching is a profession that requires ongoing professional development.

There is growing concern that the current emphasis is on professional development quantity over quality (Kennedy, 2005; Tooley & Connally, 2016). Teachers must spend a fair amount of time after professional development before they can see effects on students' outcomes and change in classroom practice. The professional development modules included in the project study are written to be spread over a 3-day period, with times between sessions to reflect on the strategies as they relate to their own science class.

Sophisticated forms of teaching are needed to develop student competencies such as deep mastery of challenging content, critical thinking, complex problem solving, academic language, and effective communication and collaboration. Therefore, effective professional development is needed to help teachers learn then refine the instructional strategies required to teach these skills (Körkkö, Kyrö-Ämmälä, & Turunen, 2016). Professional development needs to focus on teaching strategies associated with specific curriculum content and supports teachers learning within their classroom contexts. Darling-Hammond et al. (2017) stated that schools increasingly structure teaching collaborative community endeavors, and teacher collaboration is an important feature of well-designed professional development.

Regular classroom teachers are challenged to address students who have a variety of English proficiency level competencies while, at the same time, encouraging all students to achieve academic excellence (Short, 2013). Therefore, researchers have established that mainstream teachers need more professional development opportunities to improve their instruction of ELLs to address the achievement gap (Nooruddin & Bhamani, 2019). The gap in language proficiency between ELLs and the general student population can hinder academic progress if teachers are not using appropriate instructional strategies to compensate for the learning gap in achievement (Nooruddin & Bhamani, 2019).

Collaborating with Peers

Fifth grade teachers in the target school district will always have ELLs in their science classrooms since the district has a significant and growing student population of ELLs. This makes collaboration with teachers, within their school, and with teachers from other schools necessary and important. Teachers, schools, departments and institutions, systems, and communities are embracing the value of collaborative structures in support of teaching, learning, and collective development (Gale, 2016). Ongoing collaboration with teachers in similar circumstances can increase confidence and encourage reflection. Lapareur and Grangeant (2018) stated that teachers that have academic knowledge can link their practices with practical strategies for achieving the expected tasks. In addition, they found that peer-oriented trainings fostered an interactive atmosphere and an environment in which practitioners reflected on their own skills and shared reflections on their personal growth.

Student learning is strongly influence by not only what but also how teachers teach. Conditions of learning must be established that are responsive to the way educators learn. Teacher professional development is defined as teachers' learning: how they learn to learn and how they apply their knowledge in practice to support pupils' learning (Postholom, 2012). Piper Zuilkowski, Dubeck, Jepkemei, and King (2018) identified the following conditions as important for teacher professional development: development of deep factual and conceptual knowledge and promotion of metacognitive and self-regulatory processes that help to define and monitor progress to meet the goals. What is most important is that any professional development for teachers be associated with positive impact on students' achievement and or behavior. Success needs to be defined not on terms of teachers' mastery but of the impact that change has on student outcomes. Numerous scholars have noted that teachers who are engaged in ongoing professional development take greater responsibility for learning of all students and are less like to dismiss learning difficulties as a result of external factors such as home or community environments.

Timeframe of Project

Teachers need multiple opportunities to understand new information and move into practice. Such opportunities include activities that challenge their current practice while, at the same time, supports new strategies and teaching techniques. Change in practice is equally about emotion as it is skill building (Hasiotis, 2015; Korthagen, 2016). Piper et al. (2018) noted that all learning activities required both trust and challenge. Change takes risk that only happens in an environment where there is support of professional vulnerability. Teachers may reject new ideas that conflict with their existing understanding unless their current ideologies are addressed. Without such engagement, teachers are likely to dismiss new strategies or new content will be irrelevant. In discussing new content, there needs to be understanding of how those ideas differ from the status quo and why they are important (Darling-Hammond et al., 2017; Sinek, 2009).

Effective professional development must be of a sustained duration. Darling-Hammond et al. (2017) noted that teachers need to be provided adequate time to learn, practice, implement, and reflect on the new strategies to facilitate change in their practice. Bates and Morgan (2018) agreed by stating that teaching is a profession that requires ongoing professional development quantity over quality (Kennedy, 2005; Tooley & Connaly, 2016). Teachers must spend a fair amount of time after professional development before they can see effects on student outcomes and change in classroom practice. The professional development modules included as the project study as a result of this case study are written for a 3-day period; time must be provided between sessions to realize any desired affect for change in practice. The key is providing high-quality materials, ensuring that the learning is relevant and actionable and that the learning accelerates teachers' abilities to apply the new content knowledge and skills.

One thing I learned in the data collection process was that all fifth-grade science teachers teach ELL students. This information provides support for increased collaboration about teaching ELLs with other fifth-grade teachers in their buildings. The 3-day professional development will provide a targeted opportunity for collaboration of content specific approaches, as opposed to fixed programs, promote teaching practices that are consistent with the principals of effective teaching but also allow for the immediate applicability to the classroom. To establish a firm foundation for professional growth, teachers must be able to integrate their knowledge of curriculum and how to teach it.

Science Professional Development

Professional learning and professional development are related by mutual overlap and interaction but are not interchangeable. Professional learning focuses on learning something new that is potentially of value (Fullan & Hargreaves, 2016). Professional development, in contrast, refers to personal growth, character, maturity, and morals. After review of multiples studies, Darling-Hammond et al. (2017) identified seven shared features of professional learning: content focused, involves active learning, collaborative and job embedded, uses modeling, provides coaching and support, provides for feedback and reflection, and is of a sustained duration. Darling-Hammond et al. established a link between effective professional learning and these seven features. Jensen, Sonnemann, Robert-Hull, and Hunter (2016) argued that creating effective professional learning requires incremental steps within a cycle of continuous improvement. Professional learning always starts and end with student outcomes.

Furthermore, effective professional development programs share some common attributes. McConnell, Parker, and Eberhardt (2013) explained the importance of professional development is to provide coherent and sustained support to teachers through collaborative work. The professional development focuses on concepts and practices to address the real needs of the classroom teachers, including teaching strategies, and content knowledge which is important for effective science teaching (McConnell et al., 2013). Deep and coherent science content knowledge if foundation for giving clear explanations and for identifying relevant and accurate examples of concepts. Teachers need an understanding of science concepts to successfully organize and implement meaningful curriculum that includes multiples representations and model science academic vocabulary for ELLs (McConnell et al., 2013).

The foundation for achieving student outcomes through professional learning is to connect adult learning to student learning (Borders, 2019). Professional development with the emphasis on core concepts and science process skills in the new Framework for K–12 Science Education (National Research Council, 2012) and the associated Next Generation Science Standards (National Research Council, 2013) make content knowledge even more important for effective teaching. This focus suggests that professional development programs need to strengthen teachers' content knowledge while applying the specific pedagogical strategies encouraged by the professional development planners. However, professional development is often planned for a group of teachers from diverse subjects with a range of educational backgrounds, teaching experiences, certifications, and content knowledge rather than targeted on specific needs of teachers or groups of students. In addition, student learning goals must meet the overall expectation for academic achievement in the district. There is little disagreement that the quality of the professional learning for teachers impact the quality of instruction.

SIOP Professional Development

SIOP strategies are typically delivered by content area specialists (Echevarría et al., 2017). The result of effective sheltered instruction is that ELLs can access the core curriculum and concurrently develop their academic English proficiency (Short, 2013). The focus of the SIOP model is language learning which supports academic vocabulary, background knowledge, and tasks needed to be successful in the content areas (Echevarría et al., 2017). Teachers integrate instruction of content concepts with academic language to develop student skills in science. The concepts and language skills are aligned with science state standards, and teachers use techniques designed to make the academic topic accessible to students and to enable them to practice the use of academic language as it is used in each subject area (Short, 2013). Echevarría et al. (2017) revealed that students who had teachers who implement the SIOP model on a consistent basis perform better on assessments of academic language and literature than students with teachers who did not implement the SIOP model. Providing relevant training for these teachers was an effective way to improve student test scores. The goal was to empower the teachers to improve their teaching (Echevarría et al., 2017). The only way the district will achieve the goal for teachers is providing teachers with the proper training to support students in the classroom.

The state of Florida has been demanding academic rigor from our students with a focus on high standards. This requirement for rigor should be matched in the professional development provided to teachers. Effective professional development is the key to improving teacher performance and effective teaching improves student performance (Short, 2013). Therefore, given the increasing numbers of ELLs in our schools, the ongoing achievement gap between ELLs and English speakers, and the continued under-preparation of teachers to serve these ELLs, the implementation of effective professional development for ELL instruction is necessary. The goal of the professional development in the short term is fidelity to the intervention and in the long term, it is student achievement (Short, 2013).

In the classroom, whole group instruction must be delivered and differentiated to meet the unique needs of all students. In this study, qualitative data were coded and analyzed using the SIOP model (Echevarría et al., 2017). Results from the interviews showed a need for increased strategies and understanding in the area of sheltering techniques for mainstream Inspire only teachers of ELL. To fill this gap in understanding, a professional development of 3-days was developed to increase science teachers' knowledge on strategies and sheltering techniques for ELL in the classroom. According to Rients (2019), citing the U.S. Department of Education, teachers who participated in fewer than 14 hours of professional development resulted no impact on student achievement. The professional development project for this study will consist in a 3-day training, six hours each day for a total of 18 hours of training.

This mixed-method case study used the SIOP as the model for collection of qualitative data. Teachers need continuous professional development opportunities to improve their students' language and content abilities in science to address the language gap in science and to make content more comprehensible for ELL students (McConnell et al., 2013). Sheltered instruction protocol includes certain research-based pointers, instructional best practices, and strategies to help ELL students to gain or improve English language development to achieve academic proficiency.

Guiding Research That Supports the Content of the Project

Planning for sheltered instruction. Data in Section 2 was analyzed in this case study and was coded against the Sheltered Instruction Observation Protocol Model (Echevarría et al., 2017). Results from this mixed-method case study showed a need for increased understanding in the area of sheltering techniques for science teachers. To fill this gap in understanding, a professional learning series of three days was developed to increased staff knowledge on foundation information of ELLs and sheltering science techniques to support ELLs. According to Rients (2019), citing the US Department of Education, teachers who participated in less than 14 hours of professional development resulted in no impact on student's achievement. This series of professional development will be a total of 18 hours of face-to-face interactive work around best practice for ELLs within science vocabulary strategies, teaching techniques, and science content.

This mixed-method case study used SIOP as the model with which data were coded and analyzed. In addressing the language gap to make academic content more comprehensible for ELL students, teachers need sustained professional opportunities in a specialized pedagogy such as shelter instruction to provide their student's language and literacy achievement. Sheltered instruction includes certain research-based indicators, instructional best practices, and strategies to help ELLs acquire English language development and achieve academic proficiency. Using sheltered instruction approach includes the use of a wide range of scaffolding strategies to make content and concepts comprehensible for students (De Jager, 2019; Johnson, 2019). In an empirical study, Gibson (2016) set out to identify the most effective strategies used to develop English language acquisition posing the question, "what best educational strategies are used to develop and retain English language proficiency?" His results showed cognitive strategies, metacognitive, vocabulary building, use of cognates, and computer-based instruction as beneficial to closing the ELL achievement gap. As noted by Hassell (2019), included as part of SIOP component four strategies, is metacognitive, cognitive, social, and affective strategies. Strategies is a central component of sheltered instruction.

Multiple researchers agree on the benefits to teachers of ELLs who have been trained in sheltered instruction techniques such as those in the SIOP Model. Koura and Zahran (2017) conducted a study to determine the impact of the SIOP protocol on teachers' teaching skills on twenty-two EFL student teachers. The result showed significant benefits to teachers trained in sheltered instruction, particularly in the areas of providing feedback, providing instruction, praising students, linking instruction to students' background, and using strategies for application of content and language knowledge. Furthermore, Song (2016) showed the potential of teachers trained in sheltered instruction documenting that they improved their instructional strategies for ELLs and attributed this improvement to SIOP training. Her research also showed the potential of teachers considering their roles for ELLs positively and attributed their attitude change toward ELLs and teaching strategies to professional leaning (Song, 2016). In other studies, Itwary (2017) and Song found a desire on the part of teachers for meaningful professional development where sheltered instruction was modeled to address the cultural and linguistic needs of ELLs. A lack of cultural and linguistic responsive professional learning correlate to diverse students' underachievement in classrooms) Lee et al., (2016). It is clear that because of the unique needs that ELLs bring to the classroom, teachers need to increase their awareness of students' varied ways of learning in order to address both their linguistic and academic needs in a culturally responsive manner.

Summary

The literature included as part of this review focused on themes that emerged from the project of this study. This review set the foundation in addressing the gaps in practice experienced at the study site. Ongoing professional learning is an important component in providing teachers with training that supports fifth grade science teachers that support ELLs need to achieve academic language and success academically. Teachers can use the knowledge they gain through professional learning to modify their instructional strategies, implementation of science vocabulary, and teaching techniques to meet the unique needs of diverse students.

