A CASE STUDY OF TEACHER AND ADMINISTRATOR PERCEPTIONS OF THE IMPLEMENTATION OF SHELTERED INSTRUCTION OBSERVATION PROTOCOL (SIOP) MODEL AND ITS INFLUENCE ON STUDENT ACHIEVEMENT IN SCIENCE AND ON LEVELS OF ENGLISH LANGUAGE ACQUISITION

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A CASE STUDY OF TEACHER AND ADMINISTRATOR PERCEPTIONS OF THE IMPLEMENTATION OF SHELTERED INSTRUCTION OBSERVATION PROTOCOL (SIOP) MODEL AND ITS INFLUENCE ON STUDENT ACHIEVEMENT IN SCIENCE AND ON LEVELS OF ENGLISH LANGUAGE ACQUISITION

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Dedication

This work is dedicated

…to my amazing daughter, Gracen. This educational journey has been one of sheer grit and perseverance, for both of us. As a single mother, there were many challenges that threatened to throw me off course, perhaps even quit, until I remembered the importance of whose beautiful brown eyes were watching me all this time. You constantly inspire me. Sometimes it is not easy to overcome obstacles, refocus your efforts, and discipline yourself and your time to complete what you set out to accomplish. I hope that this journey with me is a reminder that "you can do all things through Christ who strengthens you" (Philippians 4:13). You are my greatest work, and I love you soooooooo much.

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students and challenging me to keep bringing my best every single day, both personally and professionally.

ABSTRACT

A CASE STUDY OF TEACHER AND ADMINISTRATOR PERCEPTIONS OF THE IMPLEMENTATION OF SHELTERED INSTRUCTION OBSERVATION PROTOCOL (SIOP) MODEL AND ITS INFLUENCE ON STUDENT ACHIEVEMENT IN SCIENCE AND ON LEVELS OF ENGLISH LANGUAGE ACQUISITION

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University of Houston-Clear Lake, 2023

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Recognizing the underperformance of emergent bilingual students, when compared to the academic achievement of their English-speaking peers, is a current and vital topic of discussion and research in the United States. The purpose of this qualitative case study was to examine the perceptions of fifth-grade science teachers and school district administrators of the implementation of the Sheltered Instruction Observation Protocol (SIOP) model and its influence on the student achievement of emergent bilinguals in science and on levels of English language acquisition. Two theoretical frameworks were used to ground the study and enhance understanding: Cummins (1984, 2000) theory of language acquisition and Vygotsky's (1986) social constructivist perspective. The research questions explored: 1) What were the teachers' perspectives of their implementation of the SIOP model in fifth-grade science? and 2) What were the administrators' perspectives of the implementation of the SIOP model in fifth-grade

science? A purposeful sampling of the participants, fifth-grade science teachers and school and district administrators, were interviewed to provide a more in-depth understanding about classroom implementation of the SIOP model with emergent bilingual students. A constant comparative analysis was used to analyze that teacher focus group and administrator interview data to yield emergent themes. Drawing from the data, the teachers voiced a strong need to integrate the instructional support received in science with the SIOP model, time to purposefully plan with these two components in mind, and vertically align accountability in teaching science. Time for follow-up to reflect on effective teaching practices with EB students was also valued. Data from the administrator interviews resulted in initiating a needs assessment with their teachers to glean areas of improvement needed in science with EB students, coordinating support between teachers and content specialists, and providing additional professional development for teaching growth in the SIOP model. With the knowledge of the lag in academic achievement of EB students in comparison to their non-EB peers, especially in the area of science learning, teachers may advocate on a deeper level about the specific professional development and instructional supports that are needed to address the diverse learning needs of EB students.

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CHAPTER I:

INTRODUCTION

Research Problem

Across the United States, English-speaking students outperform their English-language learning peers, known as emergent bilinguals (EBs), in academic core classes, such as science. English-speaking students also graduate at a higher rate than their EB classmates, and this has become a growing and persistent topic of interest in education (Collier & Thomas, 2017; García et al., 2018). In the state of Texas in 2022, the graduation rate of EB students was less than 80%, comparatively lower than English-speaking students at 94%, Hispanic students at 88%, African American students at 86%, Asian students at 96%, American Indian students at 87%, and 91% for students who identified as Two or More Races (Texas Education Agency Online, 2022). The disproportionality of educational outcomes and experiences for EBs, the largest of all subgroup achievement gaps, has also gone relatively unchanged for over a decade (NCES, 2019).

Short et al. (2011) noted that the education reform movement in the U.S. facilitated by the No Child Left Behind (NCLB) legislation directly affected how teachers teach emergent bilingual students and how states planned to assess EBs' English language proficiency on a yearly basis. Additionally, NCLB (2001) required that states evaluate all students in the area of science achievement at least once in elementary, junior high, and high school. Emergent bilingual students are expected to perform at or above the proficiency levels of their English dominant peers in the content areas of reading, language arts, math, science, and social studies (Brooks et al., 2010; Collier & Thomas, 2017; Heineke et al., 2012; Short & Echevarría, 2016). Such rigorous state testing mandates often govern classroom instruction; however, there is a need for effective and

specific instruction for English language development for second language learners (Short & Echevarría, 2016; García et al., 2018). The Every Student Succeeds Act (ESSA, 2015) further mandated each state's standards for English levels of proficiency (ELPs) focus on the four language-learning domains: listening, speaking, reading, and writing, and ensure the ELPs are aligned with the content area standards (U.S. Department of Education, 2015). In most states, including Texas, EBs are required to achieve high levels of English language proficiency, pass end-of-course exams in all content areas, and pass the State of Texas Assessment of Academic Readiness (STAAR) tests to graduate from high school (TEA, 2007-2022). This means that first year EB students will take the same end-of-course exam or STAAR test for science as their native English-speaking peers who have been attending U.S. schools all of their lives.

García et al. (2018) posited that disparities continue to exist between English-speaking students and students of diverse cultural backgrounds, such as emergent bilingual students, specifically in the area of science achievement. According to the 2021-2022 STAAR Performance report, also referred to as the Texas Academic Progress Report for the state of Texas, the number of fifth-grade students who scored "meets grade level or above" expectations on the STAAR test in science was 67% for Asian, 54% for Caucasian, 46% for students identified as two or more races, 37% for American Indian, 31% for Hispanic, 24% for African American, and 29% for EB students (Texas Education Agency Online, 2022). This designation means that students have a strong grasp of knowledge for the course content covered on the STAAR test (Texas Assessment, 2023). It is notable that only 12% of EB students scored at the "mastery" level on the science STAAR test. For their peers, non-EB students scored at the "mastery" level at 40% for Asian, 28% for Caucasian, 23% for student identified as two or more races, 15% for American Indian, 13% for Hispanic, and 9% for African

American (Texas Education Agency Online, 2022). According to the Texas Assessment (2023) website, the level of "Mastery" on the STAAR test means that a student has shown mastery of the grade-level content for that course. This means that only about 58% of EBs are meeting the "Approaches Grade Level" score in the area of science on the STAAR test. The score of "Approaches Grade Level" score indicates that students have learned some important content for the course, but the students are also missing some critical understanding in that content area that require additional content supports during the upcoming school year (Texas Assessment, 2023). For emergent bilinguals, this means that they will continue to fall further and further behind in their learning in science, and therefore, may not be able to access higher levels of science learning in junior high and high school.

Holmlund et al. (2018) were troubled with the underrepresentation of students of color in science, technology, engineering, and math (STEM), stating "it has been apparent in education that when equity is not explicitly named and addressed, it is overlooked" (p. 16). While Vazquez (2022) affirmed that policy stakeholders have made advances in creating education policies and initiatives that promote the integration of multicultural curricula on national and levels, discrepancies still remain concerning to the extent to which educators are integrating a multicultural mindset in the classroom with students, especially in the area of STEM education. The consequences of not embracing this shift in both mindset and pedagogical practices, by teachers, education practitioners and policy makers, and community stakeholders, will continue to perpetuate the deleterious effects of educational and adult life experiences for students of color (Evans et al., 2020). Callahan et al. (2016) hypothesize that the long-term consequences may be that fewer EBs will have access to higher education opportunities that could lead to higher paying careers in science, such as those related to STEM, because of these

disparities in English proficiency and in their acquisition the academic content in science. Therefore, if children are not learning science in the elementary grades because of language issues, they will be less likely to be successful later on and unprepared to engage in careers in STEM fields.

Gay (2020) asserted that "when academic knowledge and skills are situated within the lived experiences and frames of reference for students, they are more personally meaningful, have higher interest appeal, and are learned more easily and thoroughly" (p. 108). Additionally, James Banks (2020) and Mary M. Atwater (2010) continue to pioneer the way for and reinforce the practice of being explicit and intentional in the multicultural education opportunities afforded to, or being excluded from, students of color in the area of the sciences.

One such method of integrating content area literacy with language instruction English and improving teachers' instructional delivery is referred to as "sheltered instruction" and is designed to address such disparities in the classroom instruction of EBs (Short et al., 2016). The Sheltered Instruction Observation Protocol (SIOP) model is a lesson preparation and delivery system used in many districts, and in school systems around the world, to support content-area literacy and the language-learning needs of their EBs in English (Echevarría et al., 2017). The SIOP model strategies can be integrated into lessons in any content area, such as science, as a flexible tool to help teachers explicitly instruct through listening, speaking, reading and writing activities in English in order for students to learn, argue, defend, and validate learning and claims made during science experiments and lessons. In light of the disproportions in academic achievement for emergent bilinguals, and the lack of prior research on EB student achievement in science, this research focused on fifth-grade teachers' and administrators' insights and perspectives into the SIOP model implementation in the science classroom.

Significance of the Study

Recognizing the underperformance of emergent bilinguals when compared to the academic achievement of their English-speaking peers is a very current and vital topic of discussion and research in the United States. This research may benefit science teachers of middle school EB students by approaching the integration of science with sheltered instruction, such as with the SIOP model, with increased fidelity and rigor. With the knowledge of the lag in academic achievement of EB students in comparison to their non-EB peers, especially in the area of science learning, teachers may be able to advocate on a deeper level about the specific professional development and instruction supports they need to address the diverse learning needs of EB students. This research may benefit school district administrators who initiate their own evaluation of the levels of support they currently provide to teachers of EB students in the content areas, such as science, and proactively apply this data to develop short and long-term professional learning opportunities for educators. It is not enough to just have an understanding of this dynamic group of English learners, but more importantly, it is essential to put into practice the supportive systems that address their specific school district's needs in servicing this diverse student population. Additionally, this research study will suggest practices to implement on school campuses that come from teachers and administrators who teach emergent bilingual students or support teachers that focus on meeting the needs of EBs in their current bilingual and ESL programs.

Purpose

The purpose of the study was to examine teachers' and administrators' perspectives about implementation of the Sheltered Instruction Observation Protocol (SIOP) with EBs in fifth-grade science. The results of this study may be valuable and instrumental in helping school districts assess the extent to which teachers apply their

knowledge and practice of the SIOP lesson planning and delivery approach to meet the second language learning needs of their EBs, especially in the area of science education. The results also showed how important the roles of the school district administrators may be in SIOP implementation with EBs in order to best support the teachers needs in science classroom instruction. EBs are learning to master the English language in addition to learning content-area knowledge, skills, and academic vocabulary within the context of core subjects, such as science, social studies, and mathematics. There is little research at the elementary school level, in kindergarten through sixth grades, pertaining to the fidelity to which teachers implement SIOP with EBs in their classrooms, as most of the SIOP studies have been concentrated on in the middle and high school levels, seventh through twelfth grades (Echevarría et al., 2017). In this study, the school district has designated and clustered the grade levels as follows: kindergarten through fourth grades as elementary schools, fifth and sixth grades as middle schools, seventh and eighth grades as junior high schools, and nineth through twelfth grades as the high school level. Although the teacher participants in this study are from a middle school, in the academic and research literature, fifth grade would be classified as an elementary school grade level.

Research Questions

This study explored the following research questions:

1. What are the teachers' perspectives of their implementation of the SIOP model in fifth-grade science?
2. What are the administrators' perspectives of the implementation of the SIOP model in fifth-grade science?

Definition of Key Terms

For this study, these definitions are operationally defined as follows:

Comprehensible input: Teachers integrate specific teaching strategies into content area lessons that enable EBs to comprehend the lesson through the use of building background knowledge that connect to students' experiences, pre-teaching academic vocabulary for a unit, varying the pacing of the lesson, using intonation to emphasize important concepts, and providing content and visual aids (Krashen et al., 1983). Explicit language objectives are created for the lesson, along with the content objectives, to adjust for ELs' language proficiency levels (Echevarría et al., 2017).

Emergent bilingual (EB) students or English learners (ELs): The emergent bilingual (EB) student has evolved from "English learner" (EL), formerly "English language learner (ELL)", which was also formerly referred to as "limited English proficient (LEP)." This designation refers to students who are "speakers of one or more languages other than English and who are developing English literacy in school" (García et al., 2018).

Emergent bilingual denial: Based on the identification of a student as an "emergent bilingual," in the aforementioned definition, this term represents an EB student whose parent or guardian has denied second language-learning services, such as in a bilingual program, ESL program, or dual language program, which are common examples in the state of Texas (Texas Education Agency Online, 2023).

Language Proficiency Assessment Committee (LPAC): A school site-based committee, consisting of a school administrator, a parent of a current EB student, and a bilingual or ESL teacher of EBs. Based on the results of the oral language proficiency test in English, the LPAC committee may or may not recommend that the new EB student participate in a particular English language learning class (Texas Education Agency Online, 2023d).

Lexicogrammar: the ways in which concepts are worded in context, specifically concerning the scientific vocabulary used in science, where vocabulary (lexis) and the syntax (grammar) are used together to define the environment and circumstances that exist for that academic vocabulary in the area of science (Halliday & Martin, 1993; Lexicogrammar, 2004).

Sheltered Instruction Observation Protocol (SIOP) model: A research-based model of instruction that focuses on developing second language acquisition skills while making current grade level subject area content accessible for LEP students (Echevarría et al., 2017).

State of Texas Assessments of Academic Readiness (STAAR): Implemented in 2012, the STAAR tests are administered annually to public school students in the following areas: reading and math in grades 3-8, writing at grades 4 and 7, science to grades 5 and 8, social studies at grade 8, end-of-course (EOC) assessments for English I, II, and III, Algebra I and II, Biology and U.S. history. Spanish assessments are available for grades 3-5 (Texas Education Agency Online, 2017)

Student Achievement: The status of subject-matter knowledge, understandings, and skills at one point in time; a snapshot of learning (Student Achievement, 2016). In the state of Texas, student achievement is measured by the State of Texas Assessments of Academic Readiness (STAAR) test scores in multiple grade levels beginning in third grade. Student achievement can also be measured through district curriculum-based assessments (CBAs) and both district-created and teacher-created formative and informal assessments.

Texas Teachers Evaluation and Support System, or T-TESS: The T-TESS is a teacher evaluation system, designed by Texas educators, to support the continuous improvement of and professional growth of teachers from year to year. Teachers are evaluated throughout the school year, receiving results from on-going formative assessments and

one summative assessment from classroom observations performed by their school administrators. This feedback enables teacher self-reflection about how students respond to their instructional practices in the classroom (Texas Education Agency, 2023c).

Summary

This chapter provided an overview of the research problem, purpose of the study, significance, research questions, and essential definitions to clarify understanding. The present study may contribute to the research by minimizing the discrepancy in student achievement between emergent bilingual students and their English-speaking peers in the area of science by highlighting best practices for teaching EBs. It is critical that the teachers of EB students incorporate sheltered instruction strategies in effective ways to maximize second-language learning in English, while simultaneously focusing on content area literacy in science. The 21st century workforce needs highly literate and science-minded students to pursue careers in STEM in order to solve problems in innovative ways. What takes place in the classroom today and every day thereafter makes a critical difference in how our workforce is prepared to address these career goals. To complement the study, the next chapter will provide a review of the literature for these topics.

CHAPTER II:

REVIEW OF LITERATURE

Learning science presents many challenges for emergent bilingual (EB) students, as they are learning core science content and academic vocabulary while simultaneously developing their language proficiency in English. In this chapter, a review of the literature is presented, highlighting important research for instructional practices for emergent bilingual students, the Sheltered Instruction Observation Protocol (SIOP) model, teacher education in the sciences through traditional certification programs and alternative certification programs, multicultural education and the cultural components of the SIOP model, science instruction and science instruction for EBs, and why learning science is difficult for EBs as they acquire science content and vocabulary in English. A review of the literature focusing on the role of administrators in supporting teachers of EB students was also included. This case study sought to examine the teachers' and administrators' perspectives about the implementation of the SIOP model as it related to the English language-learning needs and academic achievement of EBs in fifth-grade science. As an empirically tested, research-based model developed to promote English acquisition of language and science concepts simultaneously with EBs in the classroom, the SIOP model has been widely regarded to have a positive impact on intense English language development (Echevarría et al., 2017; Himmel et al., 2009).

Emergent Bilingual Students

All public schools in Texas require parents or guardians to complete a home language survey for every student enrolled (Texas Education Agency Online, 2022). If parents indicate that any language other than, or in addition to, English is spoken in the home, the student will be tested by an adult trained in administrating an oral English language proficiency test (OLPT) for Pre-K to 1st grade and/or an oral proficiency test

and a norm referenced standardized achievement test for grades 2-12. Where applicable, the student will also be assessed on their levels of language proficiency in their home language, their primary language or native tongue, such as Spanish, for example. The results from these tests determine the student's level of language proficiency, in the native language and in English. According to the Texas Education Agency (2023), students are determined to be "emergent bilingual (EB)" if their scores show they are limited or have no English language skills.

This designation does not insinuate that EB students come to U.S. schools devoid of language skills in their primary language. The approved OLPT in students' primary language will provide evidence for or contrary to this, as applicable. Additional conversations with the students' parents or guardians during the enrollment process allow schools to gather a clear picture of EB students' previous education experiences and schooling in their home country upon enrollment in U.S. schools or a lack thereof. While previous research uses the terms "English Learner (EL)" or "English Language Learner (ELL)" interchangeably, current research uses "EB" to advocate for and emphasize the "importance of leveraging *all* of the linguistic and cultural practices of emergent bilingual students to educate them" in an equitable manner (García et al., 2018).

After initial identification, a committee will convene to discuss the initial OLPT results. This committee is referred to as the Language Proficiency Assessment Committee (LPAC), and it consists of a school administrator, the parent or guardian of the current EB student, and a bilingual or ESL teacher of EBs. If the LPAC committee recommends that the new EB student participates in a particular English language learning class, then the parent or guardian of that student may accept or deny this second language-learning service, such as in a bilingual program, ESL program, or dual language program, which are common examples in the state of Texas (Texas Education Agency Online, 2023d).

Consequently, EB denial students may be placed in classes without any English language learning strategies and support provided to them if the parent or guardian signed to waive this support out of their daily instruction.

Theoretical Framework for English Language Learning

Cummins (1984, 2000) asserted that, typically, EBs whose first language (L1) is not English develop two types of language proficiency: basic interpersonal communication skills (BICS) and cognitive academic language proficiency (CALP). BICS are skills used to communicate informally in English in social settings with peers, with special attention given to interpreting the facial expressions, physical gestures, and body language used for understanding conversations. In contrast, Cummins explained that there was another language category of English language learning in which EBs' cognitive academic language proficiency, or CALP, was developed (2000). CALP is the specialized language and discourse of core content areas, especially those of math, science, and social studies. Cummins's research also found that EBs developed BICS rather quickly while CALP development takes five to seven years to acquire the levels of proficiency in English that is comparable to that of EB students' dominant English-speaking peers, whose primary language is English (1984). This time difference is because learning the correct use of the lexico-grammatical features of English, such as plurals, prepositions, and the language mechanics of English simultaneously to the academic vocabulary in the content areas, takes considerably more time to develop (Cummins, 2000; Halliday et. al., 1993). Used within the study of systemic functional linguistics, the term lexicogrammar means the way concepts are worded, specifically concerning the scientific vocabulary used in science. Created by linguist Michael Halliday, the word lexicogrammar is used to describe the interdependency between vocabulary (lexis) used to describe and name things and the syntax (grammar) used to

define the environment and circumstances that exist for that vocabulary (Halliday & Martin, 1993; Lexicogrammar, 2004), such as the language used in the area of science.