Project Description

Implementation

I will offer this 3-day professional development as a summer session for fifth grade Inspire Science only teachers and will include opportunities for collaboration among fifth-grade science teachers. Effective professional development must be of a sustained duration. Darling-Hammond et al. (2017) noted that teachers need to be provided adequate time to learn, practice, implement, and reflect on the new strategies to facilitate change in their practice. Bates and Morgan (2018) agreed by stating that teaching is a profession that requires ongoing professional development. There is growing concern that the current emphasis is on professional development quantity over quality (Kennedy, 2005; Tooley & Connally, 2016).

Teachers must spend an adequate amount of time following the completion of professional development before they can observe effects on student outcomes and change in classroom practice (Bates & Morgan, 2018). The key is providing high-quality materials, ensuring that the learning is relevant and actionable and that the learning accelerates teachers' abilities to apply the new content knowledge and skills. Each session will be a 6- hours training with breaks and a lunch hour built into each session for a total of 7.75 hours. This information will be presented using lecture, PowerPoint (Appendix A), and group activities.

Required Resources

For training purposes, the required resources will begin with *The SIOP Model for Teaching Science to English Learners* by Echevarría, Short, and Vogt (2017). This book is the principal resource for lesson planning with ELLs need for content-specific language development and building proficiency in Science. The projects' alignment to the SIOP Model and Inspire Science training will be provided by a PowerPoint and materials to demonstrate the SIOP Model's 8 components, techniques and activities, and strategies. A furnished training facility with tables and chairs for groups of seven will be necessary to host the training. The ideal training size is 49 participants because of the team planning presentation element on day three. This will allow for ample time for the seven groups to demonstrate their own lessons incorporating SIOP and Inspire.

Existing Supports

Implementation of the project requires the school district to provide approval and supports from the Professional Learning Department, Multilingual Service Department, and the Curriculum and Digital Learning Department specifically the elementary education science chair. The Professional Learning Department will assist in the documentation and accreditation process for the teachers continuing education credits, with the specific ESOL designation. The Multilingual Service Department would be used to help disseminate information regarding the training and creating an atmosphere of support. The Title I Department would assist in obtaining funds paying teachers for training time, for materials and literature required for the training. The Facilities Department and Information Technology Services Department may be required to assist in obtaining a location to host and providing technical supports for the instructor and participants.

Potential Barriers and Solutions

One barrier is a limitation of seats in the training. Ideally, educators will participate in a lesson development and presentation segment, which would create a major time barrier, unless seats are limited. The barrier is that there are 100 elementary schools within the district using only Inspire Science curriculum. These 100 schools are the primary concern, so to assist with the allotted seat problem, one solution is to offer the professional development multiple times during the summer and to restrict access to each course on a first-come basis, with a waiting list available. Another way to limit access is to use school data and provide preferential seating to teachers with higher population of ELL, Title I schools, and lowest performing schools according to the Florida State report card on schools.

Another barrier is cost. The book *SIOP Model for Teaching Science to English Learners* is $43.68 for single purchase according to Amazon.com (2020). Supplies for the actual training would remain under $500 for, but not limited to: paper for blackline masters and group surveys, writing utensils, chart paper, post-it notes, table organizers, and candy for icebreaker activity and refreshments. An additional cost for the training is the income costs to teachers for the 3-day summer training at the agreed-to contract amount. The cost could be covered a couple of ways. All books and resources for Title I teachers could be paid from Title I funds. The professional development may be funded by grants or budgeted in the school districts' fiscal budget.

The restriction of time is a barrier. The ultimate time to host a 3-day professional development would be limited to the summer. Having teachers dedicate time to the training in the summer may interfere with other plans. If multiple courses are offered, the amount of time will be restricted to a time limit that is appropriate for a professional development. Offered too far in advance, teachers may not use the program as intended.

Proposal for Implementation and Timetable

The 3-day professional development will last 7.75 hours per day with a 1-hour lunch break and three to 10- to 15-minute breaks. The actual professional development training will last six hours per day. According to Rients (2019), citing the US Department of Education, teachers who participated in less than 14 hours of professional learning resulted no impact on student achievement. The professional development is segmented into three elements with a total of 18 professional development hours.

Day 1 will begin with an Introduction to the instructor, and overview of the project study to review the findings of ELL students' performance with and without the additional content-specific language, and an introduction to the SIOP Model and the 8 components of the SIOP Model. The eight components consist of: lesson preparation, building background, comprehensible input, strategies, interaction, practice/application, lesson delivery, and review and assessment.

Day 2 will consist of SIOP lesson modeling and lesson planning. The first half of the day, the instructor will model a five-day science lesson - Newton's First Law of Motion lessons, focusing on the 8 SIOP components. When participants return from lunch, they will be tasked with an Inspire Lesson for each group. The lessons will cover the first seven lessons of the start of the school year. Each group will plan for one of the following lessons: Human Body Systems, Plant Systems, Animal Systems, Living Things and the Environment, Adaptations, Natural Selection, Objects in Space. After planning their lesson, the group will also plan for a presentation on the third day with a focus on an assigned component.

The last day will bring together the participants' learning with presentations. While each collaborative group is presenting, the corresponding seat number of the non-presenting groups will oversee filling out feedback for the presenting group. Their group members may add to the feedback on post it notes. The seven presentations will be divided around breaks and lunches. The last hour will focus on feedback about the lessons. Finally, participants will take a survey on the professional development. The lesson plans that were developed will be accessible by all participants for their use in the classroom.

Roles and Responsibilities

It is my responsibility as the researcher to present the results of the research to the Chief Academic Officer and or delegates from departments including: Minority Achievement Officer, Associate Superintendent Curriculum and Digital Learning, Executive Director Professional Learning Department, Director Multilingual Services, Director of Federal Programs, Senior Director Curriculum and Instruction, Senior Administrator Elementary Science, Program Specialist Elementary Science, Senior Administrator/Manager Title I Operations, Research and Evaluation Department. The presentation will develop information to share from the study and present recommendations. I will work with the district committee to schedule the 3-day professional development and prepare materials for the training.

The participants in the professional development will develop lesson plans to be implemented in the first weeks of the school-year and feedback at the end of the sixth lesson and at the end of the 3-day workshop. The researcher will follow-up with participants throughout the school year to encourage continuation the use of SIOP Model integrated with Inspire Science. In July 2021 when testing scores are received, the researcher will analyze the data to show the results of the ELL students and share the results with the teachers.

Project Evaluation Plan

The findings of my study and the goals for the project will be reviewed to establish criteria for the evaluation. This project is designed to create a professional community of classroom teachers who teach ELLs. The classroom teachers will establish connections during the 3-day professional development training. This project should support teachers in implementing vocabulary instructional strategies.

To evaluate the project, a goal-based anonymous survey will be distributed after the 3-day professional development. The survey, which can be found in Appendix F, will ask how effective the peer professional development has been at providing such a collaboration for teachers. Participants will be asked to rate the usefulness activities and effectiveness of the overall project using a rating scale and open-ended questions survey also asks for comments and suggestions for improving future professional development. The survey will be used to make changes in subsequent staff development sessions.

Project Implications Including Social Change

Local Community

The overall goals of this project are: (a) increase the understanding and ability of teachers to implement research-based strategies for effectively teaching academic science language to ELLs, (b) to provide clarification and purpose for instructing ELLs, (c) to support excellent practices in science teaching of ELLs within the SIOP framework resulting to improve science vocabulary of ELLs in the community. The intention of the project is to support teachers as they provide science language instruction to ELLs and to increase the effective strategies used by the teachers. In addition, if the rate of student science vocabulary acquisition increases to be near that of their native English-speaking peers, the ELLs will be equipped with similar vocabularies as their peers. In this way, the students may be able to perform class requirements at grade level comparable to that of their native English-speaking peers (Marzano, 2003). The intended impact in the local community will be improving communication among teachers of ELLs to enhance collaboration experiences. The purpose of this concurrent mixed- method case study was to explore to what extent each of the two fifth grade science programs provides or does not provide textbooks, curriculum guides, instructional strategies, classroom assessments aligned with research-based practices for ELLs.

According to Walden University, social change is defined as “a deliberate process of creating and applying ideas, strategies, and actions to promote the worth, dignity, and development of individuals, communities, organizations, institutions, cultures, and societies. Positive social change results in the improvement of human and social conditions" (Walden University Student handbook, 2019, p. 15). This project study may affect social change by providing highly qualified teachers who are responsive to their unique needs and abilities, promote college readiness in students, and promotion of culturally responsive actions at the local level. Teachers who participate in the professional development workshop will be provided with the tools to improve the academic science vocabulary and strategies to support ELL students.

Larger Scale Change

The possible large-scale change could be increased ELLs proficiency in science, better preparation for college and career success in STEM industries. ELLs may seek college degrees and seek careers with potential for advancement. The educational process should promote an environment for learning and allow for all students to become college and career ready. Although all students may not choose this pathway, ELL students often do not seek high level jobs and are often underemployed. DeKay (2018) stated that many Latino ELL may be underemployed due to lack of English skills, cultural values, and childhood upbringing. Hispanic and Latino reported having low wage jobs such as: clerical work, childcare, food preparer, janitor, maid, retail, construction workers, laborers.

Walden University has a commitment to social change as its core value. The purpose of the professional development is to provide the teachers with the effective teaching strategies to assist ELLs to be successful academically and in the near future to further their education. In addition, the series of professional development may have implications of change in other districts as an extension of the local district. This project could provide educators across the state with a professional development series and accompanying resources to increase the understanding and ability of teachers to implement research-based strategies for effectively teaching academic science language to ELLs, to provide clarification and purpose for ELL, and to support excellent practices in the science teaching of ELLs within the SIOP framework.

Conclusion

Section 3 included a description and explanation of the goal of the project as well as a scholarly review of literature related to the specific genre of the project. The goal of the professional development project is to increase teachers' ability to use research-based materials, strategies and assessments that support acquisition of science academic vocabulary and increase proficiency for ELL students, within the Inspire Science program.

The focus of the project is to support teachers as they provide science language instruction to ELLs and to increase the effective strategies used by the teachers. In the literature review, I discussed the importance to provide teachers with the appropriate tools to teach ELL students incorporating the SIOP model reaching strategies and the importance of collaboration with peers.

This section also included recommended logistics for project delivery and identification of stakeholders. The project description including needed resources was described with potential obstacles and solutions to barriers noted. Finally, implications for social change in the local community as well as larger scale were explained. In the final section, Reflections and Conclusions, I will evaluate the project including identification of possible strengths and limitations. Finally, the project's implication for social change will be shared as I reflect on my work as a scholar practitioner.

Section 4: Reflections and Conclusions

The purpose of this concurrent mixed method case study was to explore teachers' perceptions of the use of research-based instructional strategies and materials consistent with the SIOP instructional framework in each of the two different science programs and to determine if there was a difference in achievement of the state-established proficiency level of ELLs between the two science programs. Section 4 includes project strengths, recommendations for alternative approaches, project development and evaluation, leadership, and change. Also, I share my reflections of personal growth as a scholar-practitioner.

Project Strengths and Limitations

Project Strengths

The project included as part of this mixed-method case study was to develop a professional learning series for fifth grade Inspire science teachers. This learning series could positively impact the implementation of science strategies and the use of academic science vocabulary for ELL students. The project was designed based on study findings presented in Section 2 to address the research problem and specific ELL strategies aligned with the SIOP protocol. The 3-day professional development will include teaching techniques and strategies to teach content language vocabulary for ELL applying the eight SIOP components. The project emerged from the study findings and literature review, indicating that effective professional development is the key to improving teacher performance and effective teaching improves student performance (Short, 2013). Therefore, given the increasing number of ELLs in our schools, the ongoing achievement gap between ELLs and non-ELLs, and the continued under-preparation of teachers to serve these ELLs, the implementation of effective professional development for ELL instruction is necessary.

The strength of the project was that the examination of a local problem led to the development of recommendations to assist the local district. The development of a 3-day professional development series addresses fifth grade Inspire science teachers need to increase their ability to use research-based materials, strategies, and assessments that support acquisition of science academic vocabulary and increase proficiency for ELL students.

The second strength of the professional development series is the research-based foundation. Research on effective teaching best practices to support ELL students, language acquisition, and the sheltered instruction protocol model were the basis of the construction of the resources and presentation for the project. The project was designed to increase teachers' ability to use research-based materials, strategies and assessments that support acquisition of science academic vocabulary and increase proficiency for ELL students. With the implementation of the research-based methods and strategies shared during each session, teachers may acquire necessary tools to plan and effectively implement teacher strategies to support ELL students (Koura & Zahran, 2017; Song, 2016).

Project Limitations

The professional development series developed from this mixed-method case study has limitations that may affect its effectiveness with participants both in and outside the study district. One of the limitations may be the interview sample size. I sent invitations to the 21 fifth grade teachers who met the criteria of at least one year of teaching the respective science program and who had ELLs in their fifth grade classroom. Only six teachers accepted the invitation to be interviewed, three from one school teaching only Inspire and three from one school teaching the combined Inspire and PSELL science programs. The small sample size may have limited the identified needs and use of research-based teaching strategies using the SIOP components, whereas a more substantive number of interviews might have yielded additional diverse results.

Another limitation might stem from the limited number of seats available for the training. Ideally, all Inspire teachers could benefit from the specific training to meet the needs of the ELLs in their classes. However, there are 100 elementary schools and many hundreds of fifth grade teachers of the Inspire program. The potential impact of the study and professional development is limited by the number of teachers that can be effectively trained in one 3-day professional development workshop.

Recommendations for Alternative Approaches

This mixed-method case study was designed to explore how science textbooks, curriculum guides, instructional strategies, classroom assessments and practices, in the district's two different fifth grade science programs, support or do not support science acquisition of content-specific for science language for English Language Learners (ELLs). Teachers are challenged to strategically use different teaching strategies to support science content vocabulary for fifth-grade ELL students. To support teachers to overcome this challenge a 3-day professional development project was designed to increase teachers' ability to use research-based materials, strategies, and assessments that support acquisition of science academic vocabulary and increase proficiency for ELL students. One alternative to the 3-day professional development may be the creation of interactive workbook for science instructional practices to support academic science vocabulary.

Another alternative to a face-to-face professional development might be the development of an online workshop that could be posted in the software applications for district professional development department for teachers to sign in and take the workshop. This would provide the flexibility needed by teachers and other school staff to master the information provided to support ELL students. In addition, this might be a possible solution to the limited seating barrier of the face-to-face workshop. With the software application, teachers in the professional development cohort could share and upload common lesson plans to share ideas.

Scholarship, Project Development and Evaluation, and Leadership and Change

Scholarship

Scholarship is building confidence in oneself. Participating in this process has developed in me the confidence to engage with other professional in scholarly conversation and sharing of ideas. During the completion of this project study, I had to learn how to overcome many obstacles. One of the obstacles was the language barrier since my first language is Spanish. Thinking in Spanish and making translations to English can be an overwhelming process. In addition, academic writing was a challenge as well, since you always have to have an open mind in receiving feedback from different experts. However, I learned that this is a learning process every day, how to be strong and self-confident.

Another challenge was being open to comments for revision from multiple reviewers. It was a hard process to revise numerous times making sure that everything made sense and that the syntax and semantics were at the level of a graduate student. I learned to be positive, as well as concise in my wording as a scholarly practitioner. On the other hand, I must mention the ongoing support from my chair, Walden residency, and efforts of my committee members to provide the support and skills to complete this project study.

Project Development and Evaluation

As an English language learner myself, I am passionate about the learning environments of my students and alike. Realizing the lack of academic language support for ELL students, being able to generate an awareness and a possible solution became compelling when I learned of the case study process. The project study provides a chance to create a partial solution for a growing demographic. The school district would benefit from increasing the ELL science proficiency levels on science scores. In return, improving proficiency in students would increase ELL students' college and career readiness. As a fifth grade teacher in another district, I am aware how teachers struggle to cover the material with effective strategies and the lack of ELL support provided for content-specific language acquisition.

The case study process has provided knowledge about the lack of supports for Inspire teachers compared to the PSELL teachers. The knowledge I gained will allow me to effectively share my findings with the school district and help stress the importance of language-specific content.

Leadership and Change Scholarship

The focus of the project is to support teachers as they provide science language instruction to ELLs and to increase the effective strategies used by the teachers. Effective strategies prove have been proven to show lead to higher learning gains for students. Teachers are successful when they have effective strategies to meet the needs of the students they serve, and increase state-determined proficiency levels (Boarders, 2019). The final product of this project will be adjustments and modifications of current science teaching strategies to support best instructional practices of ELLs.

Analysis of self as a scholar. A scholar is defined in Merriam-Webster (n.d) as a learned person who has done advanced study in a specialized field. I identified myself as a lifelong learner who is dedicated to her students and identified closely with the ELL population because I am one of this population. I believe that my academic work over these past years helped moved me from a student to a scholar in the field of science academic language. With the identification of this topic that I am passionate about it, I have strategically looked at the research in the ELL area, collected data as an impartial researcher, and used the data to identify trends and patterns to develop a project that addresses the needs identified in the findings.

I have grown in my abilities to express myself through scholarly writing and discourse. A scholar must be willing to reflect on the learning and analyze objectively the information to inform their study. Gratification comes from putting all the pieces together and being able to share the product to support other teachers in their instructional best practices for ELLs.

Reflection on Importance of the Work

There are several implications to be considered for science teachers, schools, school districts, and ELLs based on the results of this study. The need of ongoing of professional development that would provide teachers better science teaching strategies to support best instructional practices of ELLs. By providing professional development on teaching science strategies for ELLs teachers perceptions might change. Teachers at all levels of education could take the information in the study and make changes that would positively affect not only ELLs, but also all learners. School leaders might implement such recommendations by educating science teachers in serving their particular ELL population. These findings could affect social change in the school district setting by enhancing teacher knowledge through professional development, improving ELL science instruction, and increasing resources specific to ELL science instruction. As a result, ELLs could be equipped with the proper tools to performed at grade level and later reach to graduate high school and seek a college career.

Implications, Applications, and Directions for Future Research

The implications of the results of this project study may lead to implementation of research-based science teaching strategies. The qualitative and quantitative findings support that ELL students in an Inspire program school whose teaching practices are frequently not individually aligned with SIOP practices are less proficient in science than those students in a school where Inspire Science is used in combination with PSELL program which is more closely aligned with the SIOP framework. Based on the findings the professional development will provide teachers with opportunities to adapt their science teaching strategies adapted with the SIOP model to support academic science vocabulary for ELLs.

Based on the professional development the teachers should be able to implement new science strategies to support teacher with best instructional practices to increase ELLs learner academic achievement in science. Possible future research related to this area might include a replication of this study with a larger sample to gain more data or extend the research model that could include teachers from other grade levels. I would also like to interview science classroom teachers after training to hear their perceptions are about SIOP teaching strategies in the science classroom. The findings from a study of this may have substantive impact on social change for teachers of students whose first language is other than English and their students.

Conclusion

The problem examined in this study was lack of understanding of how each of the two fifth grade science programs provides or does not provide textbooks, curriculum guides, instructional strategies, classroom assessments aligned with research-based practices for ELLs and if there is a difference in state-established proficiency level for ELLs between the two programs. Data were gathered through quantitative using FCAT science proficiency results from 2018-2019 were analyzed using a Mann Whitney U test and qualitative means, interviews to science teachers. Interview questions were based on SIOP indicators (Echevarria et al., 2017). The resulting study data provided direction for development of 3-day professional development project that could increase the fifth-grade science teachers' efficacy. Professional development was chosen as the genre for the project because it was the most appropriate based on the study's findings. A professional development for fifth-grade science teachers will best support the outcomes of the study and impact teachers who have not had the training in working with ELLs.

After decades studying the population of ELL it is imperative to keep searching for methods to support this population. The technology advancements and rigorous education, educators need to be equipped with the best teaching practices to support higher achievement education in students. The best research-based instructional practices may result in more ELLs meeting with success in careers and life.

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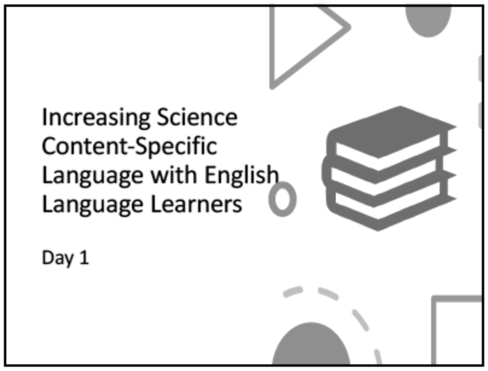
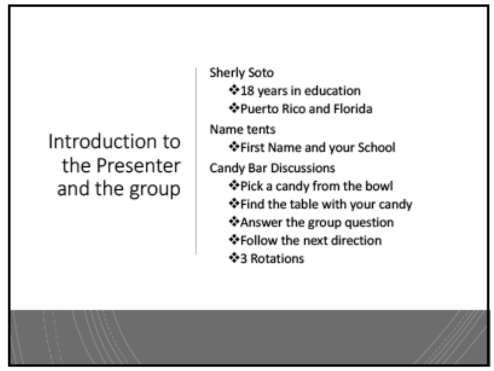
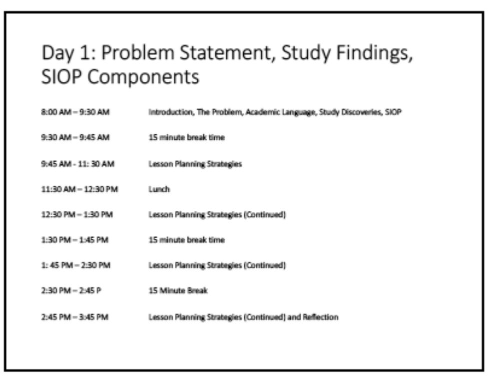
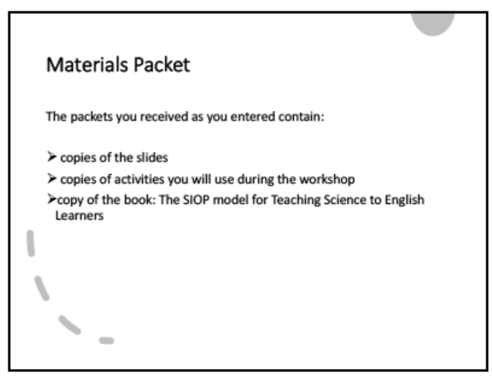
Appendix A: The Project

PowerPoint Presentation and Participant Handouts and Materials









District Problem

- ELLs in the district have habitually achieved inadequate levels proficiency in science; lower in fact than in English, history or math.
- The state has required that the district address this problem
- The reason you signed up for this workshop, I am sure, is to find means for having ELLs gain more in science in your classroom.

District level comparison 2018

At the district level the state reported achievement gaps between 5th grade ELLs and non-ELLs as:

42.4 percentage points in Science

41.3 percentage points in English Language Arts

26.3 percentage points in Mathematics

State wide comparison in 2018

- Florida Department of Education reported that the proficiency gap between ELLs and non-ELLs state-wide was:

➢ 41.8 percentage points in Science

➢ 41.4 percentage points in English Language Arts

➢ 27.7 percentage points in Mathematics

- Science FCAT results 2017-2018

➢ District FCAT results for 2017-2018 showed that only 17.5% of 5th grade ELLs tested at the proficient level compared to 59.9% for non-ELLs.

➢ State levels of proficiency were comparable for ELLs and non-ELLs, 17.0% to 58.8%, respectively in 2017-2018.

Why did I conduct a study?

In 2019, I did a study of:

Two science programs

- Inspire Science
- PSELL in combination of PSELL

What did I find?

1) PSELL teachers used targeted instruction for ELLs
2) ELL students in PSELL classrooms achieved higher proficiency levels
3) ELLs are allow to use their L1 for understanding
4) Modify lesson to meet ELL needs

Importance of Vocabulary in Science Class – Two Types

BICS - social language that students require to communicate with their peers - can be developed outside the classroom.

CALP is the language primarily learned in the classroom and is critical for academic success.

What does the experts have to say?

According to Hunt and Feng (2016)

- ELLs who lack academic language will struggle with understanding of spoken language.
- Relevant to learning of science because of the amount of content-specific vocabulary

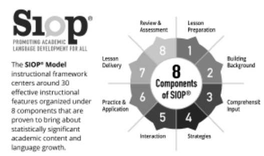
(Weinburgh, Silva, Smith, Groulx, & Nettles, 2014).

Academic Language of Science

Challenges	Assets
1. Dense	1. Clear delineation of vocabulary
2. Conceptually difficult	2. Build-up of ideas
3. Central to text	3. Concepts can be taught thematically
4. General academic vocabulary	4. Many clear Spanish cognates
5. Not much time for science instruction	5. Potential for high levels of engagement

Study's Framework

The **SIOP, Sheltered Instruction** Observation Protocol, model is a research-based method of **instruction** targeted toward meeting the academic needs of English language **learners** (**ELLs**). Simply put, it's an **instructional** model used to ensure **ELLs** have their content and language needs met in mainstream classrooms.