Current research affirms that there is a semiotic learning relationship between L1 and L2, allowing for EBs to engage their full unitary repertoire to maximize their meaning-making potential, regardless of which language it is in (García et al., 2018, p. 81). This negotiation of meaning between the students' two languages allows them to use their current schema about language and content to build upon, understand and learn new content through engagement in linguistic transfer of knowledge. Historically, using one's L1 as a valuable tool and a springboard to learning L2, was the premise behind the work in biliteracy of Jim Cummins, stating that each language is not taught in isolation, but L1 and L2 are interdependent of one another in biliteracy development (Cummins, 1984).

Vygotsky (1986) affirmed that not only is language important for social interactions, but, equally, language is a cognitive tool through which learning and meaning can be applied and synthesized. This approach to learning, such as in science class, lies in the theoretical framework of the social constructivist perspective. Thus, learning science becomes a process of social acculturalization for students through which the meaning of the language of science and constructing personal meaning from it used to retain science content are constantly negotiated (Costa, 1995; Scott, 1997; Vygotsky, 1986). Within Vygotsky's socio-cultural theory lies the concept of teaching to each student's zone of proximal development (ZPD). This learning zone represents the difference between the student's current level of development and the next level of potential development, supported by guidance and instruction from a teacher or in interaction with more capable peers (Shi, 2017). Therefore, it becomes clear that intentional, daily language development is essential and may be achieved effectively when taught within academic content areas, such as science, and within the collaboration

of students' peers. It continuously bridges and scaffolds upon students' own experiences and culture with a deeper understanding of the connections and relevance to the scientific world around them, and more importantly, challenges students to consider how their lives may be impacted by such connections. This type of critical thinking lends itself to addressing current science issues and potential challenges faced throughout our world: climate change and global warming, technology advancements, and the broader scope of STEM career interests.

English Language Learning in the Sciences

Researchers assert that differences exist between perspectives with regard to how students perceive their world through the lens of their respective culture and the culture that is generally embraced by the scientific community (Costa, 1995; Horton, 2022; Moll, 2019). How then should teachers instruct students to bridge connections between their familial culture in order to apply them to learning academic content at school? Costa (1995) posited in her research, concerning the cultural differences between the students' perceptions of their world and the world of school and sciences, that there are five categories into which students can be placed according to their ease of transition into their learning of science: 1) "Potential Scientists" who transition easily into learning content, because the students' familial culture is congruent with the culture of school and science; 2) "Other Smart Kids" who are able to manage this transition into science learning, but whose experiences are inconsistent when relating to science concepts; 3) the "I Don't Know Scientist," whose familial culture does not connect with school or science learning, struggles a great deal in the science classroom; 4) the "Outsiders," whose transitions are nearly impossible, because their culture of family and friends conflict with the cultures of both the school and science; and 5) "Inside Outsiders," who experience great frustrations and difficulty in connecting with school, due to the irreconcilable

differences between their culture and school (p. 316). In contrast, they find it fairly easy to transition into learning science content. Still today, this perspective into the students' culture and its influence on learning science are practical insights for teachers, because there are multiple opportunities to negotiate cultural differences and embrace diversity in the science classroom to help make the content relevant and engaging for EB students (Horton, 2022; Moll, 2019).

The Sheltered Instruction Observation Protocol (SIOP) Model

Since 1995, the SIOP model has been refined and implemented in EB classrooms in all 50 U.S. states and around the world (Echevarría et al., 2017). Before this time, there was no framework for sheltered instruction; therefore, instruction looked very inconsistent across school classrooms as instructional strategies and activities varied. In 1996, a team of researchers and middle school teachers from three school districts collaborated and conducted a seven-year research study, supported by the Center for the Research on Education, Diversity and Excellence (CREDE) and funded by the U.S. Department of Education (Echevarría et al., 2017; Short & Echevarría, 2016). The collaboration of teams focused on research-based best practices for integrating content area literacy and English language acquisition, in addition to synthesizing teacher fidelity in delivering instruction and its effects on student achievement (Short & Echevarría, 2016). This research resulted in the creation of the Sheltered Instruction Observation Protocol, and it was used as a tool to evaluate classroom lessons taught through sheltered instruction. Later, the SIOP model was developed (Echevarría et al., 2017).

The SIOP model was intended to systematically support EBs in the content areas through comprehensible and strategic teaching techniques and academic language development, when implemented consistently and with a high level of fidelity (Echevarría et al., 2011). Its applicability is not limited to support EB students, but the

SIOP model can also be integrated into bilingual and dual language programs, content-based ESL classrooms, instruction in special education classrooms, and general education classrooms (Echevarría et al., 2017). The SIOP model offers a flexible framework in which teachers may vary their teaching styles and instruction, such as incorporating student-centered inquiry lessons. In the classroom, EBs are faced with intense academic language demands and challenged to think in more abstract ways in subject area content. According to Echevarría et al. (2017), the model for such acceleration and improvement in English literacy development in the content areas, such as science, is in the daily implementation of the SIOP model. The model capitalizes on building upon students' background knowledge and personal experiences to scaffold instruction, while also helping teachers meet the developing academic language demands on EBs' listening, speaking, reading, and writing skills in their classrooms (Echevarría et al., 2017).

The SIOP model framework consists of eight components, with thirty different features, which covers from teacher lesson planning through lesson delivery and assessing students on their learning. The main eight components of the SIOP model represent the following: lesson preparation considerations, building upon students' background knowledge experiences, explicit teaching techniques to create comprehensible input for student understanding, lesson scaffolding strategies, engaging interactions between students, student practice and how to challenge students' thinking through content-specific application activities, monitor and adjust teacher lesson delivery for effectiveness, and review and assessment components to provide feedback to students about their learning during the lesson and to check for students' understanding after the lessons using authentic formative and summative assessments (Echevarría et al., 2017). Table 1 summarizes the eight components of SIOP.

Table 1:

Overview of the SIOP Model (Echevarría et al., 2017).

Components	Features
Lesson Preparation	Clear content objectives, clear language objectives, supplementary materials complement the lesson, clear, explicitly taught lessons
Building Background	Explicit connections with students' schema and prior learning, as well as to new academic vocabulary
Comprehensible Input	Teacher adjusts speech, clearly defined academic tasks, provides multiple techniques for contextual understanding, differentiates for varied levels of students' English proficiency
Strategies	Scaffolding techniques that allow students multiple opportunities to apply cognitive learning strategies in context; varied questioning and tasks to promote higher order thinking
Interaction	Encourages student collaboration, cooperative groups, and appropriate, meaningful groupings for language and content development
Practice and Application	Meaningful activities that scaffold students to move from the concrete to abstract thinking through student practice, language extension, and mastering subject area content in the areas of listening, speaking, reading, and writing
Lesson Delivery	Lessons clearly match content and language objectives, assess student learning throughout the lesson, appropriate pacing for students' proficiency levels; engage students 90% to 100% of the time during the lesson
Review and Assessment	Ongoing assessment of key content concepts, comprehension, and academic vocabulary; provide meaningful feedback to students on a regular basis

In a two-year study conducted by Echevarría et al. (2011), the researchers used the SIOP model to evaluate the effects on the acquisition of academic language and science content with English language learners in seventh grade science classrooms. The first year consisted of developing and piloting lesson plans and assessments for the seventh-grade science teachers. The SIOP was used to rate the lesson plans created on the levels of SIOP model implementation. These piloted lessons became a springboard for creating four instructional units for year two in the area of biology: one science unit that focused on cells, a second unit focused on the structure and function, a third unit to explore photosynthesis and respiration, and a fourth to teach genetics, respectively (Echevarría et al., 2011). Key elements of the SIOP model were included in the lesson plans. During the second year, the researchers secured permission for participation in the study from the teacher participants from eight middle schools, with a total of four science teachers from three schools in the control group and a total of eight science teachers from the five schools in the SIOP treatment group. The eight teachers in the SIOP group participated in a two-and a half day SIOP model professional development, and afterwards, they were provided the binder with the SIOP lessons and activities created for each of the four units. These teachers were also provided with instructional coaching from one of the researchers to guide SIOP implementation, including lesson plan collaboration and constructive feedback. The control group planned their own lessons and instructional delivery to their science classes for these units. To evaluate student learning, a pretest-posttest comprehension test was used for each of the four units of study. Non-essay and essay questions were included in the tests. The results of the study showed that student achievement was modestly higher with the science teachers who implemented the SIOP model in seventh grade science (Echevarría et al., 2011). The researchers posited many reasons that may have attributed to low overall differences between groups: the

small number of science teacher participants and limited number of participating middle schools, and, therefore, a smaller sampling of English language learners within the science classes (Echevarría et al., 2011). Additionally, the time between the SIOP model teacher training, and application and synthesis in implementing the SIOP model, with the instructional coaching support, in the science classrooms would have occurred over several months prior to student assessments and evaluations (Echevarría et al., 2011).

Using the SIOP Model to Meet TELPAS Goals for Emergent Bilinguals

Multiple opportunities, like implementing the SIOP model, are provided to teachers concerning ways in which EB student engagement can be improved to create an optimal learning environment conducive to strong language development in English. In the state of Texas, specifically, the Texas English Language Proficiency Assessment System (Texas Education Agency Online, 2014), is the assessment instrument used to assess EBs' growth in English language development through the four language-learning domains of listening, speaking, reading, and writing. TELPAS is administered annually, in the spring, to all EBs, including EB students whose parents have previously denied second language learning services. EB students are tested in English in the areas of listening, speaking, reading and writing. Afterward, students and parents receive the TELPAS results of students' progress in each of the four domains and a cumulative score for that school year is assigned: Beginning, Intermediate, Advanced, and Advanced High, respectively (Texas Education Agency Online, 2014),).

The Beginning leveled rating of TELPAS indicates that the EB student is in the early stages of learning English. Students on this level may be newcomers to the United States, possess a small vocabulary of common words in English, and have little ability to use English in their academics in meaningful ways. Typically, the students at this level use the English that has been memorized in order to communicate basic skills and

vocabulary with friends in social situations. Students at the Intermediate rating of TELPAS use basic English in routine academic settings, but they still require substantial support in English to understand academic content. Socially, Intermediate students engage in communication with friends on topics familiar to them and are typically able to understand the general idea of the conversation, although some details may still be incomprehensible or misunderstood. Students at the Advanced level of TELPAS understand and use academic language in class in meaningful ways, with some English-language support. With friends, Advanced students understand most of what is discussed, but these students are still learning more advanced vocabulary and grammar structures. Advanced students will still have some difficulty in comprehension because of this. Finally, EBs at the Advanced High rating have the ability to use academic English in the content areas in meaningful ways, with little help from others. This includes being able to communicate in a clear, fluent manner in most situations, even when the topics are unfamiliar. This grasp of English may mirror that of their English-only speaking peers and is reflected in all four of the TELPAS domains (Texas Education Agency Online, 2014).

In a dissertation conducted by Hayden (2019), the researcher implemented the SIOP model in fifth and sixth grade classrooms, by four team-teacher partnerships made up of two teachers per team, to explore if there was a significant difference on the growth of English proficiency of ELLs with limited or interrupted schooling. All teachers and students were from a Midwest Title I charter school. Each teacher team consisted of a content-area teacher and an ESL teacher who taught a student population comprised of 100% African American students, of which 95% of the students identified as East African. Two teams of teachers (T1 and T2) routinely collaborated for lesson planning and taught using the SIOP model, while the other two teacher teams (T3 and T4) also

routinely collaborated for lesson planning but did not use the SIOP model. The students' English language proficiency was measured using the ACCESS pre-test/post-test at the beginning of the school year and at the end. The data supported that although 98% of students demonstrated growth in the composite score for gains in English proficiency, students who received teacher instruction using the SIOP model during class lessons grew significantly more, at 0.84, than the growth of students in classrooms whose teachers did not teach using the SIOP model, at 0.45 (Hayden, 2019).

Integrating SIOP with Teacher Planning, Instruction Delivery and Evaluation

Considering the myriad of differences between students in our classrooms today, their backgrounds, levels of English proficiency, reading levels and content area scaffolds, lesson planning for effective teaching to reach all learners can be a challenge. Strong (2007) posits that highly competent teachers have command of and utilize varied instructional strategies to engage student learning. Thoughtful and reflective planning allows for greater teacher effectiveness and, thus, more effective learning experiences for students in the classroom (Short et al., 2016). One advantage of the SIOP instrument is that it supports effective and specific lesson planning for content area lessons in order to meet the needs of EBs, as well as the flexibility to differentiate to implement best teaching practices for all students in the class (Echevarría et al., 2017).

It is also important to consider the role of fidelity when implementing a program to teach EBs. According to a research study conducted by Echevarría et al. (2011), the degree to which teachers implement research-based practices in the content areas, such as the SIOP model, greatly affects student achievement. In a study funded by the Center for Research on the Educational Achievement and Teaching of English Language Learners (CREATE), the researchers investigated the fidelity of the SIOP model within a large school district with high numbers of seventh grade EBs from eight middle schools. A

total of 12 teachers and 1,021 students were randomly assigned to a treatment group (eight teachers and 649 students) and control group (four teachers and 372 students). Teachers in the treatment group received an intensive two-and-a-half-day professional development in the SIOP, with a focus on why the techniques used in the SIOP are effective with EBs. This training included a review of second-language acquisition, an introduction to the SIOP model to learn each of the eight components and its research background, and practice and implementation time to demonstrate their understanding of the model. Afterward, each participant was presented with a binder of four curriculum units of study in seventh grade science, complete with lesson plans, content and language objectives for each lesson, academic vocabulary development, detailed activities to foster student and teacher interaction, and pre- and posttests to assess prior knowledge and content learning after the unit. To examine fidelity to the model, observation protocols and field notes, written by coaches trained in the SIOP, were used to rate teacher implementation in the classroom. These ratings were plotted on a graph to illustrate the relations between teacher implementation and student gains on assessments. The results of the study concluded that high implementers of the SIOP engaged more frequently with its components throughout the lesson and to a deeper degree. For example, high implementers would often refer back to the content and language objectives throughout the lesson, ask students to explain these objectives in their own words, and explain the academic vocabulary within the objectives (i.e., summarize, establish a purpose).

One study by Li, Steele, Slater, Bacon, and Miller (2016), the researchers investigated the sheltered instruction teaching practices and the use of language of 56 teachers in Dual Language Bilingual Education classes in a northwest school district in the United States using the SIOP model. The study first round of teacher observations focused on an in-depth view of what instruction looked like in the dual language classes

and if there were significant differences between the dual language classrooms and traditional classrooms taught in English. The participants were teachers of English and teachers who taught in the partner languages. The partner languages represented classes taught in Spanish and Russian, and the instruction was provided through one-way and two-way dual language classrooms. The second round of teacher observations focused on the extent that the teachers and students used the partner language during class: at the beginning during the instruction part of the lesson delivered by the teacher, during the student interactive phase where students worked with their peers and documented the quantity of language used by students in the partner language for speaking and writing activities during the lesson (Li et al., 2016). The school district used an observation protocol, adapted from the SIOP model, based on combined the thirty SIOP features into twelve and maintained the eight SIOP components, which classroom observers used to rate the teachers' lessons. Using the SIOP, all of the teachers' lessons were observed and evaluated on the eight SIOP components. The results of the study revealed that all of the classes observed showed evidence of strong teacher instruction and strong implementation of district initiatives, including sheltered instruction and SIOP strategies, across the programs observed using the protocol. This result in the study supported previous research that asserted how sheltered instruction, such as the SIOP model, in and of itself, is useful with all students in many different classroom settings (Short et al., 2011).

Modeling the study by Li et al. (2016), Purdue University researchers Choi, Kim, Wright, and Morita-Mullaney (2023) observed and video recorded 15 teachers from Dual Language Bilingual Education (DLBE) classes and non-DLBE classrooms using the SIOP (Choi et al., 2023). The study focused on how teacher instruction in the DBLE classrooms changed over time and evaluated the impact of specific teacher coursework

and instructional coaching had their teaching practices. Over the course of a two-year period, the teachers participated in instructional group coaching sessions, completed five online ELL teacher licensure classes, and two online DLBE certificate courses at Purdue University (Choi et al., 2023). The findings concluded that, regardless of the language in which the class was taught or whether or not the class was a DLBE or traditional English class, all teachers in the study exhibited strong fidelity when implementing sheltered instruction in their classrooms with students, as measured using the SIOP (Choi et al., 2023). The SIOP also provided data to address areas in which teachers may need additional professional development opportunities to support instruction and student achievement in the DBLE classrooms (Choi et al., 2023).

Teacher Certification Training

Currently, teacher certification training is a serious topic of discussion in the literature in response to the high volume of teacher shortages around the world (Dori et al., 2023; Garcia & Weiss, 2019; Ruitenburg & Tigchelaar, 2021; Troesch & Bauer, 2020). To address this global issue, some countries have proposed alternative pathways to traditional teacher training that allow individuals to become certified as teachers who did not previously hold a degree in teaching (Lucksnat et al., 2022). According to a study by Matsko et al. (2022), the researchers asserted that "little empirical work has been done to determine the degree to which intended differences in non-traditional pathways are being actualized in candidates' preparation experiences" (p. 226). Teacher candidates have an array of choice, however, for teacher preparation that may fulfill each candidate's needs, as there are over 170 educator preparation programs in order to attain teacher certification in the state of Texas (Educate Texas, 2023; TEA, 2023e). Located in universities, school districts, education service centers, community colleges, and private entities around the state of Texas, these educator preparation programs are almost equally divided into

traditional certification programs and alternative certification programs, all approved by the State Board of Educator Certification (Educate Texas, 2023). The Texas Education Agency created an interactive tool titled "Approved Texas Educator Preparation Programs" to assist teacher candidates with exploring the different types of educator preparation program offered by colleges and universities around the state and sort through the certification options that meet their individual needs for certification (Educate Texas, 2023; Texas Education Agency, 2023e). Utilizing this tool, Texas offers 75 traditional certification programs, 102 alternative certification programs, and 76 postbaccalaureate certification programs (Texas Education Agency, 2023e).

Traditional Teacher Certification Programs (TCP)

Undergraduate teacher candidates can simultaneously earn a bachelor's degree or higher while in route to teacher certification while attending university programs (Educate Texas, 2023). This means that prospective teachers can expect to plan a 4-year commitment to work on a bachelor's degree. This coursework is included within the traditional educator preparation for teacher certification. Part of the teacher preparation requires that teacher complete a minimum of fourteen weeks of clinical teaching in a classroom with a mentor teacher to help guide through practical application of the educator preparation coursework in daily lessons (Educate Texas, 2023).

Candidates who already hold bachelor's degree or higher may apply to and attend that university's educator preparation program to earn a teaching certificate (Educate Texas, 2023). This pathway is a one-to-two-year commitment, and some programs allow candidates to obtain a one-year paid internship experience while completing their teacher certification program (Educate Texas, 2023). Clinical teaching is still a requirement if the internship option is not available.

Schmidt et al.'s (2020) research concluded that graduates from traditional teacher certification programs in the area of mathematical pedagogy have statistically higher math content preparation compared to graduates of alternative certification programs. This was a consistent result across different types of alternative teacher preparation programs (Schmidt et al., 2020).