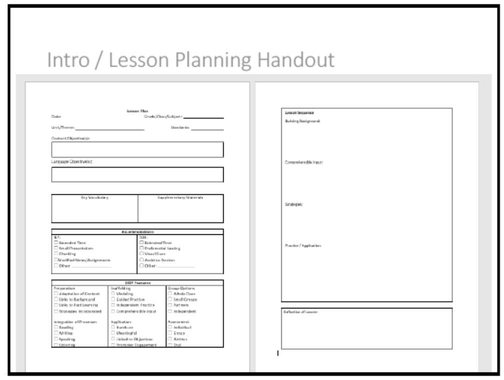
Sheltered Instruction Observation Protocol (SIOP) 8-components

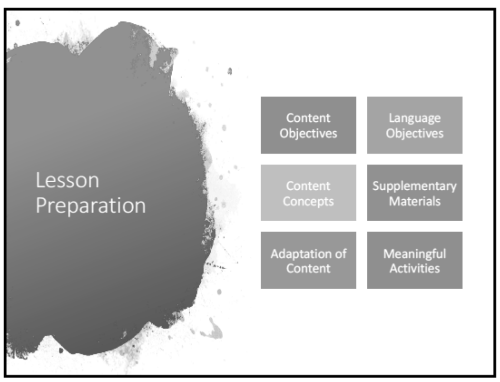
- Lesson Preparation
- Building Background
- Comprehensible Input
- Strategies
- Interaction
- Practice/Application
- Lesson Delivery
- Review & Assessment

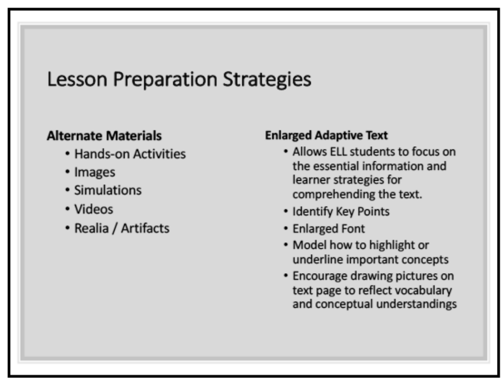
15 minutes

BREAK TIME


Techniques for Planning Science Lessons


Intro / Lesson Planning Handout


Lesson Preparation
Content Objectives
Language Objectives
Content Concepts
Supplementary Materials
Adaptation of Content
Meaningful Activities


Lesson Preparation Strategies
Alternate Materials
• Hands-on Activities
• Images
• Simulations
• Videos
• Realia / Artifacts
Enlarged Adaptive Text
• Allows ELL students to focus on the essential information and learner strategies for comprehending the text.
• Identify Key Points
• Enlarged Font
• Model how to highlight or underline important concepts
• Encourage drawing pictures on text page to reflect vocabulary and conceptual understandings

Building Background

- Concepts Explicitly Linked to students' background experiences
- Links Explicitly Made between past learning and new concepts
- Key Vocabulary Emphasized

Building Background Strategies

Magic Curtain of Science

- 10-15 minute activity
- Allows students to make connections between their lives and science topics
- Good for introductory lesson
  - Place 8-10 items underneath a piece of fabric called "The Magic Curtain of Science"
  - Teacher will lift curtain for 10 seconds and replace curtain. Students try to remember as many things as they can
  - Call on students to share what they saw
  - Students predict the lesson topic

Building Background Strategies

Quickwrite

- 5 minute activity
- Safe way for students to share their connections to a certain topic
- Spelling and grammar do not matter
- Students must write the entire time.
  - Modifications include
    - Sentence strips / structures
    - Word banks
    - Allow drawings for clarity

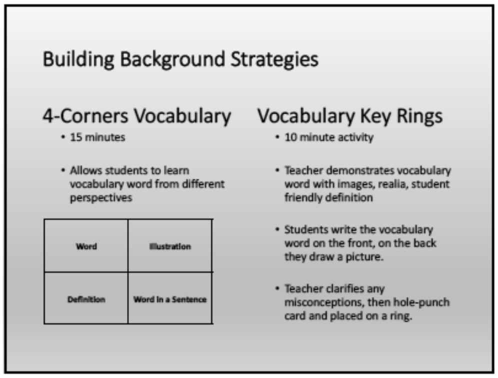
Building Background Strategies

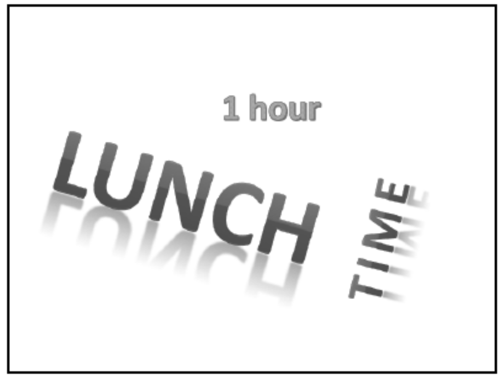
Oh Yesterday!

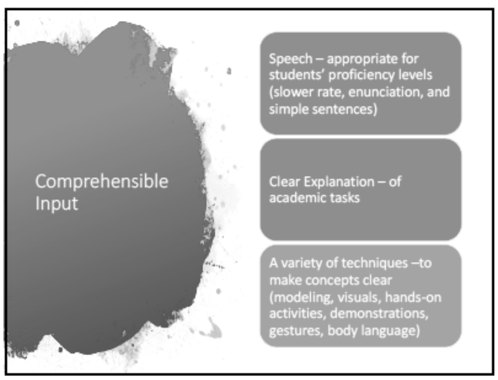
- 5 minute activity
- Recall and relate information they learned in prior lesson
- Students present theatrically
- Sentence starters may include
  - Oh yesterday! I learned…
  - Oh yesterday! We studied…
  - Oh yesterday! I discovered…
  - Oh yesterday! Our class…

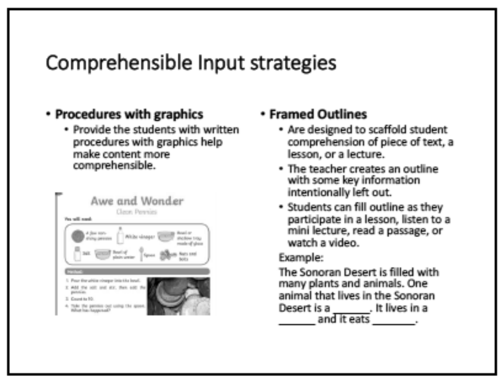
Signal Words

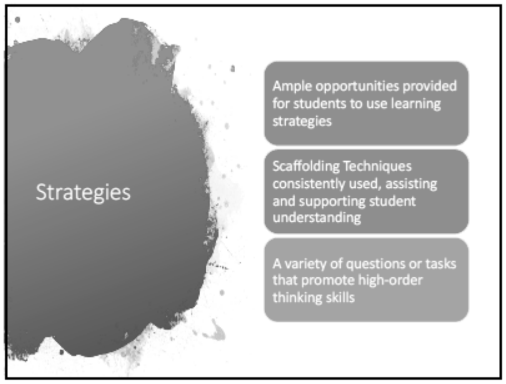
- 10 minute activity
- Teacher creates posters to help students recognize and understand different structures
  - Compare/Contrast
  - Sequence
  - Describe
  - Cause and Effect
- Helps structure reading and writing of text
- Applies to reading and writing

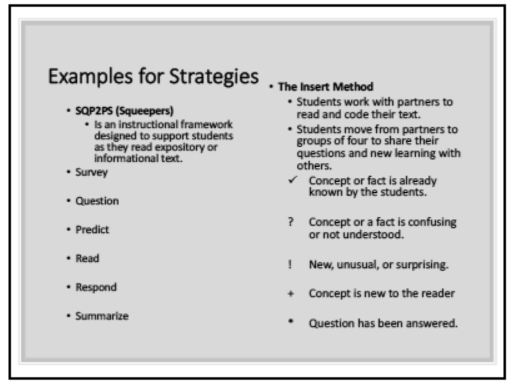

Building Background Strategies
4-Corners Vocabulary
• 15 minutes
• Allows students to learn vocabulary word from different perspectives
Word
Illustration
Definition
Word in a Sentence
Vocabulary Key Rings
• 10 minute activity
• Teacher demonstrates vocabulary word with images, realia, student friendly definition
• Students write the vocabulary word on the front, on the back they draw a picture.
• Teacher clarifies any misconceptions, then hole-punch card and placed on a ring.

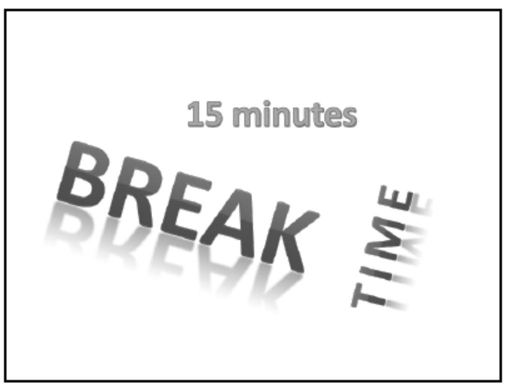

1 hour
LUNCH
TIME

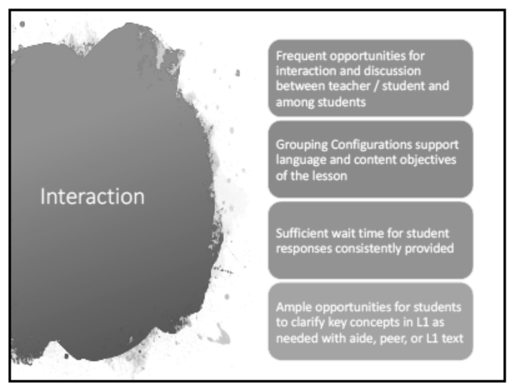

Comprehensible Input
Speech – appropriate for students' proficiency levels (slower rate, enunciation, and simple sentences)
Clear Explanation – of academic tasks
A variety of techniques –to make concepts clear (modeling, visuals, hands-on activities, demonstrations, gestures, body language)

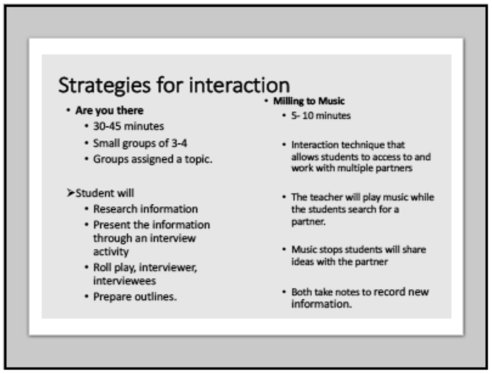

Comprehensible Input strategies
• Procedures with graphics
• Provide the students with written procedures with graphics help make content more comprehensible.
Awe and Wonder
• Framed Outlines
• Are designed to scaffold student comprehension of piece of text, a lesson, or a lecture.
• The teacher creates an outline with some key information intentionally left out.
• Students can fill outline as they participate in a lesson, listen to a mini lecture, read a passage, or watch a video.
Example:
The Sonoran Desert is filled with many plants and animals. One animal that lives in the Sonoran Desert is a ______. It lives in a ______ and it eats ______.


Strategies
Ample opportunities provided for students to use learning strategies
Scaffolding Techniques consistently used, assisting and supporting student understanding
A variety of questions or tasks that promote high-order thinking skills

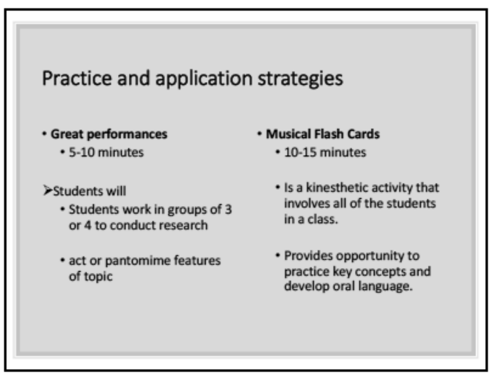

Examples for Strategies
SQP2PS (Squeepers)
Is an instructional framework designed to support students as they read expository or informational text.
Survey
Question
Predict
Read
Respond
Summarize
The Insert Method
Students work with partners to read and code their text.
Students move from partners to groups of four to share their questions and new learning with others.
✓ Concept or fact is already known by the students.
? Concept or a fact is confusing or not understood.
! New, unusual, or surprising.
+ Concept is new to the reader
* Question has been answered.

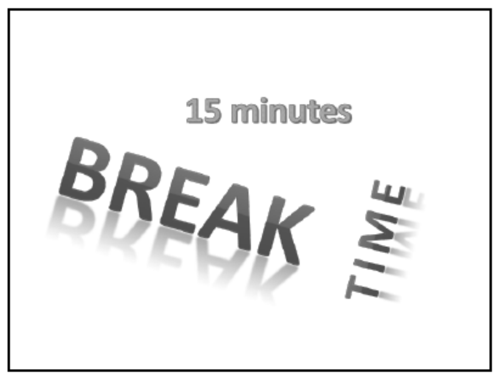

15 minutes
BREAK
TIME


Interaction
Frequent opportunities for interaction and discussion between teacher / student and among students
Grouping Configurations support language and content objectives of the lesson
Sufficient wait time for student responses consistently provided
Ample opportunities for students to clarify key concepts in L1 as needed with aide, peer, or L1 text

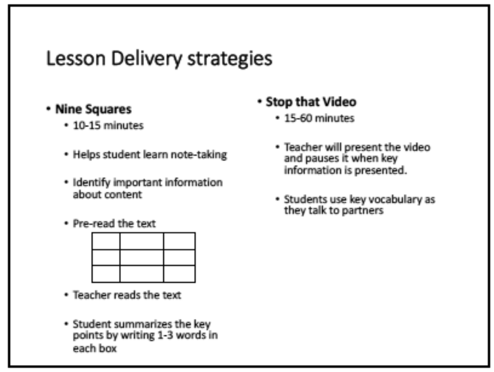

Strategies for interaction
• Are you there
• 30-45 minutes
• Small groups of 3-4
• Groups assigned a topic.
➢Student will
• Research information
• Present the information through an interview activity
• Roll play, interviewer, interviewees
• Prepare outlines.
• Milling to Music
• 5- 10 minutes
• Interaction technique that allows students to access to and work with multiple partners
• The teacher will play music while the students search for a partner.
• Music stops students will share ideas with the partner
• Both take notes to record new information.

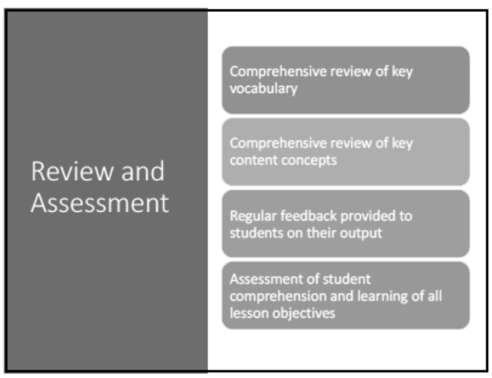

Practice and Application
Hands-on materials or manipulatives provided for students to practice using new content knowledge
Activities provided for students to apply content and language knowledge in the classroom
Activities integrate all language skills (reading, writing, listening, and speaking)

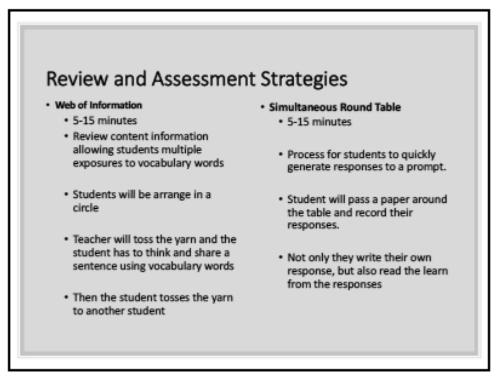

Practice and application strategies
• Great performances
• 5-10 minutes
➢Students will
• Students work in groups of 3 or 4 to conduct research
• act or pantomime features of topic
• Musical Flash Cards
• 10-15 minutes
• Is a kinesthetic activity that involves all of the students in a class.
• Provides opportunity to practice key concepts and develop oral language.


15 minutes
BREAK
TIME


Lesson Delivery
Content objectives clearly supported by lesson delivery
Language objectives clearly supported by lesson delivery
Students engaged approximately 90% - 100% of the period
Pacing of the lesson appropriate to students' ability levels


Lesson Delivery strategies
Nine Squares
10-15 minutes
Helps student learn note-taking
Identify important information about content
Pre-read the text
Teacher reads the text
Student summarizes the key points by writing 1-3 words in each box
Stop that Video
15-60 minutes
Teacher will present the video and pauses it when key information is presented.
Students use key vocabulary as they talk to partners


Review and Assessment
Comprehensive review of key vocabulary
Comprehensive review of key content concepts
Regular feedback provided to students on their output
Assessment of student comprehension and learning of all lesson objectives


Review and Assessment Strategies
Web of Information
5-15 minutes
Review content information allowing students multiple exposures to vocabulary words
Students will be arrange in a circle
Teacher will toss the yarn and the student has to think and share a sentence using vocabulary words
Then the student tosses the yarn to another student
Simultaneous Round Table
5-15 minutes
Process for students to quickly generate responses to a prompt.
Student will pass a paper around the table and record their responses.
Not only they write their own response, but also read the learn from the responses

REFLECTION

- 3 – 2 – 1 Parking Lot

- On a Post-It Note, Reflect on today –
- 3 – Things you have learned
- 2 – Things that you already knew
- 1 – Question you have

WHAT TO EXPECT TOMORROW

- Modeled Lesson and Debrief (AM)

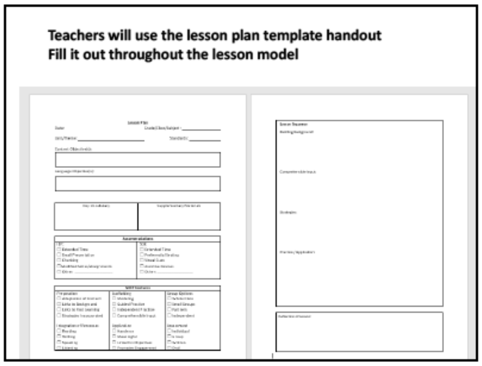
- Participants break out to Prepare a Lesson from Inspire Book (PM)

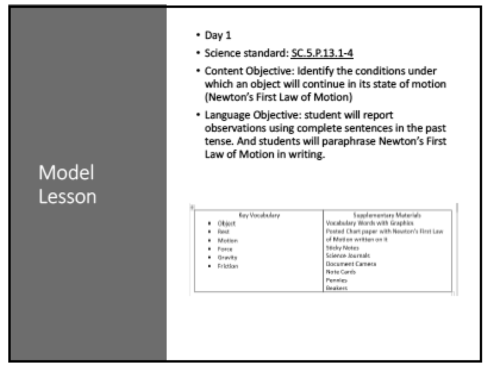
Increasing Science Content-Specific Language with English Language Learners

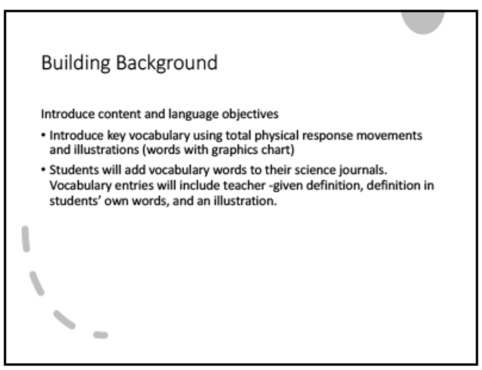
Day 2

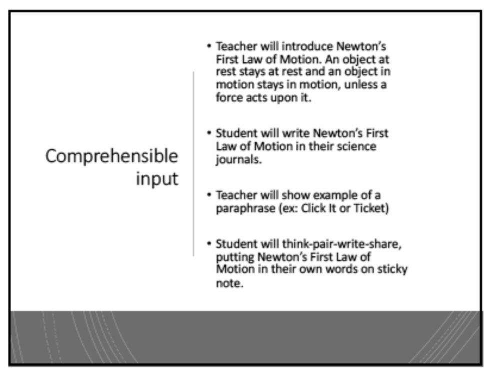
Day 2: Science Lesson Planning and Unit Design

8:00 AM – 9:30 AM	Model One Lesson
9:30 AM – 9:45 AM	15 minute break time
9:45 AM - 11: 30 AM	Debrief Model One Lesson
11:30 AM – 12:30 PM	Lunch
12:30 PM – 1:30 PM	Lesson Planning in Groups
1:30 PM – 1:45 PM	15 minute break time
1: 45 PM – 2:30 PM	Lesson Planning in Groups
2:30 PM – 2:45 P	15 Minute Break
2:45 PM – 3:45 PM	Lesson Preparations for Following Group


Teachers will use the lesson plan template handout
Fill it out throughout the lesson model


Model Lesson
• Day 1
• Science standard: SC.5.P.13.1-4
• Content Objective: Identify the conditions under which an object will continue in its state of motion (Newton's First Law of Motion)
• Language Objective: student will report observations using complete sentences in the past tense. And students will paraphrase Newton's First Law of Motion in writing.
Key Vocabulary
Object
Rest
Motion
Force
Gravity
Friction
Supplementary Materials
Vocabulary Words with Graphics
Posted Chart paper with Newton's First Law of Motion written on it
Sticky Notes
Science Journals
Document Camera
Note Cards
Pennies
Beakers


Building Background
Introduce content and language objectives
• Introduce key vocabulary using total physical response movements and illustrations (words with graphics chart)
• Students will add vocabulary words to their science journals. Vocabulary entries will include teacher -given definition, definition in students' own words, and an illustration.


Comprehensible input
• Teacher will introduce Newton's First Law of Motion. An object at rest stays at rest and an object in motion stays in motion, unless a force acts upon it.
• Student will write Newton's First Law of Motion in their science journals.
• Teacher will show example of a paraphrase (ex: Click It or Ticket)
• Student will think-pair-write-share, putting Newton's First Law of Motion in their own words on sticky note.

Continued

Student will post their sticky notes at the front of the room on the chart paper that displays the Law.

Teacher will distribute the mini-procedures experiment and observation sheets.

Strategies

- Think-Aloud 1 At the start of this unit, prepare a vocabulary chart with pictures or graphics to illustrate the key words.
- Think-Aloud 2 You can provide a sentence starter to use so they practice appropriate scientific language and discourse style.

Practice and Application /hands on activity

- Teacher facilitate Mini-Experiment #1, (Running) with small groups will model with taking notes on experiments.
- As groups take turns running, other groups take notes on what they observe on the observation sheet.
- Teacher model set-up for mini-experiment #2 and #3 (Flick the note card and pile of pennies) and will refer students to the procedures posters for each experiment.
- Teacher will model using notes to write an observation in a complete sentence in the past: One observation I made during the experiment was ___________.

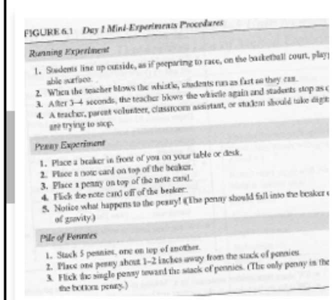


FIGURE 6.1 *Day 1 Mini-Experiments Procedures*

Running Experiment

1. Students line up outside, as if preparing to race, on the basketball court, play able surface.
2. When the teacher blows the whistle, students run as fast as they can.
3. After 3–4 seconds, the teacher blows the whistle again and students stop as
4. A teacher, parent volunteer, classroom assistant, or student should take digi are trying to stop.

Penny Experiment

1. Place a beaker in front of you on your table or desk.
2. Place a note card on top of the beaker.
3. Place a penny on top of the note card.
4. Flick the note card off of the beaker.
5. Notice what happens to the penny! (The penny should fall into the beaker of gravity.)

Pile of Pennies

1. Stack 5 pennies, one on top of another.
2. Place one penny about 1–2 inches away from the stack of pennies.
3. Flick the single penny toward the stack of pennies. (The only penny in the the bottom penny.)

Handout for teachers

Wrap up – Three W

- Students discuss or write:

➢ What did we learn today?

➢ So What? (relevancy, importance, usefulness)

➢ Now What? (how does this fit into what we are learning, does it affect our thinking, can we predict where we are going)

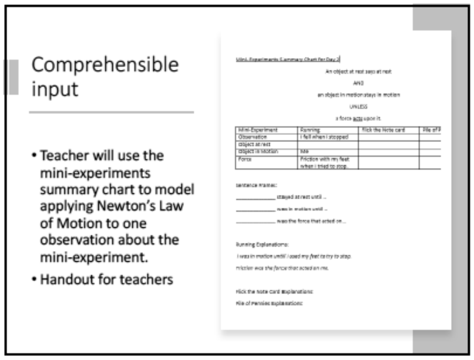
Model Lesson Day 2: Explaining the mini-experiment

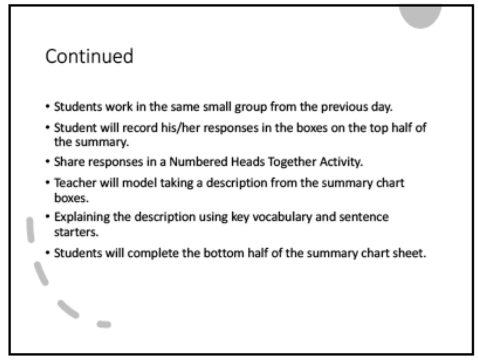
Standard: SC.5.P.13.1-4

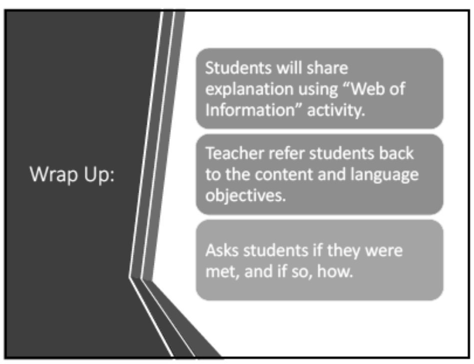
- Objective: Apply Newton's Law of Motion to their observations from the mini-experiments.
- Language Objective: Use key vocabulary and sentence frame to explain their observations from the mini-experiments.
- Key vocabulary: object, rest, motion, force, gravity, friction
- Supplemental materials: chart paper, science journals, mini-experiments summary chart

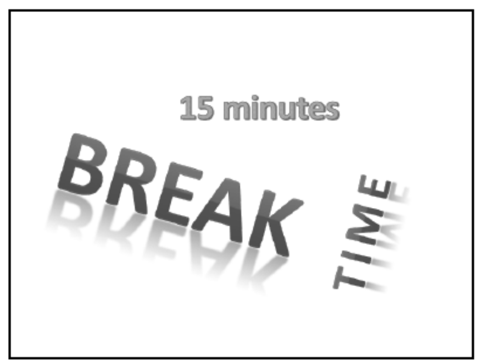
Building background

- Introduce content and language objectives
- The student will perform "Oh Yesterday" to relate at least 1 observation for each of the mini-experiments from the previous day.