Alternative Teacher Certification Programs (ACP)

In the United States, pathways providing a fast-track to teacher certification are referred to as "alternative" certification programs (ACP), as they provide an alternative approach to the "traditional" university-based programs available for teacher preparation (Matsko et al., 2022). These alternative program models originally emerged in the 1980s in an effort to attract a more culturally diverse group of teacher candidates to the profession (Hammond, 2020; National Center for Educational Statistics, 2022). In the state of Texas, about 377,836 teachers were employed for the 2022-2023 school year and were represented in the following demographics: 55% White, 30% Hispanic/Latino, 12% Black/African American, 2% Asian/Pacific Islander, and 1% representing two or more races/ethnicities (TEA, 2023a). More than 33% of teachers employed in Texas were certified through alternative certification programs, an increase from more than 26% noted ten years earlier (Landa, 2022).

Alternative Certification Programs are designed for teacher candidates who already hold a bachelor's degree or higher and offer a different approach to attain the required teacher preparation curriculum. Coursework and training typically require a one-to-two-year commitment in the program, with some programs offering a one-year paid internship while completing certification (Educate Texas, 2023).

Multicultural Education

James A. Banks has been a pioneer and long-standing proponent of integrating multicultural education into content area curriculum in the classroom. For Banks, "the goal of multicultural education has been to transform the classroom curriculum to more culturally responsive lessons and also give teachers practical applications to become more multicultural educators" (Nance, 2022). Banks (2020) explained that multicultural education is "an idea, an educational reform movement, and a process" (p. 13). With the emphasis on providing equitable learning opportunities for all students, teachers are tasked with the focus of implementing culturally inclusive content that foster an appreciation of students' cultural identities and how they, too, can be included in their own life narratives, as well as become advocates in their own neighborhoods, in their communities, and in their world (Nance, 2020).

There are five dimensions of multicultural education, and they include: content integration, the knowledge construction process, prejudice reduction, equity pedagogy, and an empowering school culture and social structure (Vasquez, 2022). Banks created an evaluation tool that could be used to assess the degree to which a curriculum aligned with these five dimensions of multicultural education (Vasquez, 2022). Banks' Levels of Integration of Multicultural Content outlined four approaches to integrating multicultural education into social studies curriculum, adding to the depth and complexity with each level (Vasquez, 2022). These levels can further be used by teachers to develop their own culturally responsive curriculum framework for their content area and apply it in meaningful ways with all classroom learners, always striving to integrate to Levels 3 and 4. Atwater asserted that when instruction reaches Banks' Level 4 implementation, this is the level that leverages equal access to the depth and complexity of the discipline that fosters full participation in addressing issue of social justice (2010).

Table 2 provides a summary of Banks' four Levels of Integration of Multicultural Content and highlights the important foci at each level.

Table 2:

Overview of James A. Banks' Levels of Integration of Multicultural Education (Banks, 2020).

Level of Integration	Depth and complexity of content integration into lessons
Level 1: The Contributions Approach	Content added to the existing curriculum that focuses on diverse and ethnic heroes, celebrated holidays, and cultural characteristics.
Level 2: The Additive Approach	Content added to the existing curriculum that focuses on diverse and ethnic content, concepts, themes and cultural perspectives.
Level 3: The Transformative Approach	Curriculum structure is changed to foster students' ability to consider content, issues, events and themes from the perspective of diverse ethnic and cultural groups.
Level 4: The Social Action Approach	Curriculum structure is changed to foster students' identification of important social issues and challenges the students to create an action plan concerning how they would solve the issues.

In a study by Nance (2022), the researcher examined how two middle school social studies teachers, in collaboration with their instructional coach, transformed their social studies class by transforming the social studies curriculum structure and the teaching resources used. The teachers and instructional coach planned their social studies units of study and daily lessons using their assigned, district-approved social studies textbook, while integrating many of Banks' multicultural approaches within the unit. The participants also incorporated the essential characteristics and standards from the Association of Middle Level Education (AMLE), which define the pertinent

characteristics of effective middle schools, and the College, Career and Civic Life Framework (C3) to foster students' inquiry mindset (Nance, 2022). Although initially hesitant to engage with and use the social studies textbook as the primary teaching resource, the teachers discovered that using the textbook content as a springboard to integrate Bank's multicultural approaches allowed for their students to excel to higher levels in comparison to previous social studies units taught before the study was conducted. This study also resulted in higher student engagement throughout the social studies units, especially with their special education students. Additionally, the students took more ownership of their learning while participating in activities that integrated Banks' multicultural approaches at the higher levels, and the students performed higher on the end of unit assessments (Nance, 2022).

Multicultural Science Education

Vasquez (2022) affirmed that there have been education policy initiatives that have promoted the integration of multicultural content within school curricula at the national and local levels. However, there are still discrepancies in understanding of the importance of and focus of this content integration into daily instructional practices with students, especially in the area of STEM education. Vasquez continued to assert that "the integration of culturally responsive instructional practices helps students from marginalized groups to become more invested in science, perform better on assessments, and communicate science more effectively" (Vasquez, 2022, p. 2).

In a recent research study by Vasquez (2022), the researcher also applied Banks' Levels of Integration of Multicultural Content to a traditional microbiology science curriculum that spanned 16 weeks of class instruction. The study focused on how the integration of multicultural content impacted: 1) students' perceptions of science, 2) students' interest and their academic success in science, and 3) student learning of the

relevant sociopolitical issues that arose during class lessons (Vasquez, 2022). The curriculum for the microbiology class was modified to reflect Banks' Levels of Integration of Multicultural Content at level 3 for the majority of classroom assignments and lab activities, and interactive discussion prompts, with some activities rated at a level 4, respectively (Vasquez, 2022). Multicultural themes and students' cultural contributions were explicitly welcomed during class lessons. Prominent scientists reflecting diverse ethnic backgrounds were highlighted and studied for their significant contributions to the field of microbiology and its scientific themes. Results from students' pre-tests, post-tests, and responses to question probes collected at the end of assignments were used to gather student data for the study. Additionally, data from classroom discussions and a focus group were also collected and analyzed. The results showed that students reported that as they learned the microbiology content that connected to their own life experiences, they were able to understand how their behaviors and choices, and the consequences attached to those, whether positive or negative, impacted their life and that of their families. As a result of the connections to the relevancy of microbiology in the students' lives, the students' interest in the subject matter increased as well as their academic performance in the class. Additionally, students became more cognizant of the sociopolitical issues that arise in the field of microbiology.

Cultural Components of the SIOP Model

Culturally responsive teaching, anchored in the research of Geneva Gay (2020), is the intentional leveraging of students' funds of knowledge, cultural learning styles, and tools that they bring to the classroom in order to create opportunities to maximize student learning for students of color (Atwater, 2010), like emergent bilinguals (Evans et al., 2020; Hammond, 2020; Moll, 2019). Devoid of a superficial approach to teaching that simply integrates cultural anecdotes into classroom lessons to engage students of color,

Gay (2020) asserted that "when academic knowledge and skills are situated within the lived experiences and frames of reference for students, they are more personally meaningful, have higher interest appeal, and are learned more easily and thoroughly" (p. 108). It is an assets-based approach to reaching all classroom learners, holding high expectations for all students and presenting academic content in a manner that reflects this approach. These interactive learning opportunities invite students to enter into conversations in the content areas to "think critically about inequities and injustices by posing the following questions: Why did this happen? Who is most impacted? and What action can we take to resist inequities/ignorance/racism?" (Evans et al., 2020, p. 63). As teachers become increasingly intentional about challenging minoritized students to engage in these types of conversations, they will begin to see the world around them through different lenses and, ultimately, find value in analyzing the information learned and using their voice to make the judgements necessary for change (Atwater, 2010; Hammond, 2020). In the area of STEM education, Holmlund et al. (2018) were troubled with the underrepresentation of students of color in STEM, stating "it has been apparent in education that when equity is not explicitly named and addressed, it is overlooked" (p. 16). They continued to reinforce the practice of being explicit and intentional in the opportunities afforded to, or being excluded from, students of color in STEM instruction. The consequences of not embracing this shift in both mindset and pedagogical practices, by teachers, education practitioners and policy makers, and community stakeholders, will continue to perpetuate the deleterious effects of educational and adult life experiences for students of color (Evans et al., 2020).

Science Instruction

In 1985, after the passing of Haley's Comet, the American Association for the Advancement of Science (AAAS) developed and advocated their "Project 2061: Science

for All Americans" to ensure access to learning science for all students (AAAS, 1989). As a response to the decline nationwide in enrollment in high school science courses and a general decrease in the amount of time spent on science instruction in the classroom at the elementary school level, the National Science Foundation began a movement that garnered interest in, promoted, and advocated for careers in science (AAAS, 1989). However, disparities in science achievement still existed between cultural groups in learning science in school (Atwater, 2010; Settlage et al., 2005; Short & Echevarría, 2016). While student achievement of English-speaking students was consistent, closing the gap between them and their non-English-speaking peers in science remains unrealized (Settlage et al., 2005). Today, this is still an ever-present reality in the United States as the national average of EB students enrolled in public schools continues to increase, 10.3% in 2020, or more than five million students. In the state of Texas, the percentage of EB students enrolled has increased to more than 20% (NCES, 2019). Moreover, careers in the areas of advanced innovation and technologies are challenged with requiring that the incoming workforce be well-educated in 21st century skills and extensive knowledge in STEM, the integration of science, technology, engineering, and mathematics into school curricula and educational programs (Granovskiy, 2018).

Today, there is a pedagogical shift in science instruction that has changed the manner in which classroom teachers teach science. This means that instruction has been tailored away from general rote memory activities and acquiring basic knowledge. Students are challenged in their thinking to solve relevant problems in the world through interactive participation in the discipline (Atwater, 2010; Banks, 2020) and student engagement in cooperative inquiry activities with their classroom peers (Grapin et al., 2022).

In and of itself, the subject of science may seem like a foreign language, laden with academic vocabulary rooted in Greek and Latin, and grounded in making connections between hands-on learning and more abstract thinking (Halliday & Martin, 1993; Horton, 2022; Moll, 2019). Science is a subject area with specialized vocabulary and language features used to construct, represent, and communicate scientific knowledge with precision (Coleman & Goldenberg, 2010c). Specialized language poses many difficulties in learning science, even for students whose primary language is English. For EBs, these challenges include learning academic vocabulary while simultaneously learning the language structure and verb tenses of English, developing more advanced literacy skills to synthesize science texts, and applying this knowledge in order to engage meaningfully in a science classroom in a relatively short amount of time (Coleman & Goldenberg, 2010c; Faggella-Luby et al., 2016; Grapin et al., 2022).

Science Instruction for EBs

When considering the amount of planning and preparation that is required to teach a science lesson, additional thought must be given to the manner in which the lesson will be delivered and the scaffolds needed throughout to connect ideas, especially for EB students. Lynch (2000) posited that although EBs represent an increasing portion of the population of school-age children, and in some areas are experiencing exponential growth in the enrollment of EB students, there have been few instructional materials developed that target their learning needs in science. Seah et al. (2014) further assert that purposeful integration of the lexicogrammatical features of science must take place for these students to achieve academic success in science. Connecting science vocabulary instruction to the concrete, hands-on nature of science inquiry is necessary in order to build upon more abstract science content and understanding. This is especially important for EBs, as abstract thinking and understanding content in science while simultaneously learning the

English language often become a barrier to learning science (Short & Echevarría, 2016). With the needed instructional materials to teach science and the explicit instruction required to meet the EBs' academic needs through vocabulary development, EBs' comprehension and application of science may improve (Coleman & Goldenberg, 2009, 2010a).

The language of science is highly academic and unique. Therefore, EBs also experience a great deal of difficulty in developing a conceptual knowledge of the academic language of science and the interrelationships between science terms. Cummins (1984) asserted that it is necessary to provide sufficient communicative input to scaffold the instruction in academic content areas, like science, in order to develop and connect EBs' comprehension needs between EBs' first language (L1) and learning a second language (L2), English. These skills are interdependent, and the interdependence becomes more engaging and meaningful when paired with a high-interest, inquiry-based content area, such as science, where science content objectives and English language objectives are developed together (Fagella-Luby et al., 2016).

Coleman and Goldenberg (2010a, 2010b, 2010c) asserted that it is critical to develop oral language proficiency for learning to occur and, thus, student achievement to happen. This applies to the science classroom as well. Explicit instruction in vocabulary development must take place within the science classroom environment. Nargund-Joshi and Bautista (2016) posited that consideration should be given to key lesson planning strategies to address the differences in English proficiency levels of EBs in the science classroom. Knowing the language-proficiency levels of EBs helps teachers modify language, instruction, and assessments, not lower content expectations, so that learning can occur. Research indicates that content objectives should be aligned with the language objectives of a lesson, with special focus and attention given to scaffolding vocabulary

and the necessary grammar structures needed to learn science content in English (Himmel et al., 2009; Nargund-Joshi et al., 2016; Short & Echevarría, 2016).

Creating structured, interactive opportunities in which EBs can practice using the English language and having the opportunity to engage in challenging interactions with their peers have been successful in meeting EBs' second language development needs (Coleman & Goldenberg, 2010a, Nargund-Joshi et al., 2016). In a study by Haverly et al. (2021), the researchers explored how EB students create their own meanings and explanations for the science vocabulary of a lesson. Rather than pre-teaching vocabulary at the beginning of the lessons, this approach, often used in STEM teaching, allowed EB students to engage in and discuss their meaning-making through building and refining models during the lesson and provided increased flexibility for students to demonstrate and communicate their scientific understandings (Haverly et al., 2021). For example, bilingual teachers were provided with professional development and examples demonstrating how to engage students in scientific modeling for a lesson about the disappearance of a puddle. This allowed students to describe the conditions for the puddle disappearance. For example, the students may describe that this phenomenon, with or without the use of the new vocabulary, was the result of evaporation because of the sun's heat, saturation into the soil, or transpiration due to the grass around the puddle soaking up the water (Haverly et al., 2021). As students were given opportunities to revise their models and explanations, discussed in their home language and in English, the teachers planned follow-up activities and a read aloud that ultimately introduced the students to the target academic vocabulary for the lesson. The results showed that EB students have the autonomy to utilize their own language first to create explanations for sense-making during the science lesson, and thus, created a more meaningful science experience during this lesson because of the thinking that was required (Haverly et al., 2021).

Jackson et al. (2017) suggested taking academic vocabulary in science and building an interactive word wall, one that encourages students to illustrate the vocabulary words, manipulate the words, and make connections between vocabulary concepts in constructive ways. This ongoing activity supports meaningful second language development instruction in the science classroom, because it is a student-centered activity immersed in vocabulary. Interactive word walls "strategically target academic vocabulary, visually display connections between inquiry science activities and vocabulary, and are student-generated" (Jackson et al., 2017, p. 84). Science teachers may incorporate word walls using tangible items (realia), or visual supports such as pictures and models that exemplify the vocabulary and build upon them throughout lessons and units to create the context that supports vocabulary and science concept meaning, or context-rich support (Cummins, 1984). Jim Cummins studied the ways in which the acquisition of language was perceived as easy or difficult. Cummins (1984) sorted different classroom activities on levels of difficulty by how cognitively demanding it was and the contextual support required for understanding the activity. Contextual support is created using gestures, demonstration, and a variety of visuals, including pictures, diagrams, and graphs. This type of context-rich support is important to all learning in a new language, such as English (Cummins, 1984, as cited in Jackson et al., 2017). These results were exemplified through classroom implementation with 150 teachers trained in incorporating interactive word walls in their classroom (Jackson et al., 2017). Administrators and other classroom teachers were eager to support and implement interactive word walls, too, because of the successful implementation from the first teacher cohort trained (Jackson et al., 2017).

In a study conducted by Fagella-Luby et al. (2016), the researchers conducted ongoing assessments of EBs' reading comprehension and science content through

retellings. The researchers posited that using trade books, in conjunction with conducting hands-on learning investigations during science lessons, offered EBs more authentic opportunities to retell what they have learned in lessons, and thus can have a positive impact on comprehension of science content (Fagella-Luby et al., 2016). Additionally, teachers were able to more readily assess whether EBs were focusing on the essential content objectives of the lesson and provide clarification, if needed, to correct student misconceptions. The researchers concluded that the use of non-fiction text features in the science trade books also allowed EBs to develop a greater conceptual knowledge as they made connections beyond the literal level of the text to speak about their learning using the appropriate terminology and precise academic language of the lesson (Fagella-Luby et al., 2016). EBs' engagement in retellings provides important opportunities for teachers to assess EBs' science understandings, even when these students may not be quite fluent enough in English to write their thinking.

The Role of Administrative Support

School and school district leadership are critical in setting high expectations for student achievement and teacher instruction to meet those goals. Principals and district administrators hold important roles in creating a shared vision and culture of pride in their schools and within a school district. In a study by Lochmiller and Acker-Hocevar (2016), the researchers explored how school administrators addressed the need to make instructional improvements in math and science and the strategies used to meet those goals. Using semi-structured interviews with over twenty high school principals and assistant principals, the researchers discovered that the school administrators were more apt to address instructional improvement challenges in math and science that did not require them to be experts in math and science curriculum content (Lochmiller & Acker-Hocevar, 2016). More specifically, these school administrators "reframed these

improvement challenges" for their high schools through purposeful hiring of teachers, providing needed professional development, and supporting teacher collaboration within the math and science departments (Lochmiller & Acker-Hocevar, 2016, p. 274). The results showed that all of the school administrators in the study primarily empowered their math and science teachers and leveraged expertise in the math and science content areas with the expertise of the content area consultants for the school district to engage in collaboration and data-driven discussions. This strategy contradicted the traditional literature assertions that school administrators should be instructional leaders with a strong foundation in content area literacy (Blase & Blase, 1999). However, the administrators in this study demonstrated instructional leadership in an organic manner that evoked change on the collaborative environment in which the desired conversations that addressed the instructional changes needed could take place (Lochmiller et al., 2016).

A dissertation conducted by White (2023) focused on principals' perceptions concerning how they faced the difficult task of improving student achievement while simultaneously closing gaps in learning of low socioeconomic students (low SES). Eighteen principals were interviewed about what their perceptions were with regard to their behaviors that enabled their schools to be identified as a high-performing school in Texas (White, 2023). Principals responded that the following leadership behaviors resulted in their administrative effectiveness to increase student achievement: making data-driven decisions, effectively hiring the right teachers, and building relationships (White, 2023). When asked what challenges the principals faced when addressing the learning gaps of their low SES population, the results showed a need for more teacher professional development opportunities and social emotional learning support for both their staff and their students (White, 2023).

Summary

In this chapter, a review of the literature was presented, highlighting trends in second-language learning instruction for EB students, research about the SIOP model, and teacher education in the area of science through traditional certification and alternative certification programs. Research in multicultural education and multicultural science education, and science instruction were included to draw attention to the importance of and responsibility to teaching science with the depth and complexity to challenge all students' thinking about critical issues in science. Additional research in content area instruction in science for EBs and why learning science is difficult for EBs as they acquire science content and academic vocabulary in English were also pertinent topics to lay the foundation for this study. Research highlighting the important role of school administrators was also included. This study sought to examine the teachers' and administrators' perspectives in the implementation of the Sheltered Instruction Observation Protocol (SIOP) model with EBs in fifth-grade science. The methods used to conduct this study are described in Chapter 3, and the results of this analysis are revealed in Chapter 4. Chapter 5 presents the conclusions and recommendations based on a synthesis of literature and the findings of this study.

CHAPTER III:

METHODOLOGY

Overview of the Research Problem

The purpose of this case study was to explore science teachers' perceptions and administrators' perceptions of implementation of the Sheltered Instruction Observation Protocol (SIOP) model with emergent bilingual (EB) students in the fifth-grade science classroom. As EBs are learning to master the English language, it is also pertinent to provide enriched experiences in science and content area literacy to improve students' cognitive and conceptual development in the subject area of science. Research has indicated that EBs have difficulty acquiring science content in English because of its own specialized vocabulary and semantics (Halliday & Martin, 1993; Seah et al., 2014). The Sheltered Instruction Observation Protocol (SIOP) model was created for such a challenge: to systematically support EBs in the content areas, such as science, through comprehensible and strategic teaching techniques and academic language development while concurrently facilitating EBs' acquisition of English (Echevarría et al., 2017).

This chapter describes the participants and setting for this study. In addition, data sources and collection are described. Explanations of how the data were analyzed, reliability and validity, and the limitations of the study are discussed in detail.

Research Purpose and Questions

The purpose of the case study was to examine teachers' and administrator perceptions about implementing the Sheltered Instruction Observation Protocol (SIOP) model with EBs in fifth-grade science. The results of this study may be valuable and instrumental in helping school districts assess the extent to which teachers apply their knowledge and practice of the SIOP lesson planning and delivery approach to meet the second language learning needs of their EBs. Additionally, the information gained about

the value of the academic support system, provided at the school and district levels for the fifth-grade science teachers teaching EB learners using the SIOP model, may have a larger impact due to teacher and student success outcomes. EBs are learning to master the English language in addition to learning content-area knowledge, skills, and vocabulary within the context of core subjects, such as science, social studies, and mathematics. This case study explored the following research questions:

1. What are the teachers' perspectives of their implementation of SIOP model in fifth-grade science?
2. What are the administrators' perspectives of the implementation of SIOP model in fifth-grade science?

Research Design

This qualitative case study investigated the teachers' and administrators' perceptions concerning the implementation of SIOP model in fifth-grade science classrooms using a face-to-face focus group for the science teachers, as well as individual interviews for administrators. Pseudonyms were used for all names in this study, as well as for all administrator and teacher names.

Participants

This study was conducted using teacher focus group data, from four fifth-grade science teachers who teach at a middle school, Ray Middle School (pseudonym), located in a southeastern suburban Texas public school district. Ray Middle School serves fifth and sixth graders from multiple elementary schools in the school district. Interview data from two middle school principals, including the principal from Ray Middle School, and four school district administrators were also collected. The district administrators held the following roles at the district's education center: K through 6th grade science specialist,

Executive Director of Intermediate Schools, Director of Bilingual Education, and school district Superintendent.

The district employs 1,339 teachers who serve approximately 21,000 students from Early Childhood Education through twelfth grade. Many ethnic groups are represented in the school district, with approximately 2,436 students identified as EBs who participate in the bilingual, dual language or ESL program. The district embraces a bilingual program and dual language program model through which instruction in English is a major component. The student demographics of the school district include approximately 32% economically disadvantaged, 32% White, 37% Hispanic, 11% Asian, 15% African American, and 4% identified with two or more races. Students identified as At-Risk make up 33% of the student population, and 12% of the students in the district are identified as English Language Learners (TEA, 2022).

Ray Middle School

Ray Middle School (Ray MS) serves approximately 754 students in fifth through sixth grades (TEA, 2022). The school is located in a low-socioeconomic part of the school district, and it is identified as a Title I school. The student demographics of Ray MS include approximately 46% economically disadvantaged, 45% Hispanic, 27% White, 19% African American, 57% At-Risk, and 22% EB. The total number of students in fifth grade is approximately 370 students, 120 of which are EB students. There are 105 Spanish-speaking Hispanic EBs enrolled in fifth-grade science. Of the other fifteen EB students, all identified as ESL and participate in the ESL program, six of these EB students speak Vietnamese, two students speak French, and there is one EB student that speaks each of the following foreign languages: Arabic, Bengali, Korean, Malayalam, Mandarin, Nepali, and Urdu, respectively. Fifty-five teachers serve the students of Ray MS. Five teachers serve all fifth graders in science instruction.

This project concentrated on the fifth-grade science teachers of EBs from Ray MS, as well as examined the perspectives of school administrators and district administrators about implementing the SIOP model during science instruction with EB students.

The teachers of EBs in fifth-grade science were personally invited to participate in the study. The researcher further explained the process, time, and final product that the research entailed in order to advocate for their participation.

Participant Selection

Fifth-grade Science Teachers of Emergent Bilingual Students

The science teacher participants from Ray Middle School were selected, because they have a high student population of EBs. These participants at this campus have been trained in sheltered instruction strategies, in the SIOP model, and teach fifth-grade science to EBs. These science teachers were invited to participate in the focus group to discuss perspectives about their implementation of the SIOP in the science classroom and reflect upon the practices they used with EBs.

School and District Administrators

Six administrators were selected because they offered different perspectives in the school system vertical alignment and school leadership support to these teachers. They also offered administrative perspectives "looking into" the classroom and may provide greater insight into the overall implementation of the SIOP model and how it affects the fifth-grade science department and student achievement, like that of emergent bilingual students, in fifth-grade science. The school administrators included two middle school principals, one of which was the principal of Ray MS. District administrators included the K through sixth grade science specialist, the Director of Bilingual Education, the Executive Director of Intermediate Schools, and the school district Superintendent.

Children were not selected to participate, as this study focused on teacher and administrator perspectives only.

Data Collection Procedures

Researcher's Role

In qualitative research, the researcher takes on the primary role and responsibility for all data collection, and this role requires transparency in identifying personal values, assumptions, and bias at the beginning of the study (Creswell, 2018). The researcher conducting this study is currently a middle school Dual Language teacher in the areas of English language arts and social studies in a fifth-grade classroom. She currently teaches in the same school district and school in which the study was conducted. With twenty-four years of elementary, middle school, and junior high experience teaching in dual language, bilingual and ESL education, she has also served as a bilingual counselor and an assistant principal in neighboring school districts. The researcher is also a second language learner, fluent in Spanish. Within her professional context of bilingual education and educating emergent bilingual (EB) students in different roles, the researcher's funds of knowledge, awareness, and sensitivity has been enhanced and enriched when considering the challenges and issues encountered in today's classroom.

The researcher chose Ray Middle School to conduct the study, because the school has been successful in meeting the academic needs of students from diverse backgrounds in fifth and sixth grade classrooms, including EB students in ESL and dual language programs. As a dual language teacher, the researcher saw a need for sheltered instruction strategy implementation that supported the development and learning of science content with EB students in fifth-grade science at her campus. The researcher has a professional relationship with the teachers and staff, the principal of Ray Middle School and the administrators in the school district. Being an insider has given the researcher a unique

perspective regarding teaching EB's using SIOP, however, every attempt has been made to keep personal biases in check when the teacher focus group and individual administrator interviews were conducted for this study.

Procedures

Prior to beginning data collection, Committee for the Protection of Human Subjects (CPHS) approval was obtained by the researcher from the university and written approval was obtained from the school district. The researcher met with the campus principal of Ray Middle School and explained the purpose of the study, data collection procedures, and the measures of confidentiality taken to protect the subjects in the study. The researcher arranged a time with campus principals to meet with individual teachers of EBs who were part of the research study. At these meetings, the researcher provided the same information to the teachers that was shared with the principals.

Upon agreement to participate, the researcher set up a time outside of the school day and off campus to meet with teachers, giving thought to conversation privacy. The researcher explained the purpose of the study again, ensured consent had been signed, and explained how to maintain confidentiality of the group during and after the study. The participants gave permission to be audiotaped for the focus group. During the audiotaped focus group, the researcher asked the teachers questions about their perceptions, attitudes and behaviors about the SIOP implementation and EB student achievement (see Appendix A). Ashley, one specific teacher participant, was also interviewed after the focus group to acquire a more in-depth perspective into her comments that she had made during the focus group about SIOP implementation with EBs in her science class. This interview was recorded and transcribed. Email correspondence was used after the meeting when the teachers felt the need to clarify their

thinking and then provided additional information pertaining to the study. The researcher transcribed the teacher focus group information for coding purposes.

The researcher met individually with the school administrators about their perceptions about the SIOP implementation, their perceptions about the support they offered or saw a need for in support of fifth-grade science teachers in the classroom, and EB achievement at their campuses and across the district (see Appendix B). These individual interviews were conducted outside of the school day, audio recorded with participant permission, and transcribed as well.

Teacher Focus Group and Administrator Participants

Table 3 offers a visual illustration of the science teacher and administrator participants.

Table 3:

Teacher and Administrator Participants

Name (pseudo-nym)	**# Yrs. Teaching Experience**	**Interview**	**Focus Group**	**Ethnicity**	**Gender**	**Title**	**Teacher Edu. Program: Traditional (TP) or Alternative Certification (ACP)**
Ashley	8	X	X	Hispanic	Female	Science teacher	ACP
Kerry	10		X	Anglo	Female	Science teacher	ACP
Kim	5		X	Anglo	Female	Science teacher	TP
Savannah	23		X	Anglo	Female	Science teacher	ACP
Ophelia	16	X		African-American	Female	School Principal	ACP
Abigail	17	X		African-American	Female	School Principal	ACP
Ingrid	23	X		Anglo	Female	Science Specialist	ACP
Laniah	22	X		African-American	Female	Executive Director of Intermediate Schools	TP
Elyn	23	X		Hispanic	Female	Director of Bilingual Education	TP
Brian	19	X		Anglo	Male	Superin-tendent	ACP

Data Analysis Procedures

To analyze the research questions, the researcher listened to the teacher focus group audio recording, as well as the individual administrator interviews in order to transcribe what the participants had communicated. The transcribed data was also member-checked with the participants and corrections were made before it was added to the study. The researcher read through all transcriptions using qualitative coding to extract common themes. Emergent coding refers to organizing chunks of text by emerging patterns, themes, or relationships that may be found when analyzing qualitative data (Miles et al., 2019). The researcher focused on reoccurring words and phrases throughout the transcriptions to identify commonalities in the data.

The data analysis was completed using a constant comparative analysis approach (Miles et al., 2019). Through a constant comparative analysis approach, the researcher was able to compare and contrast the participants' responses to the same questions between the teachers in the focus group (Miles et al., 2019). This approach was also applied to the transcriptions of the administrator interviews, in order to extract possible a-priori themes from both participant groups derived from the literature review conducted for the study (Kolb, 2012; Miles et al., 2019). The themes identified from the teacher focus group were the following: modeling and support, purposeful lesson planning time for implementation, accountability and follow-up with in-class implementation. From the administrator interviews, the following themes emerged: creating a teachers' needs assessment, coordinating support for teachers with district specialists, and administrator professional development. Once the themes were coded, the researcher was then able to compare these themes across and within the participant groups to identify commonalities and outlier data (Kolb, 2012). Afterward, the researcher compared the teachers' perspective themes to the themes gleaned from the administrators' perspectives.

The researcher ensured that there was more than one instance where participants spoke about the same subject in order to categorize that subject as a theme from the data.

Validity

The researcher ensured that the qualitative findings were valid through member checking to ensure accuracy of information from all of the participants (Miles et al., 2019). During the teacher focus group and individual interviews with the administrators, the researcher interacted with the participants. After the participants responded to each question in the protocol, the researcher repeated what the participant had said to ensure that the participants' intended meaning was clear, and any researcher misinterpretations were immediately clarified with the participants during that time. After the teacher focus group and the individual interviews with administrators, the researcher again reached out to the participants, through emails, when needed, to clarify meaning during the analysis process. In addition, the researcher looked for negative cases, or remarks that were not congruent with the thinking of other participants in the study. All participants were fully described, and all participant roles were fully defined in the study.

Reliability

Before conducting the teacher focus group and individual administrator interviews, the researcher ensured that the research questions were clearly written. The researcher's role was cited, and it clearly explained how it related to the study. The answers for the interview protocols were connected to the SIOP model and implementation, as well as to Cummins' theory of language acquisition.

Privacy and Ethical Considerations

Once CPHS (Institution Review Board – IRB) research approval was received from both the University of Houston-Clear Lake and the school district, then the process of data collection began. The researcher met with fifth-grade teachers in person to explain

the study, secured signed consent for their participation, and discussed the process of data collection using the teacher questionnaire and teachers' participation in the focus group with their peers, and follow up email, if needed. The researcher invited the administrators individually to be voluntary participants in the study. As the researcher met with each administrator, the study and its significance were explained as well. Signed consent was secured before each interview. Each teacher and administrator received a pseudonym name to maintain participant confidentiality, and the corresponding participants' names will be kept in a research folder in a locked filing cabinet in the researcher's office. All research data collected for this study will be secured on a drive in a locked filing cabinet for three years. After three years, all research data will be destroyed. There was no foreseeable risk of participation at the time the study took place.

While every effort was made to keep participants' names and contributions confidential, it was communicated that it is nearly impossible to guarantee when meeting with a focus group. Prior to any focus group or individual interview meetings for data collection, the researcher discussed the benefits of confidentiality and the implications when the agreement of confidentiality was broken.

Research Design Limitations

This study was limited in focus by studying only fifth-grade science teachers and school administrators in one specific middle school. Since the sample group was rather small with a total of ten participants, it must be noted that a larger group may yield different results. Due to lack of interest on the part of additional teacher participants at other middle schools in the school district, the researcher was only able to interview a limited number of fifth-grade science teachers and administrators. Although many findings may be common across other learning environments, this study is not necessarily applicable to other school environments. Teacher and administrator perceptions may be

similar among professionals who service EBs in their classrooms and lead schools as administrators. However, even though the results cannot be generalized to all fifth-grade science teachers and school administrators who work with them, it is hoped that the researcher findings may be helpful to others who are working with fifth-grade EB students using the SIOP model.

Summary

The purpose of this qualitative research study was to examine teacher and administrator perceptions about the classroom implementation of the SIOP model in science lessons in fifth-grade classrooms with emergent bilingual students. Through the use of a teacher focus group and one-on-one interviews with school district administrators, the researcher attempted to identify the factors that aided and hindered the implementation of the SIOP model with emergent bilingual students.

CHAPTER IV:

RESULTS

The purpose of this study is to examine teachers' and administrators' perspectives on the implementation of the Sheltered Instruction Observation Protocol model (SIOP) in fifth-grade science classrooms. As EBs are learning to master the English language, it is essential to provide enriched experiences in science as well as in content area literacy to improve students' cognitive and conceptual development in the subject area of science. Research has indicated that English Learners (ELs) have difficulty acquiring science content in English because of its own specialized vocabulary and semantics (Halliday & Martin, 1993; O'Toole, 1996; Seah et al., 2014).

This chapter presents the thematic results of the data collected, transcribed, and analyzed for this qualitative study. The researcher derived the emergent themes through a thorough analysis of the interview and focus group transcriptions. One teacher focus group, consisting of four fifth-grade science teachers, and six individual administrator interviews were conducted using structured questions. The focus group and interviews were conducted using two separate interview protocols created by the researcher, one for teachers (see Appendix A) and one for administrators (see Appendix B), to explore the following research questions:

1. What are the teachers' perspectives of their implementation of the SIOP model in fifth-grade science instruction?
2. What are the administrators' perspectives of the implementation of the SIOP model in fifth-grade science instruction?

The results are presented thematically. Several themes have emerged through qualitative coding and analysis. The coding and analysis protocols were different for each group participating in this study. For the teacher group, the salient common themes

include SIOP Modeling and Support, Purposeful Lesson Planning Time for SIOP Implementation, and Accountability in Implementation of the SIOP. For the administrator group, the following themes emerged: Creating a Teachers' Needs Assessment, Coordinating Support for Teachers with the Science Specialist, and Administrator Professional Development in the SIOP model.

Theoretical Framework

This study used a theoretical framework to enhance the understanding of the teachers' and administrators' experiences and perceptions in implementing the SIOP model in fifth-grade science classrooms. The theoretical framework used to guide the study is Cummins's Theory of Language Acquisition (Cummins, 1984). Cummins believed that language learning is two-fold. Language learning is negotiated and learned through both components, and it is most effective when built upon the students' first language, L1, or native tongue, as a strong foundation for learning a second language, L2. The first and easiest component to develop when learning a second language is the social component in which students learn to socially interact with others through the Basic Interpersonal Communication Skills (BICS) developed through daily social interactions in listening to and speaking with friends and family. This can occur while eating at lunch, playing at recess, or participating in extracurricular activities in and out of the school environment. Upon arrival to a new country, strong BICS can be developed between six months to two years. According to Cummins, students may thrive using BICS, however it is a common misconception that students have reached a high level of language proficiency because they demonstrate a strong level of social language and communication skills.

While BICS are important, Cummins emphasized that it is the Cognitive Academic Language Proficiency (CALP) skills that allow students to fully develop their

second language acquisition, because this cognitive approach to learning is more effective and allows for students not only to become bilingual, but to excel in their academics. CALP is the language of reading, writing, and communicating on a scholarly level that enables students to successfully engage in their academic interests. Students become readily equipped to address classroom tasks such as comprehending in the content areas like science and social studies, applying the use of complex sentence structures to their writing, comparing and contrasting characters, and evaluating character behaviors in a novel.

Participant Demographics

A total of 10 participants, four science teachers and six school and district administrators, were selected to participate in the study. All teachers and administrators were from one suburban school district in southwest Texas. The fifth-grade science teachers, representing one Title 1 middle school campus, agreed to participate, as they collaborate and work with one another. This middle school, Ray Middle School (pseudonym), consists of fifth and sixth graders. Their fifth-grade classes include students identified as English Learners (ELs), and they use the SIOP model during science lessons. This school is comprised of 754 students, 47% are female and 53% are male, 45% Hispanic, 27% White, 19% Black – African American, 5% Asian, and 4% Two or More races acknowledged. Emergent Bilingual (EB) students represent 22% of the student population, while 25% are bilingual learners and 4% participate in the ESL program (Ray Middle School, 2023).

Middle school principals and school district administrators were also invited to participate: two middle school campus principals, including the principal of the middle school campus of the fifth-grade science teachers who participated, the science curriculum specialist, the Director of Bilingual Education for the district, the Executive

Director of Middle Schools, who was once a principal at different Title 1 middle school campus in the same school district, and the new Superintendent of Schools for the district.

Since this qualitative study sought to explore the perceptions of teachers and administrators on the implementation of the SIOP model in fifth-grade science classrooms, the researcher thought it prudent to provide additional information about the participants. A pseudonym was given to each participant in order to protect their anonymity and privacy.

Science Teachers

Ashley

Ashley is a fifth-grade science teacher in a Dual Language classroom, with over eight years of teaching experience as a bilingual/dual language teacher. She graduated with a bachelor's degree in interdisciplinary studies and completed an online alternative certification program (ACP) through Texas Teachers. Ashley is currently completing her master's degree in Instructional Design and Technology, as she expressed her appreciation for the instruction she has received in technology integration after school districts shut down because of the rise in the population with COVID in March 2020. She explained:

> It is the direction in which education is heading, and there are many advantages in teaching through technology. I believe knowing how to design lessons efficiently and effectively are great benefits that I receive, and I will be able to apply this knowledge in my science classroom with all of my students, GT, those in special education, and especially with my ELs who struggle with technology usage.

Kerry

Kerry is a fifth-grade science teacher in a general education classroom. Initially, Kerry completed a bachelor's and a master's degree in business. She, too, completed her alternative teacher certification (ACP) online through Texas Teachers in grades four through eight. She is ESL certified. Kerry would like to be certified at the high school level and teach business classes at the Early College High School in the district. She stated "The students are really motivated there, and I'd love to use my business degrees to guide young adults forward in their future aspirations."

Kim

Kim is a fifth-grade science teacher in a general education class. She previously earned her teacher certification from another state with an elementary teaching certificate in grades Kindergarten through sixth, and she earned a minor in ESL. Kim highlighted that she enjoyed the classes that fostered an appreciation for cultural diversity and developed an awareness of cultural biases that interfere with developing authentic relationships with teaching colleagues and students. Conversations in her ESL methods classes were memorable for her as she recounted her college experiences. Having taught for three years before moving into her current role, and being licensed to teach at the elementary level, it was only a matter of completing the teacher certification test in Texas. She now holds her Kindergarten through sixth grade certification. She enjoys teaching ESL to her ELs in her classes. This is her second-year teaching ESL within the context of her science class.