Comprehensible input
• Teacher will use the mini-experiments summary chart to model applying Newton's Law of Motion to one observation about the mini-experiment.
• Handout for teachers


Continued
• Students work in the same small group from the previous day.
• Student will record his/her responses in the boxes on the top half of the summary.
• Share responses in a Numbered Heads Together Activity.
• Teacher will model taking a description from the summary chart boxes.
• Explaining the description using key vocabulary and sentence starters.
• Students will complete the bottom half of the summary chart sheet.


Wrap Up:
Students will share explanation using "Web of Information" activity.
Teacher refer students back to the content and language objectives.
Asks students if they were met, and if so, how.


15 minutes
BREAK
TIME

Model Lesson
Day 3: Forces Are Fun

- Content objective: student will conduct five mini-experiments relating to force and make two observations about each.
- Language objective: student will use the following sentence starters to reflect on their observations in writing:

"One interesting thing I noticed was ______________".
"__________ was an example of _________".

Key vocabulary: object, rest, motion, force, gravity, friction, magnetic force, buoyant force.

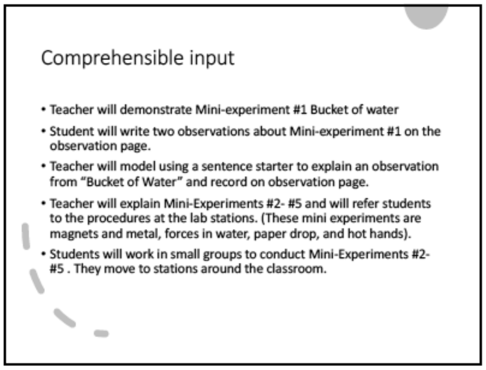
Building Background

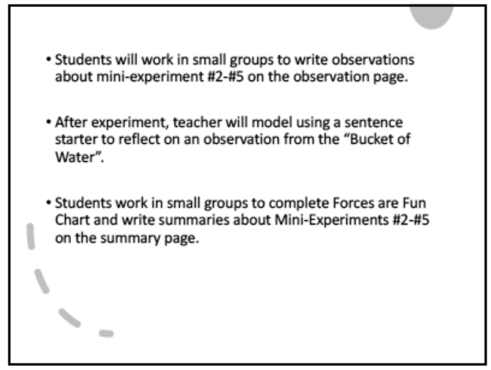
- Teacher will referred to mini-experiment summary chart from previous day and the students will respond the following questions in their journals:
  - What was the most interesting observation you made yesterday?
  - What ideas do you have for another mini-experiment demonstrating Newton's First Law of Motion?
- Add vocabulary word to the science journal.

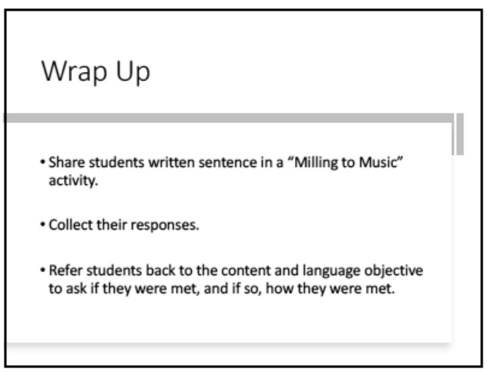
Comprehensible input/ Handout

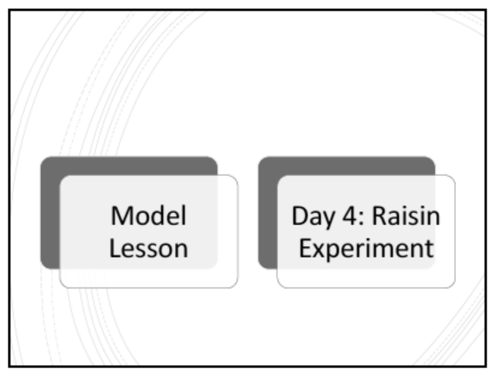
Day 3 Mini-Experiments procedures

1. Bucket of Water
   1. Fill a bucket with water
   2. Hold the bucket by the handle with your arm straight out in front of you.
   3. With the bucket held away from you, spin in circles. The water should stay in the bucket.
2. Magnets and Metal
   1. Provide students with magnets and metallic objects
   2. Have students play with the magnets and the object for a few minutes.
3. Forces in Water
   1. Provide students with beakers of water and small objects. (Be sure that at least one of the objects will float: styrofoam peanuts, for example, will work.)
   2. Have students drop the objects into the water to see what happens.
4. Paper Drop
   1. Provide students with small pieces of paper.
   2. Have students drop the pieces of paper to the ground from different heights (e.g., above their head, waist level).
5. Hot Hands
   1. Have students place their hands together, fingertips and palms touching.
   2. Instruct to rub hands together slowly and then quickly


Comprehensible input
• Teacher will demonstrate Mini-experiment #1 Bucket of water
• Student will write two observations about Mini-experiment #1 on the observation page.
• Teacher will model using a sentence starter to explain an observation from "Bucket of Water" and record on observation page.
• Teacher will explain Mini-Experiments #2- #5 and will refer students to the procedures at the lab stations. (These mini experiments are magnets and metal, forces in water, paper drop, and hot hands).
• Students will work in small groups to conduct Mini-Experiments #2-#5 . They move to stations around the classroom.


• Students will work in small groups to write observations about mini-experiment #2-#5 on the observation page.
• After experiment, teacher will model using a sentence starter to reflect on an observation from the "Bucket of Water".
• Students work in small groups to complete Forces are Fun Chart and write summaries about Mini-Experiments #2-#5 on the summary page.


Wrap Up
• Share students written sentence in a "Milling to Music" activity.
• Collect their responses.
• Refer students back to the content and language objective to ask if they were met, and if so, how they were met.


Model Lesson
Day 4: Raisin Experiment

Day 4: Standard: SC.5.P.13.1-4

- Content Objectives: Student will make 6-8 observations during the raisin in beaker experiment.
- Language Objectives: Students will discuss observations and the application of Newton's Law of Motion with a partner.
- Key vocabulary: object, rest, gravity, friction, magnetic force, buoyant force.
- Materials: chart paper, overhead projector, 600ml beakers, baking soda, vinegar, raisins, sticky notes.

Building Background

- Students will get in groups of four.
- Each group will have chart paper.
- Students will participate in a "graffiti write" to recall everything they remember about Newton's Law of Motion, and vocabulary words.
- 1-2 minutes

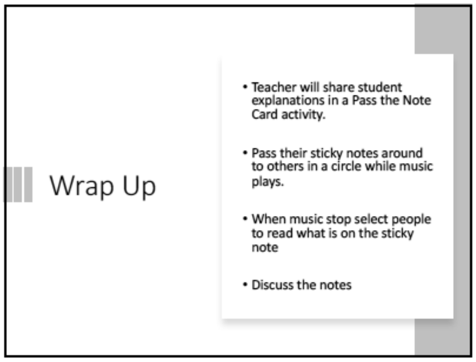
Comprehensible input / handout Procedures for Mystery Raisins experiment

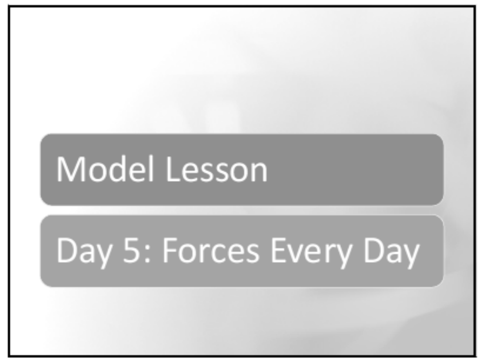
Procedures for the Mysterious Raisins Experiment:

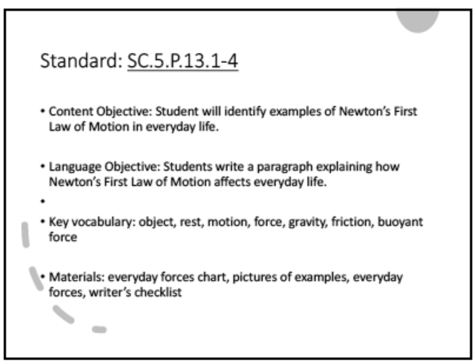
1. Put 100ml of water in your beaker.
2. Add one spoonful of baking soda.
3. Add 5 raisins
4. Add 15 ml vinegar
5. Record your observations for 2-3 minutes.
6. After 2-3 minutes, add another 15 ml vinegar to your beaker.
7. Record your observations for 2-3 more minutes. You should have at least 8 observations in total now.
8. Clean up! Rinse the beaker with water. Throw the rains in the wastebasket.

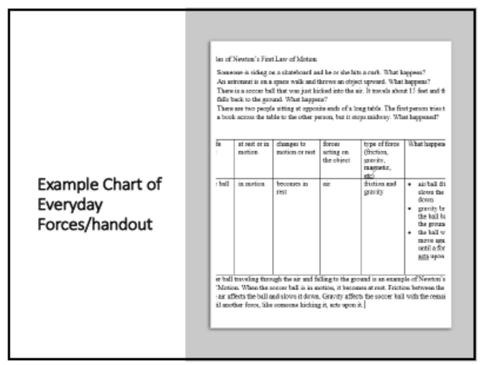
Instructions:

- Teacher will model the procedures for the raisin experiment.
- Student will work in small group (3-4) to complete the experiment.
- Students will observe the experiment
- Students will record their observations.
- Teacher will call on students randomly to shared observations using academic vocabulary such as buoyant and gravity.
- Student will work with a partner to use Newton's Law to explain one observation.
- Student will share observations with the whole class.


Wrap Up
• Teacher will share student explanations in a Pass the Note Card activity.
• Pass their sticky notes around to others in a circle while music plays.
• When music stop select people to read what is on the sticky note
• Discuss the notes


Model Lesson
Day 5: Forces Every Day


Standard: SC.5.P.13.1-4
• Content Objective: Student will identify examples of Newton's First Law of Motion in everyday life.
• Language Objective: Students write a paragraph explaining how Newton's First Law of Motion affects everyday life.
•
• Key vocabulary: object, rest, motion, force, gravity, friction, buoyant force
• Materials: everyday forces chart, pictures of examples, everyday forces, writer's checklist


Example Chart of Everyday Forces/handout
Someone is riding on a skateboard and he or she hits a curb. What happens?
An astronaut is on a space walk and throws an object upward. What happens?
There is a soccer ball that was just kicked into the air.
falls back to the ground. What happens?
There are two people sitting at opposite ends of a long table.
a book across the table to the other person, but it stops midway. What happened?
at rest or in motion
changes to motion or rest
forces acting on the object
type of force (friction, gravity, magnetic, etc)
in motion
becomes in rest
air
friction and gravity

Comprehensible input

- Teacher will distribute the Everyday force chart to each student.
- Share examples of First Law of Motion
- Teacher will model how to complete the chart
- Student will work with a partner to think of an everyday example of Newton's First Law of Motion
- Teacher will model using the chart and sentences starters on the Everyday Forces chart to write a paragraph.
- Explain how Newton's Law of Motion affects in everyday life.

Wrap up

- Student use outcome sentences to share their learning in a Web of Information

✓I wonder ....
✓I discovered ...
✓I still want to know ...
✓I learned ....
✓I still don't understand...
✓I still have a question about....
✓I will ask a friend about ...

1 hour

LUNCH TIME

Group Lesson Planning with INSPIRE

Your group has been assigned a Unit from INSPIRE

Group 1: Human Body Systems	**Group 5: Adaptations**
Group 2: Plant Systems	**Group 6: Natural Selections**
Group 3: Animal Systems	**Group 7: Objects in Space**
Group 4: Living Things and the Environment	

Plan your lesson using SIOPs 8 components for content-specific language.