Savannah

As a fifth-grade science teacher, also in a general education class, Savannah has not always been interested in teaching. Her undergraduate degree is in agricultural development with the initial goal to work in agricultural sales. Faced with the decision to

move to the Midwest or stay, she decided to stay and complete her teaching certification in the area Early Childhood through sixth grade, with an ESL endorsement certification, through the ACP program. This year she celebrates 23 years of experience as an educator. Savannah continues to grow professionally as she began an additional online master's program with a focus on curriculum and instruction in the areas of math and science. She recounts one class that focuses on cultural diversity and understanding where students' funds of knowledge come from. "For my ELs, the family dynamic is very important to them." The class fosters an appreciation of relationship building, with one activity asking the class participants, who are primarily teachers, to interview their students' parents outside of the school setting. This opportunity gives parents and teachers the freedom to be authentic and informal. Savannah explains, "I can just be me, Savannah at the mall, not Mrs. So-and-so in the classroom having a formal parent-teacher conference." She also aspires to work on the corporate side at the district level upon graduation.

Administrators

Ophelia

Ophelia is a school administrator who initially majored in Communications and went on to graduate to become a teacher through the Alternative Certification Program (ACP) for teachers, certified in grades 7-12. For her learning style, she preferred the face-to-face and hands-on approach to learning rather than in an online teacher certification program. She is also ESL certified and trained in the SIOP model. Her master's degree is in educational leadership with a principal certification. She taught ESL students in junior high and high school English classes for two years with "an inspirational mentor teacher" and coached sports, then Ophelia transitioned out of the classroom to work as a district instructional coach for another two years. According to Ophelia, "seeking out a role in which to have some greater impact on students" was important to her. Ophelia worked as

an Associate Principal for two more years in preparation for a principal position in the future. Today she works as a middle school principal.

Abigail

Abigail is the first college graduate in her family, with over 17 years of experience in education. She has worked as an assistant principal at a junior high school, and she is currently a middle school principal. Having graduated through the ACP with a certification in high school English, she taught high school English for two years while pursuing her master's in counseling. Abigail is a second-language learner, fluent in Spanish. She did have ESL students in her classroom and started studying for the ESL certification test, however when it came time to take the test, Abigail had secured a job as a high school counselor. Abigail did not take the ESL certification test. She deeply enjoyed working for a federally funded program for low-income first-generation students advising and counseling incoming students on college and career paths of study, helping them complete college applications and paperwork, and leading students on visits to prospective college tours. Upon returning to public schools, Abigail worked again as the lead counselor at alternative high schools in the area, assisting students who typically experienced difficulties in a large school setting. She expressed her passion for working with low-income first-generation students, like herself, researching potential vocational or college programs and providing opportunities for exposure to what is possible in today's workplace. Abigail expressed that "exposure really can expand your opportunities, but sometimes students do not know what to ask to get that information."

Ingrid

Ingrid is a district curriculum administrator with a focus on middle school science instruction and supporting science teachers in the classroom from Pre-kindergarten through sixth grade. She has been in this current position for 16 years and continues to

enjoy it. She holds a bachelor's degree in Policial Science, a master's degree in educational leadership, and her teacher certification through the ACP as a teacher of general education for Early Childhood students through eighth grade. She is also ESL certified and has been trained in SIOP. Ingrid had opportunities to teach ESL abroad in Asia and the Middle East which opened doors to travel and fostered an appreciation in celebrating other cultures and cultural perspectives.

Laniah

Laniah is a district administrator with over 22 years of education experience as a certified teacher in Early Childhood through sixth grade, an assistant principal, a principal, and an Early Childhood Director. She remembers going through an intense week of SIOP training as a young elementary teacher, because the school district in which she worked had a large population of diverse ELs. She earned her bachelor's in education from an accredited university that offered a traditional cohort model, she holds a masters in School Administration, and she has earned her Ph.D. in Educational Leadership with a specialization in Superintendency. It was not until recently that she received her ESL certificate to fulfill the ESL certification requirement of teachers in her district. She continued to explain that she did it "to exemplify a good role model to her administrators and teachers. I want them to know I'm sitting in the classes with them learning the ESL material, and I'm paying for it to be added to my certification." Today, she oversees many school principals in her school district.

Elyn

Elyn is a district administrator over the school district's Bilingual/ESL program with twenty-three years of education experience in many diverse roles. Originally from Venezuela, Elyn always knew she would be an educator, just like her mother. She immigrated from Venezuela as a sophomore in high school, not knowing any English, but

she expressed that she had great ESL teachers and a Spanish teacher that recognized her potential and passion for learning. It was this fervor for learning that she excelled in learning the English language, she graduated from high school, and, thereafter, she pursued multiple degrees through universities. She holds a bachelor's degree in bilingual education in grades first through eighth, a principal certification, a master's degree in bilingual education, and a doctorate degree in educational psychology with an emphasis on bilingual education.

Brian

Brian is a first-year superintendent of a school district. Originally becoming a teacher through the ACP in a neighboring school district, Brian taught for five years in the classroom before pursuing administrative roles. He mentioned that he is not ESL certified, but he had been trained in the SIOP model and the Capturing Kids Hearts program (Flippen Group, 2023). Through incorporation of the character-based curriculum and professional development provided by the Capturing Kids' Hearts program, Brain learned the importance of building strong connections with students, creating a positive, self-managing classroom, and fostering students' problem-solving skills to deal with peer conflict, curbing negative classroom behaviors (Flippen Group, 2023). This is the focus of the program in order to create safe and welcoming environments where students build strong relationships with educators, coaches, and student leaders. This work has been the inspiration toward moving the school district to embrace the "whole-child approach" in teaching its students. Brian brings nineteen years of administrative experience to his current role. He has held positions as an assistant principal of a junior high school, the ninth-grade center, and a high school. He went on to become a high school principal, the director of maintenance and operations, and an assistant superintendent of supportive

services for the school district. He holds a bachelor's degree in history and a master's degree in education, both through accredited universities in Texas.

Teacher Perspectives and Experiences

There were various emergent themes that were identified through the analysis of the data regarding teacher experiences and perceptions of the implementation of the SIOP model in the fifth-grade science program. These themes were discussed the most during the teacher focus group, and therefore, pervaded the study: a) modeling and support, b) purposeful lesson planning time for sheltered instruction implementation, and c) teacher accountability and follow-up with in-class implementation.

Modeling and Support

As teachers model classroom instruction and provide examples for students during lessons, so, too, do teachers learn best by example when acquiring content and instructional strategies from adult presenters during professional development training.

Science Training for Teachers

Teachers in accredited university-based teacher education programs complete their certification by taking the corresponding TExES state teacher certification exams in their subject areas as a part of their teacher education program prior to graduation. Students in many education programs must pass all of their TExES exams before going into clinical teaching, which is like student teaching the last semester of their program. If they do not pass all parts of all exams, then they cannot advance to their clinical teaching.

Alternative Certification Programs (ACP) for teachers may offer a face-to-face cohort model in which prospective teachers, who have degrees outside of education, apply for the program, complete the required coursework, and graduate from the program together (Texas Teachers, 2023). This was the ACP model completed by Savannah when she earned her teacher certification. Other ACP programs offer an online program in

which students work through the modules, activities, and exams at their leisure, all online, as was the experience for Ashley and Kerry in this study. The teachers reported that their ACP programs did not concentrate specifically on one content area, and therefore, building teaching capacity in one content area, such as science, was difficult. After program completion, teachers then took their TExES certification exams and earned a generalist certificate of teaching in their grade band of study, as mentioned in the participant profiles. As these teachers become hired in their current school district, the district would then provide ongoing professional development in content area instruction through their curriculum specialists with content area support for these specific subjects, such as science. This is the current process in this school district for this study, as reported by Savannah.

When asked what the teachers' ramifications were for them having limited prior background in science methods, Ashley discussed the effects this had on their teaching for her and her colleagues:

> We, being the new teachers to teaching 5th grade science when we first came to the district, relied heavily on Ingrid for guidance and instructional support, because we were learning the content ourselves, then we had to teach it to our students. We met together during planning and researched the content to learn the content and the vocabulary ourselves, as most of it was foreign to us. For me, I also say that it was lacking a bilingual perspective, because the curriculum is not friendly for our emergent bilingual students (EBs), our students learning the English language, too. There are complex vocabulary words and connections being made, so having had some instruction in the SIOP in my previous district, I realized that there were many opportunities to utilize the SIOP strategies I knew. I often do class demonstrations, create anchor charts with my students, and have

> word banks covering my closets for easy access. In our daily notes we rely heavily on illustrations, and I know we all try to implement and use as much realia as possible during lessons to make those connections with real world experiences.

Savannah shared a recent date night that she had with her husband at the city's science museum, to gain clarity about a subject in science that was confusing. She described:

> My husband and I went to the science museum on Saturday, and we watched the Black Holes in the planetarium. The presentation described what black holes are, how scientists believe that these holes are based on the theory of relativity, and how there is a time that light bends in space that causes these phenomena. And something clicked for me and it all made sense, because in our classrooms we teach the kids in 5th grade that light travels in straight lines. This was the one thing that I did not understand well, and I was worried to teach it to my students incorrectly. I did not know that it traveled in a straight line, and watching this presentation helped me a lot. Then I'm thinking about this planetarium and studying space, and it was all just very interesting to make connections to what I teach my students.

When the focus group was asked about their perceptions concerning how well they were prepared as preservice teachers to teach science, Ashley and Kerry agreed that their online alternative certification programs (ACP), which were not university based, did not prepare them well to teach the science curriculum, except for implementing the 5-Es into their lessons. Created by educators J. Myron Atkin and Robert Karplus in 1962, an effective learning cycle was based on the constructivist model of learning in which students are active participants during inquiry lessons and activities that build upon a foundation for science content (Lesley University, 2023). They posited that effective

learning happens through a learning cycle inviting students to explore a subject, create questions about it, and then evaluate and make judgements about the subject as they dig deeper in their learning about it (Lesley University, 2023). The 5E Instructional Model implemented in today's classrooms was developed by the Biological Science Curriculum Study (BSCS) led by Principal investigator Dr. Rodger Bybee. Based on constructivist-learning theory, educators invite and guide students through the five stages of learning and inquiry, with each stage beginning with the letter E: engage, explore, explain, extend, and evaluate. Each stage highlights the ideas, concepts, and skills needed for students to explore a particular science topic, like different forms of energy or designing and building an amusement park ride (Bybee, 1997). Ashley and Kerry referred to these classes as more methods or pedagogy courses about how to teach math, social studies, and science. Both agreed that the 5-E Model "is used daily during our science lessons with the students, so that's why it stuck with us."

SIOP Training for Teachers

All four teacher participants agreed that more explicit SIOP training focused on implementing its strategies is needed, as evidenced below. They also concurred that the quality of the training currently being offered is not sufficient. The focus group members concurred that the SIOP training provided by the bilingual department in the school district in the past has been the same or a repeat of training they had attended before. Ashley clarified:

> The district requires six-hour gifted and talented (GT) updates every year and special education updates, but where is the application piece for the SIOP or ESL so that we can meet our students' second language needs in English, too? The specific trainings set up to address our teaching needs for that end up being the same refresher every year.

The issue of repetitiveness is also echoed in Kerry's thoughts about attending training in the SIOP model:

> After ESL training and updates, we are not given a lot of time to plan and prepare for strategy implementation or anything that we have learned concerning sheltered instruction. There is no time. I mean the district takes all of our workdays, and then the professional development we often attend seems to be something random, so it is checks off the box that we have a yearly update, instead of just providing us that time to do what we need to do.

Ashley clarified that "there should be one course or full day training that should focus solely on how to apply these strategies and provide applicable examples to use with students. This would be incredibly helpful." Savannah added, after quietly listening to her colleagues, that as a new teacher she remembered enjoying her SIOP training. She shared how she used what she initially learned and found value in implementing it with her students in class.

> Really, SIOP is just good teaching for everyone…ELLs, special education students, GT students…everyone can benefit. I think we take for granted that perhaps we already implement some sheltered instruction into lessons for everyone, because they are so good. Even my denials, who don't receive any services, benefit from these. These are the things I'm doing in my class, and the kids are starting to get it a little more every time. They are starting to ask questions to help them clarify a bit more, because now they've made this connection but maybe aren't understanding one of the parts. So, I love that about sheltered instruction. Create an anchor chart, pre-teach the vocabulary and ask how it connects with what we are learning, ask kids about how this works with that and how it be represented in our web of words we are working with here are

> all things we do. Knowing this now as a seasoned teacher, I do not understand why we don't have more purposeful SIOP training to take things deeper or develop our practices in a more meaningful way.

Kerry clarified the vocabulary activity that Savannah mentioned above. Ingrid, the SIOP-trained, district's science specialist, had created this activity for each of their science units. She designed a graphic organizer with all of the academic vocabulary words in one column. This allowed students to write the definition in a second column and then add a connection, an example, or an extension for the word in the third column. Kerry noted that her EBs typically struggled with creating the visuals or making the connections for the vocabulary when she first introduced it at the beginning of the year. However, since they engage in this activity in every unit it has become very user-friendly for all of the students. Kerry reiterated that "the students love to complete this activity and share what they've created and connected. They are so proud of themselves to share with their peers!"

At the conclusion of the SIOP theory trainings being offered, teachers reported that the information was not sufficient address the real issues in the classroom. Kim reiterated this thought with an example from her classroom:

> We use Canvas online, our district's course management system where we put all of our students' lessons, videos, content instruction and students practice in so that students can seamlessly work on their computers for our coursework. We've done this since COVID hit in 2020. We started creating everything online for our students learning from home as well as those students who came to our face-to-face classes. Now, for our teacher professional development (PD), the district will drop courses and activities in Canvas for us to complete on our district PD days. So, we had this ESL course in Canvas, but it was the exact same assignments and

> exact same videos I remembered doing at the beginning of the year last year for our ESL PD Day. I was halfway through the course when I thought "Wait a minute…this is all the same." It was very frustrating and what I felt was a complete waste of time. There was nothing fresh or applicable about it.

Ashley supported this claim when she reiterated:

> The current SIOP or sheltered instruction trainings do not offer a lot of depth into how we, as teachers, apply SIOP strategies and what that looks like in the classroom with students. It is hit or miss with these yearly trainings. To be quite honest, I feel like all of the trainings I've taken here are for the average ELL on their way to being advanced high and working on the ability of a native-English speaker. The trainings do not teach me how to scaffold down a bit in order to meet the language learning needs of new ELLs and those who aren't quite at the advanced level in their English acquisition. This is where I feel there is a super big gap, because in the classroom this year we have more needs to scaffold down issues to make them comprehensible than scaffolding up.

Ashley and Kerry further explained an example from Kerry's own classroom that supports why the SIOP training is critical to scaffold students' language development and the transfer of language from the dominant first language (L1), Spanish, to learning English as the second language (L2). Kerry stated:

> This student has been passed on through each grade level, K-fifth, as an English language learner without ever truly mastering content in the Spanish language. Now she's in fifth grade, with multiple STAAR tests to pass this year, and she needs to show growth on her TELPAS test in English, but she cannot read in either language. There isn't any academic support in English at home from her parents, and her older sister translates everything for her. There's just a real

> struggle to negotiate language in the home and at school in English and Spanish. How did she get this far? This is a real example of a student who could have benefitted from strong sheltered instruction strategies throughout her school career, and it's apparent she's not had any whatsoever. I suppose I could understand why she does not read now if she was labeled an "ESL Denial" student who did not receive any sheltered instruction strategies at the request of her parents, but this is not the case either. So, I try to help her as much as possible, especially developing those sight words first and teaching her to decode. We are really focused on building that foundation for her this year. She has good conversation skills; she has a modified curriculum, and she gets the anchor charts and visuals. She writes all the notes…she's eager to write them with me while I model and shows a lot of motivation. It takes her some time, but it happens. But good gracious, she's still so far behind. I end up having conversations with her about the content, because she doesn't read on a fifth-grade level. I feel so bad for her to have gotten this far. I feel like she should be further along in the curriculum than what she's able to do and produce in class. And I'm sure COVID time out of class didn't help.

Ashley synthesized this example from their conversation to offer a possible rationale concerning why this student had not mastered her L1, and therefore, she has not been able to master her L2 up to this point in her schooling experience:

> You know what happened here, and to others that get to us and cannot comfortably transition between L1 and L2? She never got her first language of instruction solidified, which would be Spanish. She didn't become literate in her first language. She cannot be a biliterate learner if she hasn't like solidified her first language…she's not ready.

To summarize, the teachers' thoughts and experiences from their own classrooms echo the need for and the value of SIOP training that builds upon the foundational knowledge they already have. The examples, mentioned above, express that the students need these second language learning strategies as well to be successful in the science content areas. This helps students bridge their knowledge from their first language, L1, and apply it to scaffold new learning in their second language, L2.

Teacher Recommendations for the SIOP Training

The participants discussed recommendations for future SIOP training. Ashley continued the discussion above about the struggling ELL and offered a suggestion for Kerry. She also reiterated that this was an example of why the SIOP strategies are critical to students' language development. In the next science lesson, she suggested for Kerry to include a sheltered instruction strategy to help the student scaffold her language development in the second language, L2. Ashley explained:

> One thing this student does have going for her is that she sounds highly motivated this year, and she's developed strong relationships with all three of her content area teachers. This may be her year to really shine. You said that she enjoys conversations and can do those activities well with her peers, so I'm thinking about how you can scaffold her writing, and therefore reading, as she writes about science. One of the SIOP strategies in the Inside-Outside circle, where you pair two students up strategically as students who make up the inside circle faces the students who are part of the outside circle. I think that incorporating the sentence stems and vocabulary that we pre-teach for the lesson will help her, with the help and support of her peer with whom she's having a discussion. They can discuss the lesson and then use the sentence stems to start their writing, completing their frames, and then reread them aloud. So now you're modeling having the

> discussion and following up with what that discussion looks like on paper, while also providing this student, and anyone else who needs that writing support, with a sentence frame about how to get started in order to write down her answer. She's going to make this reading-writing connection, even if it's only supported in English at this moment. And you're building her visual vocabulary development because she's reading from the sentence frame and reading her own thoughts in writing. This is a great interactive SIOP strategy that scaffolds off her speaking skills, and then it challenges her a little further to write down her thoughts and reread for clarification.

Throughout this conversation between the teachers, there is no lack of passion to first identify the struggles in incorporating the SIOP model in science, but more importantly, the vehemence with which they provide solutions to address ELs language learning needs also permeated the discussion. Creating authentic student interaction during lessons is an important component of the SIOP model and scaffolds the language support needed for students to be successful on the task at hand. Savannah summed up with the following comment: "we love teaching, we love our kids, but every year we feel like there is more on our plate without the coordinating support that should go with that. We have to get creative and do the problem solving ourselves." While keeping the SIOP in mind when lesson planning, Savannah offered a suggestion for prioritizing.

> It's great when I'm looking over my plans or reflecting on a lesson and realize that I did incorporate some of the SIOP strategies. I don't realize that I am doing it until I start looking. What I would really like to create is a "SIOP at a glance" reference page, like we have for our curriculum. In our curriculum guide, we have units of study at a glance which gives us an overview of the entire unit in science, like classifying matter by its physical properties or exploring forms of energy and

> how it is used. I would love a one-pager checklist, laminated, so I could mark strategies off that I incorporate, because if not I'm going to miss all kinds of great strategy stuff. Why not have a one-pager that has what we need to do for SIOP and combine it with the 5E Model…combine it, embed the strategies so it becomes a tool that we can refer to often and integrate it like we really want to do? We are all more veteran teachers than newbies, we share science stuff all the time, so why not integrate what we know to be all great things for science and ELs? It is creating a tool for us to work effectively and smarter when planning and teaching.