Group 1: Lesson Preparation	**Group 5: Comprehensible Input**
Group 2: Interaction	**Group 6: Lesson Delivery, and Strategies**
Group 3: Building Background	**Group 7: Review and Assessment**
Group 4: Practice and Application	

Group Lesson Planning with INSPIRE

- Prepare your presentation. Your group will have 45 minutes to present the lesson.
- Your presentation will not be the classroom lesson as most units will take multiple days; however, please plan to share and model a few techniques you will use during your lesson.

REFLECTION

15 minutes

BREAK TIME

WHAT TO EXPECT TOMORROW

Presentations 45 minutes
Group Order
Group Share

Increasing Science Content-Specific Language with English Language Learners

Day 3

Day 3: Presentations and Reflections

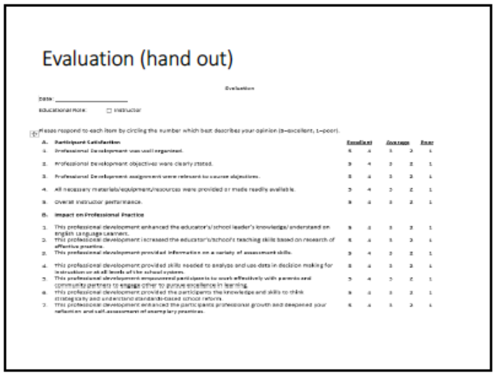
8:00 AM – 8:05 AM	Presentation Expectations
8:05 AM – 8:50 AM	Group 1
8:50 AM – 9:35 AM	Group 2
9:35 AM – 9:50 AM	Break
9:50 AM – 10:35 AM	Group 3
10:35 AM – 11:20 AM	Group 4
11:20 AM – 12:20 PM	Lunch
12:20 PM – 1:05 PM	Group 5
1:05 PM – 1:50 PM	Group 6
1:50 PM – 2:00 PM	Break
2:00 PM – 2:45 PM	Group 7
2:45 PM – 3:20 PM	Reflection
3:20 PM – 3:30 PM	Break
3:30 PM – 3:45 PM	Evaluation

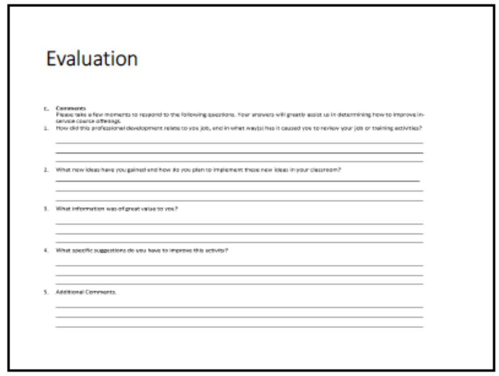
Group Lessons: Presentation Expectations

Group Presenting: Lesson
SIOP Component
Time

Evaluator: Seat #
Corresponding seat numbers will evaluate the Lesson and Component provided in the presentation. Other group members may write comments on sticky notes for the evaluator to include in the feedback. Please, remember feedback is a learning tool to encourage growth in the profession.

Group Presentations


Evaluation (hand out)
Evaluation
Participant Satisfaction
Impact on Professional Practice


Evaluation
C. Comments
1. How did this professional development relate to you job, and in what way(s) has it caused you to review your job or training activities?
2. What new ideas have you gained and how do you plan to implement these new ideas in your classroom?
3. What information was of great value to you?
4. What specific suggestions do you have to improve this activity?
5. Additional Comments.

Professional Development Handouts

Day 1: Professional Development Agenda

8:00 AM – 9:30 AM	Introduction, The Problem, Academic Language, Study Discoveries, SIOP
9:30 AM – 9:45 AM	15 minute break time
9:45 AM - 11: 30 AM	Lesson Planning Strategies
11:30 AM – 12:30 PM	Lunch
12:30 PM – 1:30 PM	Lesson Planning Strategies (Continued)
1:30 PM – 1:45 PM	15 minute break time
1: 45 PM – 2:30 PM	Lesson Planning Strategies (Continued)
2:30 PM – 2:45 PM	15 Minute Break
2:45 PM – 3:45 PM	Lesson Planning Strategies (Continued) and Reflection

Science Lesson Plan Handout

Lesson Plan

Date: ____ Grade/Class/Subject: _____________

Unit/Theme:_______________________ Standards: _______________

Content Objective(s):

Language Objective(s):

Key Vocabulary

Supplementary Materials

Accommodations

IEP:
- ☐ Extended Time
- ☐ Small Presentation
- ☐ Chunking
- ☐Modified Notes/Assignments
- ☐ Other: ___________________

504:
- ☐ Extended Time
- ☐ Preferential Seating
- ☐ Visual Cues
- ☐ Assistive Devices
- ☐ Other: __________________

SIOP Features

Preparation
- ☐ Adaptation of Content
- ☐ Links to Background
- ☐ Links to Past Learning
- ☐ Strategies Incorporated

Scaffolding
- ☐ Modeling
- ☐ Guided Practice
- ☐ Independent Practice
- ☐ Comprehensible Input

Group Options
- ☐ Whole Class
- ☐ Small Groups
- ☐ Partners
- ☐ Independent

Integration of Processes	Application	Assessment
☐ Reading	☐ Hands-on	☐ Individual
☐ Writing	☐ Meaningful	☐ Group
☐ Speaking	☐ Linked to Objectives	☐ Written
☐ Listening	☐ Promotes Engagement	☐ Oral

Lesson Sequence
Building Background:

Comprehensible Input:

Strategies:

Practice / Application:

Review / Assessment:

Reflection of Lesson:

Day 2: Agenda

8:00 AM – 9:30 AM	Model One Lesson
9:30 AM – 9:45 AM	15 minute break time
9:45 AM - 11: 30 AM	Debrief Model One Lesson
11:30 AM – 12:30 PM	Lunch
12:30 PM – 1:30 PM	Lesson Planning in Groups
1:30 PM – 1:45 PM	15 minute break time
1: 45 PM – 2:30 PM	Lesson Planning in Groups
2:30 PM – 2:45 PM	15 Minute Break
2:45 PM – 3:45 PM	Lesson Preparations for Following Group

Mini- Experiments Summary Chart for Day 2

An object at rest says at rest
AND
an object in motion stays in motion
UNLESS
a force acts upon it.

Mini-Experiment	Running	Flick the Note card	Pile of Pennies
Observation	I fell when I stopped		
Object at rest			
Object in Motion	Me		
Force	Friction with my feet when I tried to stop.		

Sentence Frames:
_______________ stayed at rest until …
_______________ was in motion until …
_______________ was the force that acted on…

Running Explanations:
I was in motion until I used my feet to try to stop.
Friction was the force that acted on me.

Flick the Note Card Explanations:
Pile of Pennies Explanations:

Examples of Newton's First Law of Motion

- Someone is riding on a skateboard and he or she hits a curb. What happens?
- An astronaut is on a space walk and throws an object upward. What happens?
- There is a soccer ball that was just kicked into the air. It travels about 15 feet and then falls back to the ground. What happens?
- There are two people sitting at opposite ends of a long table. The first person tries to slide a book across the table to the other person, but it stops midway. What happened?

real life object	at rest or in motion	changes to motion or rest	forces acting on the object	type of force (friction, gravity, magnetic, etc)	What happened?
soccer ball	in motion	becomes in rest	air	friction and gravity	• air/ball friction slows the ball down • gravity brings the ball back to the ground • the ball won't move again until a force acts upon it.

A soccer ball traveling through the air and falling to the ground is an example of Newton's First Law of Motion. When the soccer ball is in motion, it becomes at rest. Friction between the ball and the air affects the ball and slows it down. Gravity affects the soccer ball with the remain at rest until another force, like someone kicking it, acts upon it.

Day 3: Presentations

8:00 AM – 8:05 AM	Presentation Expectations
8:05 AM – 8:50 AM	Group 1
8:50 AM – 9:35 AM	Group 2

9:35 AM – 9:50 AM	Break
9:50 AM – 10:35 AM	Group 3
10:35 AM – 11:20 AM	Group 4
11:20 AM – 12:20 PM	Lunch
12:20 PM – 1:05 PM	Group 5
1:05 PM – 1:50 PM	Group 6
1:50 PM – 2:00 PM	Break
2:00 PM – 2:45 PM	Group 7
2:45 PM – 3:20 PM	Reflection
3:20 PM – 3:30 PM	Break
3:30 PM – 3:45 PM	Evaluation

Appendix B: SIOP Matrix

SIOP® Component Features

The SIOP® protocol features	
Component	Feature
Lesson preparation	• Content objectives clearly defined, displayed, and reviewed with students • Language objectives clearly defined, displayed, and reviewed with students • Content concepts appropriate for age and educational background level of students • Supplementary materials used to a high degree, making the lesson clear and meaningful • Adaptation of content • Meaningful activities that integrate lesson concepts with language practice opportunities for reading, writing, listening, and/or speaking
Building background	• Concepts explicitly linked to students' background experiences • Links explicitly made between past learning and new concepts • Key vocabulary emphasized
Comprehensible input	• Speech appropriate for student's proficiency level • Clear explanation of academic tasks • A variety of techniques used to make content concepts clear
strategies	• Ample opportunities provided students to use learning strategies • Scaffolding techniques consistently used to assist and support student understanding • A variety of questions or tasks that promote higher-order thinking skills
Practice and application	• Hands-on materials and/or manipulatives provided for students to practice using new content knowledge • Activities provided for students to apply content and language knowledge in the classroom • Activities integrate all language skills (reading, writing, listening, speaking)
Lesson delivery	• Content objectives clearly supported by lesson delivery • Language objectives clearly supported by lesson delivery • Students engaged approximately 90% to 100% of the period • Pacing of the lesson appropriate to students' ability level
Review and assessment	• Comprehensive review of key vocabulary • Comprehensive review of key concepts • Regular feedback provided to students on their output • Assessment of student comprehension and learning of all lesson objectives throughout the lesson

Note. Summarized from Echevarría, et al. (2015). *Response to intervention (RTI) and English learners using the SIOP® model* (2nd ed., pp. 128-129). Boston, MA: Pearson.

Appendix C: The SIOP Framework, Semistructured Interview Questions, and Research Question Alignment

Background and demographics questions

1. How many years have you been teaching in general?
2. Which is your highest level of education degree?
3. Have you taken any courses or attended any workshops on teaching English Language learners?

SIOP Conceptual research-based Framework	Semistructured Interview Questions aligned with SIOP Protocol	RQs Addressed
Component 1: Preparation		
• Content objectives clearly defined, displayed, and reviewed with students	How does Inspire direct how your content objectives are defined, displayed and reviewed with ELLS in your science classroom?	RQ1 and RQ2
	How does P-SELL direct how your content objectives are defined, displayed and reviewed with ELLs in your science classroom?	RQ2
• Language objectives are clearly defined, displayed and reviewed with students	How does Inspire direct how academic language objectives are defined, displayed and reviewed with ELLs in your classroom?	RQ1 and RQ2
	How does P-SELL direct how academic language objectives are defined, displayed or reviewed with ELLs in your classroom?	RQ2
• Supplementary materials used to high degree, making the lesson clear and meaningful	What supplementary materials does Inspire use to make the lesson clear and meaningful for ELLs? (i.e. computer programs, graphs, models, visuals).	RQ1 and RQ2
	What supplementary materials does P-SELL add to the Inspire program, to make the lesson clear and meaningful? (i.e. computer programs, graphs, models, visuals).	RQ2