Barely able to complete her thoughts about her one-pager to integrate the SIOP with the 5E Learning Cycle, Savannah's idea is met with resounding affirmations, as it was well-received by her teacher peers (Bybee, 1997). Kim excitedly elaborated upon Savannah's contribution by adding:

> Oh goodness I'm so excited about this…we can add thinking maps and just all of the activities and strategies we do and collaborate on into this document for sheltered instruction, even make connections across the different content areas into the science part. Think about also how this will support new science teachers and other teachers of ELs. We use this like it was intended, together, not just take the bits and pieces, because bits and pieces of a whole program just doesn't work. I love it! Who's ready to get to work?

Even with experienced teachers, the feeling of continuous improvement upon their teaching skills and SIOP knowledge permeated their enthusiasm as professionals.

Purposeful Lesson Planning Time for Implementation

As evidenced in the words below, all four teachers agreed with the notion that having time to internalize the SIOP professional development they attended and then

having time to plan for instructional implementation in their own classroom are important pieces in applying the knowledge they had acquired. While attending professional development opportunities, the teachers demonstrated an appreciation for the training, however there was little time to synthesize the information afterward. Ashley asserted:

> Without purposeful planning time, in addition to professional development, it isn't possible to plan successfully what SIOP strategies are needed to implement in a particular lesson. I feel most effective when I've had time to plan, truly just sit down and have time to plan purposefully. Because I feel like, and I hate to say it, when we are in science trainings together it feels very rushed, almost like the training is on a timer and we just keep moving on to the next thing.

A typical training followed this trend and little time was left for purposeful planning to implement what had been learned. Kerry echoed the importance of purposeful planning and noted:

> It's difficult to discern between what is truly needed versus "do I need to implement all of this information I just learned through training?" You must be purposeful about teaching EBs, and you have to be purposeful about teaching your TEKS and you have to be purposeful about teaching your GTs and advanced students, and that makes it hard when you have to meet all these needs in your 45-minute class time. Every teaching moment counts, like we learned as undergrad teachers. We teach bell to bell, and with our different populations and student needs, time is critical and whatever you do in class needs to be thoughtfully planned and thoughtfully implemented. This is the part of our job that takes time. The planning part afterward is so important. Ultimately, I find myself prioritizing, and I get the majority of it done, including implementing the SIOP strategies.

The other teachers nodded their heads in agreement with Kerry. They affirmed with resounding yeses that having time to plan the SIOP strategies to implement them with students in their own classrooms was just as important to them as well. They voiced that a lot of their own time is used for planning, in addition to their forty-five-minute daily conference teachers receive during the school day.

Teacher Suggestions for Purposeful Lesson Planning Time for Implementation

In reflection of the struggles previously summarized, Kerry reflected on how additional time would affect her teaching practice in the science classroom with her students. She suggested:

> Being able to have extra time to purposefully plan everything into my lessons, because all of the kids' needs are important, I can take another look to see if I'm covering what I need to. In addition, I am able to have some much-needed reflection time about what else I can do to improve upon my lessons and teaching practices. Addressing each student's need as an EL in science is another layer that will make me a more effective teacher for them, and everyone else.

In summary, the teachers voiced that additional time for purposeful lesson planning in order to implement the SIOP model in the manner in which it was intended to be implemented is necessary, especially after trainings for professional development.

Collaboration with Teaching Colleagues

During district trainings, there are multiple schools that meet within the same grade band, grades fifth and sixth, which allows for teachers to plan together and collaborate. Kim expressed that these are valued opportunities that add to the professional discourse and growth, opportunities to talk with other teachers from other schools and ask about their practices and teaching ideas in their own science classrooms. She explained more specifically stating:

> I love asking other science teachers about what they are doing in class. I did that during our STAAR (state test) countdown meeting last year. I talked with a colleague from another school about how they spiral reviewed the science TEKS (state standards) and how they worked with their students on content for this test or that, because they always outscore us on the unit assessments. This just made sense…that we were in the same room together to collaborate and share strategies on what was working in their classroom with their student population. I would share, too, on what was working and what activities I worked on with my students. And then afterwards, I reflected on what I could take away from that conversation and how it would apply to students in my classroom.

Ashley affirmed Kim's thinking and applied it to teaching ELs in her own classroom. She continued to clarify her thinking with an example from a professional development experience during a science in-service:

> We need this collaboration time, too, for sheltered instruction, not just for science. We value the need to collaborate with other teachers at our level in science. It should be subject area based and grade-level based so that we are all on the same page, especially when meeting the needs of our special populations like ELs, kind of like in-person departmentalization. The content learning strategies and how to implement them with students is so important. There are some teachers who have fabulous student scores for their unit test, and my students may have really struggled when I see my scores reflect that. It's a great opportunity for me to ask one of my peers during this time 'What did you do to address this question about Earth's rotation on its axis, because my students truly didn't understand the question?' Then we talk about the vocabulary and how that question was asked. That teacher may have tweaked their lesson or connected their vocabulary with a

> graphic organizer, a certain visual, or example that just clicked with kids, and boom, they got it! This is the time for us to discuss this, so that we all benefit from the collaborative input between one another. It's professional learning at its best, peer learning, like we teach our students to do with one another in their groups in class.

Ashley articulated finding value in these learning opportunities with her teaching colleagues from neighboring middle schools in the school district. The other teacher participants shared similar thoughts and voiced appreciation for time to discuss best practices for teaching science to ELs.

Collaboration with the Science Specialist

Not only did the teacher focus group speak passionately about teaching their ELs and collaborating to create instructional immersion experiences to meet students' needs in science, but they also communicated an overwhelming appreciation for opportunities to collaborate with the school district's science specialist, Ingrid. When asked what their perceptions were about the instructional support provided by Ingrid, Kim perked up excitedly and discussed her first experience with Ingrid during her first year as a science teacher at her new Texas school:

> My first-year teaching science, I was really struggling with how to introduce my physical science unit to my students, specifically on the topic of circuits. So, I emailed Ingrid to see if she would come to my class to give a lab demonstration on this topic. She responded almost immediately that same day, and she seemed really excited I had reached out to her for help. She agreed to come in to help, and when she came that week she asked if I had a plan. I looked at her like a deer in headlights and replied that I honestly didn't have a clue where to start. She didn't miss a beat! We sat down, and she helped me plan all of my lessons, vocabulary,

> and activities for the next two to three weeks. From that I was also able to add in the ESL components into the unit, then she planned to come for another planning day when we could meet again to plan the following science unit. She did this with me for the remainder of the school year! Oh my gosh…I was so grateful and appreciative for that invaluable time with her and her sharing her expertise! Ingrid was awesome!

The other teachers smiled and nodded their heads in agreement and chorused a resounding "Yes!" Afterward, each one began to share their experiences in collaborating with Ingrid. Savannah began with an example from a planned professional development day in which the fifth-grade science teachers sat down with Ingrid to plan an upcoming unit with new materials and lab experiences for the students. She explained:

> On one of our curriculum planning days, we got to meet with Ingrid for the entire day, and it was fabulous! We typically all meet with her, including teachers from fifth and sixth grades from other schools, and she always makes this time so beneficial for all of us. So, she showed us the new things she had for us, the new labs and the new hands-on activities. Then she told us to get with our teams and plan. During this time, she circled around to all the different groups and provided feedback. She does not sugarcoat anything, but she challenges us in a professional way to make sure we are teaching the content correctly. Because we respect her greatly and know that her intentions are always teacher-centered and student-centered, we are very receptive to her feedback and suggestions for improvement. This is obviously what we all strive for. So, she is very involved and will reteach the lab correctly if we have it wrong. She'll jump in and clarify and then say 'This is what you're supposed to ask students. And if the students do this, you need to tell them like this.' I had asked her one time if she would come to one of my

> classes to demo a lab, and she came and said "Here, I'll take the first class and model and teach everything, then you can do it with your next class." She is so hands on, and you can totally tell she loves it! I, personally, really appreciate Ingrid's support in this way.

The teachers learned significantly more during their professional development time when they were able to practice the new curriculum and labs alongside Ingrid. Similar to students' learning experiences they received from their teacher during science instruction, Ingrid modeled the instruction for the new science unit and modeled how to interact with and teach using the new materials and artifacts. She also clarified any misconceptions that arose from the teachers so that meaningful learning and connections could be made throughout the lesson.

While new to teaching science and learning how to plan effective science instruction, Kim's focused on the importance of collaboration with Ingrid, because she, too, was learning the science content she taught and the potential pitfalls that students face when they learn fifth-grade science. She reiterated that Ingrid had created and shared with the science team a list of common misconceptions for each science unit, errors in thinking that students may make during learning.

> Ingrid stressed the importance of clarifying some of the things that kids commonly mess up, especially for our ELs and for students who just have a difficult time with science content in general. I thought that this was completely brilliant and so valuable for the students!

As evidenced by the affirming comments above, the teacher participants valued ongoing collaboration with Ingrid throughout the school year about the fifth-grade curriculum in science. From year to year, too, Ingrid has been intentional about building working relationships with the fifth-grade science teachers, and the science teachers in

turn felt comfortable contacting her with questions to voice their needs in their classrooms.

Accountability and Follow-up with In-Class Implementation

Ultimately, accountability is one's pledge to a commitment, and with accountability comes follow-up and persistence in reaching the intended goal. Teachers are accountable and pledge to teach the curriculum and persist in teaching practices that engage students in authentic learning and content mastery of the TEKS at every grade level. The teachers in the study reinforced this conclusion by further reflection on teaching science across grade levels when they commented that accountability and follow-up should be made a priority across the grade levels in the teaching of science. Kim asserted this thought:

> There is a gap in science learning, a lack of cohesiveness in the vertical alignment throughout the grade levels. Fourth grade's TEKS are totally different than fifth grade's TEKS, so when students get to fifth-grade science they are already behind if they didn't get the science instruction in fourth grade or a strong grasp on the foundational science knowledge in the lower grades. There does not seem like there is fidelity in teaching science across the grade levels, which makes our job incredibly hard, especially when we are tested in science for STAAR.

There was consensus in the focus group discussion between the science teachers on this issue. Ashley supported Kim's thought when she reiterated that "the kids are super excited about science, because it's new. However, it's a problem because it's new information, too." Savannah posited another layer of the lack of accountability in reporting students' progress in the lower grades when learning science:

> We have no prior benchmark grades in science in the previous grades, so that's a problem also. When students get to fifth grade, we are testing on every unit

> constantly to monitor progress and spiral review what is not mastered. It takes three or four tests until we really know what students know and what they do not understand. However, to provide a baseline of what students know when they are coming to fifth grade, we have nothing that is indicative of what has been covered or learned. So, this feels like we are flying blind initially in the school year, teaching the science TEKS, not truly knowing what they know yet, and to add another layer of complexity, we factor in EL learning needs. These are difficult concepts for EL students, a complex combination of learning science and science language in addition to the English language. Of course, it isn't the students' fault at all; it just happens to be perhaps a flaw with the system that needs to be addressed.

The teachers summarized, too, that it is difficult to be accountable to other teachers when grades PreK through fourth grades are on elementary campuses and fifth and sixth grades are on separate middle school campuses. Their paths do not cross within the school day, and therefore, the teachers do not get that constant reminder of accountability to the next grade level. For example, Ashley remarked about her experience in a previous district on a campus that provided PreK through fifth grade:

> We had a designated science lab teacher, as a Magnet campus, and the students all rotated through her class, she facilitated the hands-on lab experiences, and the students would practice with vocabulary and testing cards that would highlight important content in that unit. It was awesome! I wish we had something like that at our school, because we have a lab classroom, but the logistics to set up and circulate kiddos through there is such a task.

To reiterate this idea, Kerry interpreted being accountable in her current role after a science training experience. She connected her thought to a previous discussion they had about learning and planning:

> It was like the SIOP training, where presenters are stuck on one of the foundational theoretical pieces without getting to the most important pieces of SIOP and how to integrate it the part that we as teachers do with ELs to help them internalize the content or vocabulary in English. This is irritating to me, because I have the sheltered instruction knowledge already, but I've already tuned out because what we are being taught, again, is very basic. However, I'm still needing that follow-up piece, and there's no accountability for what we've learned or how we are implementing it. I'm glad I'm trusted as a teacher with this knowledge and the expectation that it will be implemented into my lessons, but I want to be accountable for doing it well with my ELs in order to make a difference. Certainly, I can take one thing, like "building background" and really just hone into that one thing to "explicitly connect science TEKS content to my EL students' cultural and academic backgrounds", then gage whether there is an increase in engagement and learning throughout the lesson. It would be beneficial to come back again to the next science training and discuss how this went and what tweaks I can make in the next round of lessons to improve.

The teachers voiced the importance of being accountable for their own learning and applying it to the classroom, just as they hold their students accountable, including EB students, for learning science content in fifth grade. The general expectation is that teachers are held accountable for improving upon their own instructional practices using the SIOP with ELs in the classroom after professional development trainings. The theme of accountability surfaced in the focus group discussion concerning elementary teachers'

instructional vertical alignment across the grade levels leading up to fifth grade. Fifth-grade teachers voiced their frustrations with the lack of students' foundational learning of science at the lower grade levels, and they reported that it was evident when students reached their fifth-grade science classroom.

Summary of Teacher Perspectives and Experiences

The teachers in this study spoke passionately about their experiences and perceptions of the SIOP model implementation in their science classrooms and identified some of the challenges they faced to meet the diverse needs of their EB students. They asserted the importance of having more examples of content modeling from district specialists in the areas of science and the SIOP model to solidify their own learning during professional development. This would allow for more opportunities to synthesis content learning during trainings and formulate a plan of action in how they will present science lessons and incorporate sheltered instruction strategies, simultaneously, with their EB students. Secondly, teachers posited that purposefully planning time in collaboration with teaching colleagues and the specialists was an essential component in order to develop their plans for science instruction and the SIOP model implementation. Lastly, teacher accountability and follow-up were important to evaluate the effectiveness of the professional development that teachers received and how it shaped EB student learning in the classroom.

Administrator Perspectives and Experiences

There were various emergent themes that were identified through the analysis of the individual interview data regarding administrator experiences and perceptions of the implementation of the SIOP model in the fifth-grade science program. These themes included: a) creating a teachers' needs assessment, b) coordinating support for teachers

with district specialists, and c) inquiring about the SIOP professional development. These themes were evident throughout the individual interviews.

Creating a Teachers' Needs Assessment

Administrators wear a myriad of hats, from creating an efficient master schedule that meets the needs of all student programs to accounting for every penny spent in the school budget; from hiring highly qualified teachers and discerning how they can best be supported to overseeing that students learn to hold high expectations for themselves and their behavior to reach their goals. As administrators, they, too, came with a wealth of prior knowledge and background experiences, a synthesis of experience to apply to their current roles.

With many years of experience as a high school counselor and lead counselor, Abigail, a middle school administrator, was very mindful of the needs of ELs when creating equitable student schedules. She clarified her thinking:

> No one really wanted to do the schedules for our special populations, because when you did the schedules you had to be very aware of not grouping certain populations together to maximize teacher instructional time. So, I would really look at the kids' needs and how to section out their programs over many teams. For example, we had students who did not participate in a particular program, students who participated in American Sign Language, and students who participated in ESL. When you have all programs on one team, there tends to be too many personalities and bodies going in and out of the classroom to support these students. It was distracting and proved to be ineffective for learning for those kids, because you had one teacher in class signing to a group of students and another teacher interpreting language to another group. I worked on schedules which focused solely on placing just ASL (American Sign Language) on one team

> and ESL on another team. This enabled one support teacher to rove around to the different teachers on that team and assist those specific students. As a result, the learning environment was focused on meeting students' needs as they worked on vocabulary in English, ESL strategies and activities, or whatever the case may have been. It also cut down on the distractions and movement within the class during lessons. So, I was very intentional and made sure there were designated sections for my ESL. I had the ESL teacher float into that classroom and then travel with those students to every single subject to help support the students. They even co-taught together!

To echo this idea, Abigail knew the importance of providing an engaging classroom environment that would maximize student learning while minimizing unnecessary distractions for all students. She also valued this knowledge and applied her experiences when she became a principal, in charge of creating an effective master schedule for her own school. The school schedule also maximizes the needs of their teachers, allowing for instructional time to be managed well to meet students' needs with the teachers necessary for their programs. This middle school services a very diverse ESL population, representing twenty-three different languages spoken by over sixty ESL students from around the world. This is a different middle school from the neighboring middle school of the fifth-grade science teacher participants in this study.

> So, this knowledge I gained while working at the high school level has been very helpful. I've done the same at my campus, and it has been so effective. I have my ESL teacher teach a newcomers' class with students who are considered beginning and intermediate speakers of English. We combined these levels because the language-learning needs are similar and developing. She builds that foundation in English. We have picked certain hallways, and then we funnel the

> advanced-speaking ESL students into just that hallway so that the ESL teacher can float with their schedule and support those students on that team. She attends all of the planning meetings for that team, for fifth and sixth grades, and then she scaffolds the content to make sure that it works for her students. Our school had the highest TELPAS rate for the district, and most of our ESL students were able to exit the ESL program.

As a principal of a campus with a sundry population of students from various countries, meeting the academic needs of each student, while holding high expectations for language learning in English, is a challenge. Another middle school principal, Ophelia, applied her knowledge and experiences as an ESL teacher and administrator, and she recalled an example when she would have student conferences with EBs about the writing expectations for TELPAS. Ophelia is the principal of the middle school at which the fifth-grade science teacher participants in this study teach.

> I would conference with them [EBs], trying to get them to see the value of trying their best and calibrating on all of the pieces of writing that were required of them for TELPAS. So that was a time when my eyes really opened to just figure out a way to get the kids to internalize that piece. It was really the socio-emotional side of learning on their part, and seeing their struggles then as they became high schoolers. They were growing up, now in eleventh and twelfth grades, and they had been in sixth, seventh, eighth grades, and all of these years, from kindergarten on, they had been in a bilingual or ESL program taking TELPAS (English language proficiency exam for students). Now in high school, [they had] still never met expectations of advanced-high in all four domains to exit the program. It was a humbling experience, right? Because I was just like, [reenacting as if to talk to her students] 'you're about to graduate and the bigger picture is

> this…you're going to have to conquer writing a college essay and you can't even really write a coherent TELPAS example about how to solve a problem in math or explain a process in science' or whatever the case may be.

Ophelia reflected on this experience and applied it to the current group of EBs at her middle school. As an administrator, she is required to document walk-through observations and formal T-TESS observations of all teachers on campus, providing feedback and points of praise and growth to help teachers refine their teaching skills and craft. The T-TESS stands for the Texas Teacher Evaluation Support System. This instrument, used by school administrators, "focuses on providing continuous, timely and formative feedback to educators so they can improve their practices" (TEA, 2023). T-TESS measures teacher effectiveness in four domains: Planning, Instruction, Learning Environment, and Professional Practice and Responsibilities (TEA, 2023). Ophelia connected her professional experience above with the students' struggles that she observed her teachers address daily. She shared:

> I think the differentiation piece for teachers is hard because there are so many students this year just struggling, and you can see that the teachers truly want to help all their students make progress. They [students] are struggling with reading, struggling with behavior, struggling with just the day-to-day expectations of school and being a student on campus again. In my opinion, I think our experiences or lack of experiences during COVID surely didn't help this for any students. I see this with *all* of the students in both grade levels, but this also reminded me of our EBs' struggles. We are still struggling with exiting them [EBs] from the bilingual/ESL programs and meeting all of the expectations for language proficiency on TELPAS. For teachers, I remember the struggle to differentiate for any student in the class, and then now in the bilingual and ESL

> classes, you have that additional layer of, 'okay, how do I meet the needs of these kids and make sure they are progressing through their language journey as well as their academics?' In our classes we have this overlap with [mono-lingual Spanish-speaking] newcomers and EBs with all levels of language proficiency all in the same class. This is definitely a challenge, not one we cannot meet or the teachers cannot meet, but just to be transparent that this is the reality in our classes.