(computer programs, graphs, models, visuals).	How does Inspire suggest that you use educational background of ELLs to adapt content of ELLS?	RQ1 and RQ2
	How does P-SELL suggest that you use educational background of ELLs to adapt the content for ELLS?	RQ2
• Adaptation of content to all levels of student proficiency (text)	How does Inspire integrate lesson concepts (surveys, letter writing, simulations, constructing models) with daily language practice opportunities?	RQ1 and RQ2
• Content concepts appropriate for age and educational background level of students.	How does P-SELL integrate lesson concepts (surveys, letter writing, simulations, constructing models) with daily language practice opportunities in your science class?	RQ2
	How does Inspire aid you with incorporating modeling, visual, and demonstrating hands-on activities in your science class?	RQ1 and RQ2
• Meaningful activities that integrate lesson concepts (surveys, letter writing, simulations, constructing models) with language practice opportunities.	How does P-SELL aid you with incorporating modeling, visual, and demonstrating hands-on activities in your science class?	RQ2
• Variety of techniques used to make content concepts clear (modeling, visuals,		

hands-on activities, demonstrations, gestures, body language		
Component 2: Building Background		
• Concepts explicitly linked to students' background	Can you give me an example of how Inspire helps you link, support and use the background of ELLs to learn science concepts?	RQ1 and RQ2
	Can you give me an example of how P-SELL helps you link, support and use the background of ELLs to learn science concepts	RQ2
• Ample opportunities provided for students to use learning strategies.		
Component 3: Comprehensible Input		
• Speech appropriate for student's proficiency level (slower, rate, enunciation, and simple sentences structures for beginners	Can you give me an example of how Inspire had you use hands-on materials or manipulatives to support academic language development?	RQ1 and RQ2
	Can you give me an example of how P-SELL had you use hands-on materials or manipulatives to support academic language development?	RQ2
• Clear explanation of academic skills		
• A variety of techniques used to make content		

concepts clear (modeling, visuals, hands-on activities, demonstrations, gestures, body language).		
Component 4: Strategies		
• Ample opportunities provided for students to use learning strategies	Can you give me an example of how Inspire promotes higher order thinking for ELLs through questioning, scaffolding techniques or tasks?	RQ1 and RQ2
	Can you give me an example of how P-SELL promotes higher-order thinking for ELLs through questioning, scaffolding techniques or tasks?	RQ2
• A variety of questions or tasks that promote higher order thinking skills (literal, analytical, and interpretive questions)	Can you give me an example in the Inspire program of how you managed interactions among students and between students and yourself?	RQ1 and RQ2
	Can you give me an example from the P-SELL program of how you managed interactions among students and between students and yourself?	RQ2
	Can you give me an example of how Inspire promotes practice and application of new content knowledge and key vocabulary?	RQ1 and RQ2
	Can you give me an example of how P-SELL promotes practice and application of new content knowledge and key vocabulary?	RQ2
• Scaffolding techniques are consistently used to		

assist and supporting student understanding (think-aloud)		
Component 5: Interaction		
• Frequent opportunities for interactions and discussions between teacher/student and among students, which encourage elaborated responses about lesson concepts. • Group configurations support language and content objectives of the lesson • Sufficient wait time for students' responses consistently provided • Ample opportunities for students to clarify key concepts as needed with	Can you describe, or show me (lesson plan or assessment) how your regular feedback to ELLs is provided using Inspire?	RQ1 and RQ2
	Can you describe, or show me (lesson plan or assessment) how your regular feedback to ELLs is provided using P-SELL?	RQ2

aide, peer, or L1 text.		
Component 6: Practice/ Application		
• Hands-on materials and/or manipulatives provided for students to practice using new content knowledge	Can you give me an example of how Inspire had you use hands-on materials or manipulatives to support new content knowledge and key vocabulary? Can you give me an example of how P-SELL had you use hands-on materials or manipulatives to support new content knowledge and key vocabulary?	RQ1 and 2 RQ2
• Comprehensive review of key vocabulary		
Component 7: Lesson Delivery	This component would require observations which is beyond the scope of this study.	
Component 8: Review/Assessment		
• Comprehensive review of key concepts	Can you explain how Inspire help you to review and assess each student learning throughout the lesson?	RQ1 and RQ 2
• Regular feedback provided to students on their output (language, content, work)	Can you explain how P-SELL help you to review and assess each student learning throughout the lesson?	RQ2
• Assessment of student comprehension and		

learning of all lesson
objectives (spot
checking, group
response throughout the
lesson)

Appendix D: Achievement Levels and Scale Scores

Achievement Levels and Scale Scores
Student performance on Florida's statewide assessments is categorized into five achievement levels. Table 1 provides information regarding student performance at each achievement level for the Statewide Science Assessment and the FCAT 2.0 Reading Retake; this information is provided on student reports so that students, parents and educators may interpret student results in a meaningful way.

Table 1. Achievement Levels

Level 1	Level 2	Level 3	Level 4	Level 5
Indicates an inadequate level of success with the challenging content of the NGSSS.	Indicates a below satisfactory level of success with the challenging content of the NGSSS.	Indicates a satisfactory level of success with the challenging content of the NGSSS.	Indicates an above satisfactory level of success with the challenging content of the NGSSS.	Indicates mastery of the most challenging content of the NGSSS.

Achievement level scale score ranges for NGSSS assessments are provided in the tables below. The lowest score in Level 3 is the passing score for each assessment.

Table 2: Achievement Levels for the Statewide Science Assessment Scale Scores (140–260)

Grade	Level 1	Level 2	Level 3	Level 4	Level 5
5	140–184	185–199	200–214	215–224	225–260
8	140–184	185–202	203–214	215–224	225–260

Table 3: Achievement Levels for the FCAT 2.0 Reading Scale Scores (140–302)

Grade	Level 1	Level 2	Level 3	Level 4	Level 5
10	188–227	228–244	245–255	256–270	271–302

Retrieved from http://www.fldoe.org/core/fileparse.php/5663/urlt/ScienceFS1819.pdf

Appendix E: Permission to Use the Sheltered Instruction Protocol Observation (SIOP)

Pearson

Permissions
200 Old Tappan Road
Old Tappan, NJ 07675
globalpermissions@pearson.com

PE Ref # 211293

Sherly Soto
WALDEN UNIVERSITY
112 Milestone Drive
Hannes City, FL 33844

Dear Sherly Soto,

You have our permission to include content from our text, ***MAKING CONTENT COMPREHENSIBLE FOR ENGLISH LEARNERS: THE SIOP MODEL, 5th Ed. by ECHEVARRIA, JANA; VOGT, MARYELLEN; SHORT, DEBORAH J.,*** in your dissertation or masters thesis at Walden University.

Content to be included is:
1-2 SIOP protocol

Please credit our material as follows:
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Sincerely,
Julia Alexander, Permissions Granting Analyst

Appendix F: Professional Development Evaluation

Professional Development Evaluation
Date: ____________________
Educational Role: ☐ Instructor
Please respond to each item by circling the number which best describes your opinion (5 = excellent; 1 = poor).

		Excellent		Average		Poor
A.	**Participant Satisfaction**					
1.	Professional Development was well organized.	5	4	3	2	1
2.	Professional Development objectives were clearly stated.	5	4	3	2	1
3.	Professional Development assignment were relevant to course objectives.	5	4	3	2	1
4.	All necessary materials/equipment/resources were provided or made readily available.	5	4	3	2	1
5.	Overall instructor performance.	5	4	3	2	1
B.	**Impact on Professional Practice**					
1.	This professional development enhanced the educator's/school leader's knowledge/understand on English Language Learners.	5	4	3	2	1
2.	This professional development increased the educator's/School's teaching skills based on research of effective practice.	5	4	3	2	1
3.	This professional development provided information on a variety of assessment skills.	5	4	3	2	1
4.	This professional development provided skills needed to analyze and use data in decision making for instruction or at all levels of the school system.	5	4	3	2	1

5.	This professional development empowered participants to work effectively with parents and community partners to engage other to pursue excellence in learning.	5	4	3	2	1
6.	This professional development provided the participants the knowledge and skills to think strategically and understand standards-based school reform.	5	4	3	2	1
7.	This professional development enhanced the participants professional growth and deepened your reflection and self-assessment of exemplary practices.	5	4	3	2	1

C. Comments

Please take a few moments to respond to the following questions. Your answers will greatly assist us in determining how to improve in-service course offerings.

1. How did this professional development relate to you job, and in what way(s) has it caused you to review your job or training activities?

____

____

2. What new ideas have you gained and how do you plan to implement these new ideas in your classroom? ____

____

3. What information was of great value to you?

____

____

4 What specific suggestions do you have to improve this activity?

____

____

5. Additional Comments ____

Appendix G: Matrix for Coding using the SIOP Components

Theme	SIOP Component	Teacher 1	Teacher 2	Teacher 3	Teacher 4	Teacher 5	Teacher 6
Content objectives, language objectives	1. Lesson preparation	Provided by the district. Don't display language objectives	Provided by the district. Objectives are the same for all students. Display the big idea of the day on the board.	Same lesson plan for all student. Don't make changes, because it is provided by the district. Don't display language objectives.	Lesson plans provided by the district. Teacher adjust plan to make language understandable for students.	Adapt lesson plan for students. Display content objectives on board. Use friendly language for students.	Adapt lesson plan Display content Objectives.
Materials use to build background knowledge, key vocabulary	2. Building Background	Use Real-World scenarios from book. No adaptation for ELLs.	Engaging question from Inspire book.	Real world problem as a background knowledge.	Teacher design activities to promote background knowledge using vocabulary.	PSELL provides a segment of background knowledge at the beginning of each lesson.	Teacher prepares Questions to use it as background knowledge. Teacher uses segment from PSELL to promote background.
Techniques used in the classroom to facilitate instruction	3. Comprehensible input	Hands on experiments 2-3 days a week, provided by Inspire. Use real-scenarios Probes	Hands on experiments provided by Inspire. Questions from the book.	Hands on experiments. District provides the Kit for hands on.	Hands on experiment provided by both Programs PSELL and Inspire. PSELL provides vocabulary list for each lesson in English, Spanish, and Creole. Graphic organizers provided by PSELL.	Both PSELL and Inspire provides hands on activities. Videos Picture card with vocabulary. Graphic organizers.	Videos, pictures, writing using lab-slips (Inspire) Graphic organizers (PSELL). Hands on experiments

Scaffolding techniques, higher order thinking questions	4. Strategies	Short responses from Inspire book, same for all students. Book questions are challenging for students.	Use questions/short responses. Modeling Pair work	PowerPoint provided by the district is used to facilitate instruction. Real worlds scenarios. Questioning-answering.	PSELL charts for annotations during experiments. The teacher creates different worksheets according to student levels. Differentiate strategies.	Provided visuals to support ELLs but to support ALL students. PSELL charts, and graphic organizers.	PSELL chart for annotations. Visuals to support ELLs. Question/answer
Interactions among students-teacher, group configuration, opportunities to student to clarify concepts in their first language (L1)	5. Interaction	Students sits in groups of 4. Students can work together.	Students are in groups of 4. Think-pair-share Turn and talk, Group collaborations, Pair collaborations.	Students are in groups of 4. Turn and talk. Group collaboration.	Students in groups of 4. Group collaborations, Think-pair-share. Teacher has small groups for students that needs clarification.	Students sits in group of 4. Teacher arrange sitting according to students' needs. Pair ELL students with someone that could help them.	Students sits in groups of 4. Students help each other. Support for ELLs from other students.
Hands-on practice, activities that interact language.	6. Practice and Application	Science experiments. Students must use academic vocabulary.	Science experiments. Inspire incorporate reading with the use of vocabulary.	Science experiments twice a week.	Science experiments is a combination of Inspire and PSELL. Both programs provides with kits with materials.	Cards with vocabulary. After experiments PSELL provides worksheets for answer questions.	Science experiments provided by both curriculums. PSELL worksheets.
Does not apply/ Observation	7. Lesson Delivery (does not apply) I did not make any observation						

Teacher provides feedback, assessments	8. Review and Assessment	Lesson plans, assessments, presentations are provided by the district. No changes apply.	Answer questions for students. Lesson plans, presentation, and assessments are provided by the district.	Assessments provided by district.	Teacher creates assessments. Create worksheets for students to write their answers. Teacher accommodates the needs of ELLs.	Teacher creates short exit-ticket slip. Teacher modify assessment provided by the district. Small groups to provide feedback.	Assessment provided by the district. PSELL has a end of the unit short assessment.

Appendix H: Theme Analysis of Inspire and PSELL Science textbooks with SIOP Components

Code

Themes	SIOP Components	Inspire	PSELL/Inspire
Content objectives, Language Objectives	1. Lesson Preparation	Content objectives provided by the district. Language objectives are not used.	PSELL book provides at the beginning of each lesson content objectives aligned with Science Standards. Language objectives not provided.
Materials use to build background knowledge,	2. Building Background	Inspire textbook does not provide specific materials to build background knowledge.	Provides a section call "Link to Prior Knowledge"
Techniques used in the classroom to facilitate vocabulary development	3. Comprehensible Input	Key words provide at the beginning of each lesson just in English.	PSELL book provides a list of vocabulary words in English, Spanish, and Creole.
Scaffolding techniques, higher order thinking questions	4. Strategies	The book uses 5-E learning throughout the textbook (Engage, explore, explain, elaborate, evaluate).	During labs each lesson provides questions for student to answer during experiments for each chapter.
Interactions among students-teacher, group configuration, opportunities to student to clarify concepts in their first language (L1)	5. Interaction	Inspire does not provide a section that suggest collaboration or the use of first language.	PSELL curriculum suggests pair collaboration and the opportunity to use their first language in case need it.
Hands-on practice, activities that interact language	6. Practice and Application	Provides Inquiry activities/investigation related with STEM.	Hands on activities, with questions and pictures.
Does not apply/ Observation	7. Lesson Delivery (N/A)	N/A	N/A

Teacher provides feedback, assessments	8. Review and Assessment	District provides assessments. In the evaluate section of the book there is an Essential Question for student to answer.	PSELL provides a section of assessment embedded in each chapter.