As the school principal, Abigail expressed that supporting her staff and being available for her teachers are key to the success of the campus. Abigail recognized the critical role of intentional collaboration between the science curriculum specialist and ESL teachers in maximizing learning experiences for students, as evidenced below:

> Supporting the content area teachers and the ESL teacher means that I'm truly listening to what they need to find out what kind of assistance or help they want. For example, our ESL teacher is truly amazing. She pushes into her colleagues' content area classrooms to find out what students will study in advance and the academic vocabulary that needs to be focused on. A lot of the times it's the vocabulary that the kids struggle with, and, at the same time, they are trying to figure out the English language in the process. So, if there are any kinds of visuals, vocabulary cards with pictures, or things like that to help the students in their science class, for example, the ESL teacher will make recommendations to the science teacher to incorporate those into her lessons. Our science specialist, Ingrid, does the same. She provides focused professional development in science throughout the school year, but she also is great about following up with teachers after the fact if they have questions or need her support in the classroom. You'll see Ingrid on our campus frequently, meeting with our science teachers during

their weekly planning time or modeling a lesson for a teacher or co-teaching in a science class.

Abigail, the ESL teacher, and the campus science teachers often collaborate on additional materials that are needed. In meeting the needs of newcomer EBs, meaning students new to the United States from other countries, new conversations have arisen about how to meet their L2 language needs in their first English-learning experiences. This may include resources such as language translations of basic words to start building connections between the L1 and L2 vocabulary. Abigail recalled one example:

> When there is a need, we often reach out to the bilingual department to see how we can get this or that. For example, one of our math teachers really had trouble figuring out what to do with our newest student who speaks only French. The teacher really could not assess where he was mathematically. We reached out to the bilingual department for some basic vocabulary translations with picture support so that she could begin at this level first and then build upon this foundation in English with ESL support, of course.

Abigail expressed that her science teachers appreciate the instructional support and modeling by the ESL teacher that joins their classes each day. With the district's mandate to ensure that all content area teachers become ESL certified, the fear of losing her and her expertise in this way is evident. Abigail shared:

> Teachers are truly upset about the thought of losing their ESL teacher, because she has become such an integral part of their classroom instruction. Even with an ESL certificate, this does not necessarily mean that a teacher is well versed in how to teach ESL students and proficient enough to know what to do with them. It's just a great designation to have, right? It meets a state requirement. That being said, the district also looks at staffing and how the budget is affected in that sense.

> When our school budget is cut drastically, it makes sense to look at where cuts can be made. Consequently, teacher salaries are a large part of the budget. However, if all content area teachers are ESL certified, then will there be a need for an additional ESL teacher on campus? Is that justifiable? I'm sure this is a concern on every campus that has a designated ESL teacher. My teachers have said that she's incredibly helpful; she comes in and even pulls the ESL students if they need one-on-one support and she is just able to expand on and provide support with different things, including all of the ESL knowledge that she can pour into us. This is her niche for sure! Teachers ask me, 'If we lose her, what do we do with them?' Although I do not make that final decision, I encourage them that, together, we will continue doing what is best for students, with her here right now. This is what we have an impact on *right now*, and we have the capacity to do it well. This is our focus.

It is evident that Abigail values not only her staff, but also the importance of creating opportunities for collaboration between colleagues and the ESL teacher on her campus, as well as with the district's bilingual/ESL and science specialists.

Elyn, the school district's director of Bilingual/ESL programs, noted the importance of clarifying and reiterating to all content area teachers at all grade levels to shift their mindset about the needs of their EB students in their classrooms. While the district is moving forward in requiring all teachers to be ESL certified, there is pushback about the rationale to do so if that teacher does not teach reading and language arts in English to second language learners. She explained:

> In the past, teachers have heard of the SIOP model and understood that implementing the strategies works for all students, not just EBs. It works for all kids, but additionally, and when you attach the instructional content and language,

> even adding that into the title, I think doing that could get more teachers on board. More commitment. We are still working to change the current mindset of teachers who do not consider themselves as language and reading teachers in their own content area, such as math, science, and social studies. And there are those teachers that teach the elective content areas at upper grade levels in junior high and high school that offer a variety of choices of study to students. So, when teachers come to PD, they are typically just there for the content. They ask why they need to teach students how to read and write in math or science. However, within their content area there are specific vocabulary and more complex reading and language structures in English that their EBs would struggle with and increasing challenging, in addition to learning just English as their second language. All of the content learning on top of learning English is compounded for EB students.

Elyn continued to clarify the language needs of EBs in the content area classrooms, as well as the language needs these students need in their English language arts class. She continued:

> General education teachers need to be reminded that their EB students are not just EBs in a language arts class, but they are EBs in math, science, social studies, P.E., art, band, in every class they take at any grade level, until they are able to meet reclassification requirements and are no longer considered an EB. They are an EB student all day long. They are learning in English all day, not just in their ESL class. Therefore, all teachers must have the ESL certification with all of that great ESL knowledge to meet these needs, not just the bilingual or ESL teacher. For example, if you are teaching about how animals interact in a food web in science and wanting kids to communicate using complete sentences or write down

their thinking, then you are teaching academic conversations about science and writing in science using the vocabulary of the unit on food webs. You are a language teacher in addition to teaching science.

Elyn asserted the impact this has on students directly, especially in the area of academic language development. She stated:

> A lot of times EBs are lacking not only the vocabulary or the academic language when they get to fifth-grade science, but they are probably lacking the science content concepts, too. So, it would be important and necessary to have that science teacher get their ESL certification. This would help the teacher to guide their EBs throughout the science lesson and support their acquisition of science vocabulary, as EB students talk about science using the English language structures needed to be successful during those interactive activities.

Elyn's perspective is especially notable because she, too, was a second language learner. Part of her expertise is by virtue of her own experience as a new high school student in the United States from Venezuela.

> Before we moved to the U. S., I had undergone a procedure on one of my eyes to try to strengthen the muscles, after which I either had to wear an eye patch for three months or choose to do surgery. So, I did the eye patch, deciding anything was better than surgery at fourteen years old. In December we would return to Venezuela for Christmas holidays. and I'd have my eye checkup. Then my family moved here shortly afterward in September, and the school year had already started. I will never forget my first day in this huge high school. So, first day of school, I don't know anyone, I don't speak English, and I'm wearing an eye patch. This is everyone's first impression of me so you can imagine what they are thinking of this new one-eyed girl. Of course, my classmates think I don't have an

eye, but I have my Spanish teacher to thank for clearing that misconception up with everyone. On top of that, I'd always get lost somewhere in the building, because it was so big. There was this class in one wing and that class in another. Then, this unbelievably loud sound engulfs my school, which turned out to be the fire alarm, and I'm on the third floor in the ESL hallway which thank goodness was connected to the hall my Spanish class was in. I remember we were walking out, my eye was covered with the patch, so I did not have any peripheral vision on that side, and someone flew open a classroom door to evacuate. I didn't see right when I was walking by, and BOOM! I was laid out on the floor and passed out completely. There are a lot of things we do not even think about that are so basic, because we have grown up living the school experience in the same areas or in the U. S. in general. Like this example, most countries do not practice fire drills. That's not a thing. However, here in our district we have to do one about every month to stay in compliance with the Fire Marshall. Now when I look back, just at all the things that a newcomer would experience in a new school, in a new country, I try to embed some of my stories when I speak with secondary administrators when we meet or if we are training our secondary people. At the time, to me, I felt this was traumatic. All of these factors to deal with and process: huge school, hundreds of students but no friends, blaring alarm, waking up in the nurse's office unable to tell her what happened, because I, of course, can't speak English yet, she didn't speak Spanish…it was a lot to take in at the time.

Sharing her first experiences as a newcomer to the United States, Elyn was able to connect to the challenges that newcomer EBs continue to face in classrooms today. She reflected on how she felt lucky though, because she was literate in Spanish and had a private Catholic school education to build upon. "I could transfer a lot of what I had

learned previously from my small-town private school in Venezuela," she clarified. "However, this isn't always the case. We have newcomer students enroll with interrupted schooling, so that creates additional challenges to their world here, feeling new and foreign." Elyn connected this knowledge with new issues that are currently surfacing in the district, when she stated:

> Our district demographics for our students have changed a lot in the past five years since I have come on board. I look at our data for our high schools and see how diverse our student populations are there, then I take into account the number of newcomers we have received from out of the country that qualify for bilingual/ESL services. There have been a lot. Now the struggle is how do we meet their needs, because as creatures of habit, we have always done the same thing in the past with the few newcomers who trickled in. Now there are enough students at this beginning level of learning English because they are non-English speakers. One of my marching orders when I came on board was to restructure the secondary ESL program with this new addition for the newcomers. There was no curriculum for them then, so our team now has a scope and sequence curriculum for that class, which is now named English Learner Language Arts, or ELLA. We have this type of class in the junior high schools, too. At every level, including elementary and middle school, what will these newcomers do when they enroll at those levels?

Through the above example, Elyn and bilingual/ESL department team show dedication in the amount of work and planning it took, and the work that is still required, to make an impact with the EB newcomer students in the school district. With changing demographics, there are new struggles to meet students' learning needs in English.

Brian, the new Superintendent of schools, reflected on the way the district administration and content specialist departments have traditionally functioned in the past. As a former school principal, he voiced his experience and frustration about how these departments lead teachers in growing professionally. He explained:

> Being that I have been in the district in different levels, AP and a principal and a director, and then as assistant superintendent, as a principal, I would also often get frustrated. Because I was trying to serve this small "city" of 3,000 students, and we have all of these departments that support you and they do a fabulous job, but it seemed like they didn't talk to each other. It seemed like there was an isolation or what is called "silos." Everyone operates in their own department, but nobody is talking to one another or sharing information.

Elyn took this idea a step further when she commented about how her department, Bilingual/ESL, was set up in the past compared to how it is set up currently.

> When I came on board there was nothing, no collaborative Bilingual/ESL department, and only one person overseeing everything. It was a lot. Teachers were once in charge of completing the LPAC paperwork for compliance and responsible for holding LPAC meetings throughout the school year. When I hired my staff, we purposed to take over that huge compliance piece from the teachers, and now, this year, we have twelve LPAC facilitators that only focus on completing EB student compliance paperwork and holding LPAC meetings during the school year. Next year we will be fourteen, because we are hiring two new facilitators to handle just the high schools' compliance for their ESL student population. We MUST be in compliance with our paperwork, because students have to be in the correct class, with the correct teacher and participating in the right program. These decisions and coding directly affect our funding for our

> programs for our EBs. So even this change has been helpful, because nobody else touches that coding, not even the campuses anymore.

The administrators in this section discovered a variety of issues that affected their teachers and their own departments. Reflecting on their prior knowledge and experiences as educational practitioners, the administrators were able to identify their teachers' critical areas of need that required their attention. With a willingness to continuously improve upon current practices, as evidenced in the narratives above, they constantly questioned how they were working and what effects this questioning had on student learning for the EB student population in the school district.

Coordinating Support for Teachers with District Specialists

Brian described his vision for how the school district's department of Curriculum and Instruction (C&I) should grow by using the analogy of an onion. The C&I department is the creator and curator of the school district's curriculum scope and sequence, created from the TEKS curriculum standards. What is positioned around all of this are the "school district's departmental" layers of the onion: Special Programs, Bilingual/ESL, Counseling, Technology, Advanced Academics (for our gifted and talented students). The problem is how should these layers be integrated if the internal conversations are nonexistent? Brian continued with an example of what this looked like for his high school teachers throughout the school year as they attended various professional development days designated by each of the departments:

> For example, you'd hear from Special Programs about updates on special education and EL instruction. One thing would be shared from Advanced Academics about what the new initiative would be with our GT kids, and still another thing from C&I, which is the driver of the ship, something totally different. At the end of a professional development day or a series of PD days,

> you're like, wait a minute, this is all curriculum, so why aren't we speaking together on these topics? So, when I took the seat of superintendent, I started looking at things and professional development has always been that we are doing great things, but we kind of do the same thing all the time. We may have the same teacher doing the same lesson example for other teachers six years in a row, and teacher go into that PD and go 'Oh, it's you again' and completely turn off for the day. So, my question is 'did we refresh?'

Bilingual/ESL Specialist Support

Ophelia posited that the message communicated from the bilingual/dual language department is focused on growing students, including EBs, in bilingualism and in building a community and culture of bilingualism. There are few conversations about testing scores and STAAR data, but more conversations are initiated where the focal point is in answering the question "In what ways could the dual language program, and thus my EB students, be supported and strengthened?"

Ophelia presented a concern about new arrival students to the U.S., and thus, Texas schools. While these students qualify for bilingual services through the dual language program, they are monolingual Spanish-speaking students that need an additional layer of support to springboard and expedite learning basic English skills in their first year of instruction. She explained, "I do not know what that would look like, but there has to be a deeper conversation about how these newly identified EBs can be better supported in the classroom as beginner English speakers." The ESL students received in-class, or inclusion, support from the ESL teacher, typically in the students' English language arts class in order to build English language proficiency.

Ophelia's concern about how to support EBs in the science classroom was echoed in Ingrid's responses in her interview. Ingrid reiterated that the C & I department seemed

to work in their own silos within their content area and apart from other departments at the district level. In her effort to offer constructive criticism in the interview, she suggested:

> I wish that there was more of an overlay between me and the district's dual language specialists and Bilingual/ESL department. Within the Bilingual/ESL department, it seems like there are three bilingual/ESL specialists that are solely responsible for program accountability and compliance, along with their new facilitators, while there is only one person in C&I who supports English and Spanish language arts content learning in the classroom for all EBs from Kindergarten through sixth grade. Only one person. Again, this goes back to how many hats we all wear, teachers and support specialists. She's responsible for the teacher professional development through the reading academies, the biliteracy academies for the dual language program K-sixth grades, and in reality, that's a lot for one person to handle. It really comes down to not having enough people to carry out what you want to have happen, the vision. I conducted a science training in the past with her collaboration, and I learned a lot from listening to her add the bilingual perspective and the SIOP strategies on top of my science content. It's just great teaching for all students. I would like to see a lot more of this in the future. I think the greatest detriment to that, in our reality, is that the responsibility is too great for just one person. When we do our curriculum writing, our team of teachers is fabulous. Thank goodness we are able to do those collaborations in the summer with the teachers' input to get things done, update what needs updating if the TEKS and activities need tweaking and add clarification and new resources to what we already have in place. We do get support from our directors for some

pretty quality curriculum writing opportunities that we are proud of when it is all finished.

Quality science and bilingual/ESL curriculum supports teachers in their ability to focus on what their students truly need in the classroom, regardless of the programs in which they participate, such as bilingual or ESL programs.

The same concerns above were also echoed in Elyn's interview as she discussed what the next steps were after staffing her department and hiring the LPAC (the Language Proficiency Assessment Committee) facilitators to complete all district compliance paperwork, freeing up teacher planning time to focus on classroom instruction. She shared:

> When I worked at Texas A & M doing research, I would go into bilingual/ESL classrooms all of the time, complete observations to gather data, and figure out what the next steps would be for instructional improvement based on the teachers' and students' needs in that data. So now I ask my team 'How are we going into classrooms? What are our next steps?' We are a team, so we need to collaborate as a team. The issues we are seeing now are how to build teacher trainings that relate to what we are seeing in the classroom, because that's what you should do, right? For example, if you notice all of a sudden that a lot of teachers have a need in a certain area, then we need to address it in a training that meets their needs. Not just a yearly training to check off a box, but something instructional that will meet that need. We have teachers with a lot of failures, not just a couple, but twenty kids failing, so what can we do to support that teacher with instruction? What assignments are students responsible for completing? Are they TEKS-based and part of that class's curriculum? Has the assignment not been accommodated for as it should be? Is it a classroom management issue? What can we do to

> improve our pool of kindergarten students who apply to participate in the dual language program, so that it is equitable for both groups of students, mono-lingual Spanish speakers and mono-lingual English speakers? We want to grow our program into additional elementary schools, so logistically, how will that work? As students get older, their learning gaps can be overwhelming, so how can we work with teachers to provide targeted support to them while they are growing these students academically. How will we evaluate that ESL newcomer curriculum we put into place in secondary? Additionally, we have had some teacher turnover, so how will attract quality bilingual and ESL teachers into those positions? They have been difficult to fill in the past. So, we are making strides in our department, but there is still a lot of work to be done.

Abigail noted the initiative taken by her content teachers at her school to ask for support and collaborate with the Bilingual/ESL department. Many times during the year the teachers have advocated for their diverse population of ESL students and asked about how to meet those language learning needs in order to maximize academic learning time:

> At times teachers have expressed they needed support from the bilingual department, so these ladies [from that department] came in and sat with the teachers to help them with how to plan to integrate ESL strategies into their math and science lessons. Another main thing that was needed were English vocabulary cards with images illustrating those particular words to post on the word walls next to the vocabulary words for picture support. Whenever we have reached out for assistance the district specialists have been very willing to offer that support. I have not felt like that when working in other school districts, but the support here is genuine and swift when we ask for help.

Reflecting on how to further support EBs at her school, Ophelia thought it pertinent to inquire about the curriculum in fifth-grade science in a deeper way. She explained her thinking:

> I think that the science curriculum, or any subject area, could benefit from what I would call an "overlay". I think there is a lot of responsibility put on the teacher to take the curriculum and the scope and sequence and then add these overlays on top of it: special education, EBs, gifted and talented (GT), etc. I think it would be most beneficial to teachers for the specialists that write these scope and sequence guides to include these considerations when planning for these students, because you are guaranteed to have these students in your classes at some point in time. What TEKS would be great to spiral back often because they are huge in the curriculum? What would be suggestions to address the learning needs of different subpopulations? What would be the SIOP strategies to use during the unit on forms of energy in science for my EBs? What could my entry point be in my lesson for my new EBs that just arrived from Cambodia or El Salvador, so they get the gist of what we are talking about during our class discussion and feel more connected in the lesson? You could call them extensions and interventions, so that there is scaffolding within the guide to authentically help teachers teach. It is our reality that when we have too many things on our plate, it is human nature that our response is to let something go. Therefore, it is probable that we will prepare our lessons for the majority of the "in the middle" learners in the classroom. So, this means that the students at the ends are probably not going to always get what they need, because time just will not allow it. However, I think if there were suggestions already thought through about how I could scaffold learning for my struggling students and extend instruction for my GT student on a particular topic,

> then this is time saved and used proactively and I would most likely implement those suggestions more frequently with my students. I have saved thirty to forty-five minutes of my planning time in searching for something I can use, and I feel more supported as a teacher to have some ideas to consider using with my group. Please do not misunderstand, this is not a script but another layer of thinking, an overlay of support. These suggestions would go a long way, especially with new teachers to the district and to content area instruction. Seasoned professionals could take these suggestions and run with them, and this is what a curriculum should provide…embedded choices.

With a new district Superintendent in place this school year, there was sense of urgency to identify the present challenges that school and district administrators address in meeting the changing needs of students' diverse backgrounds. Reflection on how bilingual/ESL instructional programming should pivot to meet these needs was critical to problem solve for appropriate solutions.

Science Specialist Support

Ophelia and Abigail both affirmed the willingness of district specialists to support them when asked, especially the science specialist, Ingrid. They both felt comfortable and confident that open communication would be well-received if they had questions and needed clarification from Ingrid about curriculum expectations in science. Ofelia clarified:

> I feel like the district specialists are very accessible. So, for fifth-grade science, I feel like Ingrid, the person who supports that, is truly a phone call, a text, or email away. She does not just say she will come support the teachers; it truly shows through their actions. This is so important because it readily builds trust and

enables transparency. It's hard to ask for help and not feel like "I know I'm new, but maybe I should already know this."

According to Abigail, Ingrid is both available and responsive when contacted for assistance and attending teacher planning meetings, stating:

> The science specialist is very good about responding and coming in when the science teachers need her, and she attends their department meetings at least twice a month. If the teachers want something modeled and they email her, she comes into their class to model a lesson with the students.

Affirming the sentiments from the school principals' comments above, Ingrid asserted that she truly enjoys working alongside of the science teachers from her grade band, Kindergarten through sixth grade. "I really enjoy what I do; it's challenging and diversified, so there are a lot of components. In the last seventeen years, I feel like I've built a successful middle school science program." Her next challenge will be to preplan the science curriculum updates for the new science TEKS that the Texas Education Agency will roll out for the 2024-2025 school year. She reiterated:

> As a new teacher coming into the science classroom in our school district, he or she has a lot of resources at their disposal, which is very helpful. And I've been coaching on the same TEKS and science components every time we begin a new school year and throughout the year with teachers during professional development. I feel though that even with the training we have in place that teachers may need additional training on new materials that are purchased for them.

With the responsibility resting on Ingrid's shoulders to support all of the science curriculum on eight different campuses, Ophelia explained Ingrid's jobs with an analogy of dividing her support between all of the schools as "a pie cut into eight equal parts."

She expressed that she felt like Ingrid had a difficult task to attend to the needs of all eight campuses, the four middle schools and the four junior high schools. Each school varies in their student demographic composition, and therefore, equal access in equal parts may not be the best way to respond to these diverse needs.

Both administrators also noted that after every science assessment, and assessments given in other content areas, they receive the data and have conversations about the "glows and grows," as Ophelia described further. These conversations bring up levels of concerns, not with specific teachers, but are more topic-focused within the curriculum. Ophelia continued to clarify:

> The conversations are more focused on students having trouble with this science TEK or that TEK, so it will be essential to plan to spiral those TEKS back in through the weekly lessons or in the spring when those TEKS are reintroduced in another unit in the science curriculum. After we see the overall scores, we start looking at our student subpopulations and how each one is doing. EBs, my 504 kids, my special ed kids, general education kids…we look at them all, because in today's school accountability report card, every kid counts, every kid. Sometimes our minds go directly to those who typically struggle like it has to be an economically disadvantaged student, but in reality, any student can get lost along the way through the years. We have to develop the mindset that we need to help every student grow, not just those who struggle. If everyone works with the mentality of growing every kid, then it does not matter what programming their participate in, as we all grow to meet our potential. We grow every student, and it might take one year, or it might take five, but we grow every student…period. We all share responsibility because they are all our kids. For example, those students who already perform at the top need to be challenged to stay there and grow there

into the next year. My message for this campus is that all of our students belong to all of us, as we are collectively accountable for each one. This mindset shift is really important, and this message is one that is coming from the top down to us.

Laniah, a district level administrator, described the struggle mentioned above and stressed that it is an issue for science teachers at the middle and high school levels. STAAR testing in the sciences are administered and students are held accountable for the curriculum in science that begins at first grade and builds year after year.

> We [district administrators] talked about this this week how we only have one curriculum specialist at fifth grade in science, which is a lot for her, because she is responsible for four middle schools, for fifth and sixth grades, and all of the junior high schools, which serve seventh and eighth graders. Additionally, she's responsible for the vertical alignment beginning at the elementary schools. It is hard. I think she really tries to give her all to our fifth grade, but she's still split in half with helping our lower grades learn science content. And students learning to get to where we need them to be in fifth grade is just as important. Coming from elementary school, I'll be the first to admit that science is not as important in comparison to math and reading. Do they get it? Yes. Do they get it to the maximum extent they need to continue to be successful when they get to fifth grade? I must be honest and say no, because in elementary school your focus is really on reading and math. This is the foundation of everything, learning to read and scaffold to build math skills. There are teachers that are really focused on teaching science in elementary and have made the time to extend their science lessons through the hands-on activities, touching things, feeling things, and going deeper with the science inquiry pieces. Currently, we are seeing large gaps in learning because of COVID, and teachers are diligently playing catch up in many

ways with their students. Students come in to fifth grade that do not have the background knowledge they need. You're having to go back to the basics and continue to spiral to make progress and get to fifth-grade content. And it's nobody's fault and we aren't pointing fingers, but as educators we must do what's best for students.

Just like the teachers, Laniah praised Ingrid's diligence in ensuring that fifth-grade science teachers have the needed professional development on how to present hands-on lab experiences to students and emphasize the vocabulary that complements the lessons.

> The professional development that teachers are receiving in science is great. Science inquiry is about understanding science vocabulary and processes in order to know why things work one way or another. It is being able to ask good questions and why those questions are asked in the first place. The principals have made sure that the teachers have the necessary materials they need, too, and Ingrid makes it all happen. Ingrid knows every campus, builds strong relationships with the science teachers there, and she mentors teachers who are struggling with the science curriculum. Her approach is hands-on, and she is always all in on growing her science teachers. When I was a principal, she was instrumental at stopping by to say "Hey, I noticed this person may need a little bit of help, do you mind if I stop by a little more often to check in and support?" She would meet with them during their planning time, and that's truly her passion. But it is also limited in a way, because you have only one person that's responsible for kindergarten through fifth grade, and that's a lot of responsibility and accountability on one person.

Coming into administrative positions with a wealth of experiences, it is evident that these administrators were purposeful in applying that knowledge and leadership in their current roles. This knowledge has enabled them to be mindful when planning for the needs of their schools, such as the scheduling logistics with diverse student populations and planning for collaboration opportunities with district content specialists to meet the needs of their teachers as they plan for student success. It was also evident that there is still work to be done to improve communication between school district departments working in their own "silos."

Administrator Professional Development

Ophelia and Abigail noted that all administrators are provided with yearly curriculum updates during the summer months and information concerning upcoming accountability changes handed down from TEA for the new school year. During these monthly leadership meetings, the administrators may also share an educational article and initiate an intelligible conversation with fellow colleagues. Ophelia mentioned, too, that sometimes teachers receive these curriculum updates before administrators through professional development opportunities in the summer. She explained further:

> I do not necessarily think it is PD, but more as an opportunity to collaborate with fellow administrators. It is a great group, and we all get along very well so it is easy to have conversations about what other campus administrators are doing. Throughout the meeting, I try to ask myself, "What can I take from this?" I feel I could sign up for anything I wanted to go to, and I would be supported with that. It is something you certainly have to grasp and pursue. PD opportunities do not fall in our laps, so you have to be proactive in searching for the topics you feel you need.

As evidenced below, Abigail expressed the need for more professional development for administrators to effectively learn content area strategies. Abigail stated:

> Yes, we do receive professional development. I think we need more. Unless you are actually going and sitting in the content area trainings and observing team meetings, you don't get all of that information. We get information at the beginning of the semesters, updated scope and sequence for curriculum and the planning guides like all of the teachers get, and you try to make yourself available when there are other teacher training days. In the summers, a lot of us will go to different conferences about things we are interested in, and then when school starts again, we get our annual updates on the Code of Conduct and any new legal updates. This year administrators focused on teacher observations and calibrating for T-TESS, so we have participated in more observations in groups to calibrate together.

Laniah affirmed Abigail's comments made above and added that as aspirations of promotion increase, there are fewer professional development opportunities for administrators to attend. Planning for teacher training concerning curriculum updates has been tantamount to ensuring that school administrators receive these updates as well. She affirmed:

> We have great principals that sit in with a lot of their teachers at the curriculum trainings, but sometimes they get pulled to attend to other responsibilities. So, to me, we need to really work on how to get our principals exposed to these updates and information during the summer months, when the teachers have gone for the summer, to enable them to focus on what they need to know concerning content area curriculum. This includes what they need to look for as they are working with teachers and observing classrooms and how to support their teachers with

curriculum during the school year. When I was a principal, I would sign up to go to a workshop with my teachers, then an emergency would pop up on campus. I was so excited to go deep into the curriculum, get to the meat and potatoes of it, because I was one of those administrators that wanted to know all about it. What is the language arts TEK 5.4b? What are the learning expectations for that TEK and what does that look like during instruction for the teacher? How will students demonstrate mastery of that TEK after a lesson? Then I would get a call from campus and have to reschedule or not attend that PD, so it ultimately became a priority where I would continually put myself in positions to learn when I could get away. When you are in a principal role, there are many other priorities that come with the job. If you don't make instructional leadership a priority, too, then you will feel disconnected to the instructional piece if you don't continue to immerse yourself in it. That's just one content area, and there are multiples, in addition to the electives being offered at that school and physical education.

This school year, one way that the new superintendent challenged the district administrators and the C & I staff was to ensure that they could calibrate their classroom observations together as they visited different schools around the district. During this collaboration, the goal after observing a classroom or lesson was to score the observation in the same way between the group of administrators. Laniah shared her experiences about these calibration activities and reflected on her role as a former principal:

> Our superintendent, Brian, challenged the entire administrative staff to go into the classrooms all over our school district in order to calibrate together to evaluate the classroom environment using T-TESS. We were all seen on campuses a lot more than in years past which I know was not easy, because typically upper administration does not show up on campus unless there is a problem to address,

and they especially didn't come into classrooms. However, I think the fact that teachers saw us come in to observe more also enabled them to become more comfortable seeing us regularly and build a stronger relationship. They know we are making efforts to show up, taking an interest in their classrooms, they see us there to support them and that has helped a lot. I hope they know that I show up to see what's going on to support them and their principals however I can. Even with my principals, I will ask them if they'd like a break and tell them "take ten minutes" to step away from their desks to do whatever they need to do for themselves. I remember being in that role, and sometimes the day does not allow for a moment to gather your thoughts and just take care of your own needs. It is a lot, and it requires a lot. Being an administrator is an awesome experience, but it can also be lonely because you have taken on so many things. It is definitely a balancing act, both personally and professionally.

With increased accountability for school and district administration, the administrators in this study voiced that one of the results from this was that there are few opportunities to step away from their administrative role in order to seek their own professional development. They noted that it was difficult to even find growth opportunities for upper administrators. Also, upper administrators at the district were mindful about how their presence was perhaps negatively perceived by staff members during campus visits and the difficulty in balancing their role in accountability with the role of professional colleague who understands the administrative duties.

Summary of Administrator Perspectives and Experiences

The administrators reiterated that working in leadership roles can feel somewhat isolating, however the work is important and essential. Creating an effective school schedule for equity in meeting the academic needs of a diverse populations and building

relationships and fostering a mindset of collaboration with district specialists in the area of science and second-language acquisition are equitable practices, especially for EB students. Continuing education through professional development opportunities for school administrators is still a priority, however it is difficult to grow in professional areas of need when the expectation is to be visible and responsible to the needs of school campus.

Summary

The teachers and administrators graciously shared their experiences and perceptions of the SIOP model implementation in the science classroom and identified some of the challenges they faced to meet the diverse needs of their EB students on their campus. Both groups asserted the importance of having more examples of content modeling from district specialists in the areas of science and in the SIOP model, and both groups reiterated that they found value in collaborative learning with peers, however time constraints and engaging in relevant professional development opportunities were challenging. The science teachers advocated for more opportunities to synthesis content learning during trainings and formulate a plan of action in how they will present science lessons and incorporate sheltered instruction strategies, simultaneously, with their EB students. However, the administrators assumed that teachers had enough time for professional development that included this planning time. Teachers voice that they valued accountability, both horizontally within their content of science and vertically in how science is taught in the lower grades, to build upon the foundational science knowledge taught in earlier grade levels in order to connect to more abstract science content in fifth grade.

CHAPTER V:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

The purpose of this study was to examine fifth-grade science teachers' and school district administrators' perceptions of the implementation of the Sheltered Instruction Observation Protocol (SIOP) model in fifth-grade science. There were two research questions that guided this study. The first question asked, "What are the teachers' perspectives of their implementation of the SIOP model in fifth-grade science instruction?" The second question asked, "What are the administrators' perspective of the implementation of the SIOP model in fifth-grade science instruction?"

For this study, the researcher used Cummins's (1984) theoretical framework of second language acquisition to enhance the understanding of the experiences and perceptions of the fifth-grade science teachers and the school district's administrators in implementing the SIOP model in fifth-grade science classrooms. Cummins's Theory of Language Acquisition states that students learn language best by integrating a strong foundation in the students' native language, L1, as a springboard for learning a second language, L2 (Cummins, 1984).

A constant comparative analysis was used in this study to compare the data obtained from the ten participants, four fifth-grade science teachers and six administrators (Miles et al., 2019). The fifth-grade science teachers and district administrators from an urban public school in southeast Texas were invited to participate in this study. The fifth-grade science teachers participated in a focus group, while individual interviews were conducted with each of the administrators. The administrators included: two middle school principals, including the principal of the middle school campus of fifth-grade science teachers who participated, the science curriculum specialist, the Director of

Bilingual Education for the district, the Executive Director of Middle Schools, who was once a principal at another Title 1 middle school campus in the same school district, and the new Superintendent of schools for the district. One teacher focus group, consisting of four fifth-grade science teachers, and six individual administrator interviews were conducted using semi-structured interview protocols, created by the researcher, one for teachers (see Appendix A) and one for administrators (see Appendix B). These interview protocols were used to explore the research questions. From the focus group data and interview data, the researcher addressed the two research questions that guided the study.

Summary of the Findings

The summary of the findings from this study addressed the three themes that emerged from the fifth-grade teachers through the data that were collected during a focus group and/or one-on-one follow-up interviews. These themes included: Modeling and Support, Purposeful Lesson Planning Time for Sheltered Instruction Implementation, and Teacher Accountability and Follow-up with In-class Implementation. Three themes emerged from the individual interviews with the district administrators: Creating a Needs Assessment, Coordinating Support with District Specialists, and Professional Development. The researcher also discussed and compared the three emergent themes that resulted from the one-on-one interviews that included the six administrators. The themes were compared in relation to the research questions that guided this study, which are as follows:

What are the teachers' perspectives of their implementation of the SIOP model in fifth-grade science?

Teachers' View: Modeling and Support for Science and the SIOP Model

One of the emergent themes from the teacher focus group was a need for more modeling and support in their science professional development trainings and in the areas

of SIOP application in the science classroom. The fifth-grade science teachers voiced the need for more training that demonstrated how to integrate the SIOP strategies with science with their EB students. One reason the teachers felt they needed more assistance in teaching science using SIOP strategies was that all four teachers commented that their preservice teacher training courses and ACP modules online in the area of science instruction did not prepare them properly to address the academic needs of students learning science. All four teachers agreed that the science specialist repeatedly planned valuable professional development trainings on specific science content for fifth grade. They reiterated multiple times that Ingrid was responsive when asked to attend teachers' planning meetings, and she would often offer to come to their classrooms to model lessons and coteach with the teachers during their class time with students. Additionally, current training opportunities in the district on SIOP have been repetitive and have not been aligned to address the diverse learning needs of EB students in science, causing teacher frustration in the process. The depth and complexity in implementing these valuable strategies is severely lacking. Savannah commented on this and noted:

> In my class, when I used the SIOP strategies with students then they begin to understand clearly and ask more questions. Now that I have made a connection in my lesson, they have a new question or ask about a part they do not understand yet. However, after a training session there is not a lot of time to plan, prepare, or implement anything that I've learned from those ESL trainings. All the preparation work I do is on my own time, because I know it is important for my EBs, and the student outcomes are so much better. But again, we all want to apply what we have learned, but there is no time.

All four teachers understood and appreciated the value in implementing the SIOP model, however they continued to request more opportunities to see how to implement it

concretely and in meaningful ways into their science lessons. This training could best be provided with clear modeling and follow-up support from the science specialist and bilingual/dual language specialists as they work with teachers to model during professional development trainings and work alongside with teachers during classroom lessons. It would also allow for the teacher-requested follow up on the results of teacher implementation and integration of the sheltered instruction strategies in science class with EB students.

Jim Cummins's (1984) theory on language acquisition asserted that second language learning in the content areas should not be taught in isolation but that learning a second language is built from and scaffolded upon a strong foundation in a student's first language (L1). After the foundational L1 is created, it is then that students have a greater ability to connect to and apply their knowledge in their L1 toward acquiring their second language, L2 (Cummins, 1984). Cummins's theory supports the fifth-grade science teachers' needs to integrate sheltered instruction strategies into their lessons in their content area for greater student success in academic learning in science. Current research on this topic continues to support this theory of second language learning in the content areas as EBs apply the L1 attributes and cultural experiences to the process of learning a second language (García et al., 2018; Otheguy et al., 2018). In this study, Spanish-speaking teachers support their bilingual Spanish-speaking students in continued language development in L1. These teachers also use students' L1 to scaffold learning to develop their second language, L2. However, for ESL students who speak languages other than English, ESL teachers are tasked with developing a strong L2 foundation through content-based sheltered instruction strategies, such as those in the SIOP model in the science classroom, in addition to teaching the structures and syntax of the English language through ESL services. Echevarría et al. (2017) asserted that "effective sheltered

instruction is not simply a set of additional or replacement instructional techniques that teachers implement in their classrooms. Instead, it draws from and complements methods advocated for in both second language and mainstream classrooms" (p. 17). In this study, student learning in science for EBs did not take place in isolation as teachers planned and implemented the SIOP model to the best of their ability using the knowledge gained from their SIOP trainings (Echevarría et al., 2017). However, the science teachers felt that they were providing surface-level instruction using the SIOP model, and deeper understanding in implementing the SIOP was needed to meet the learning demands of their EB students.

Administrators' View: Modeling and Support for Science and the SIOP Model

Five out of the six administrators asserted that they believed the science teachers needed more time for modeling and support from the district's science and bilingual specialists through the science and sheltered instruction trainings that were already being provided. The administrators' perceptions were in line with that of the teachers' perceptions on this topic. Five out of the six administrators asserted in some fashion that the SIOP model is just full of good teaching strategies that benefit all students in the classroom, even for students who are not identified as emergent bilingual students. All four teachers asserted the value of the SIOP model as well and experienced this first-hand a positive response from their EB students. As a school administrator, Abigail noted that her fifth-grade teachers of the EBs on her campus have asked for and worked with the bilingual specialists on several occasions throughout the school year to address specific second language learning needs of their ESL students on her campus, because additional support was needed. This is aligned with the research of Echevarría et al. (2011) in that the bilingual specialists responded to the teachers needing additional support to assist their ESL population at their school, therefore, increasing the fidelity to which the teachers implemented sheltered instruction to meet specific student needs. Abigail was an

instrumental example of leveraging the expertise of the bilingual specialists to engage in purposeful modeling and support for the SIOP model in the content areas (Lochmiller & Acker-Hocevar, 2016).

Implications for Practice: Modeling and Support for Science and the SIOP Model

Involving all content teachers into professional development conversations during teacher trainings about how they indeed are teachers of the language of their content area will be critical in changing the traditional teacher mindset focusing solely on their content and vocabulary development, like in science, math, or social studies. It may also be assumed that teachers of EB students typically overestimate their students' knowledge of academic content and academic language based on how well they speak conversational English with their peers and adults. However, this cannot be a valuable assumption based on high levels of social language in English, or EB students' L2. As Elyn, the Director of Bilingual and ESL programs, asserted in her interview, "a lot of teachers sometimes feel that they are not language teachers. They are there to teach academic content, and they question why students need writing in math or science. You need to have a language mindset for every content area." It will be critical for school district principals and professional development facilitators to take initiative in planning effective opportunities to share how this integrative approach between academic content and communication using the academic language affects all of their students' learning in their classroom. In research conducted by Hayden (2019), students' achievement in English acquisition greatly improved for the EB students who participated in class lessons with teachers who implemented the SIOP model daily and with fidelity. For example, for this study, integrating professional development trainings that connect science content and sheltered instruction strategies, to address the learning needs of EB students during science lessons, could provide the science teachers with specific verbiage and examples of model lessons

that meet the teachers' needs as well. This practice would simulate what good science lessons would look like with students in the science classroom using the SIOP strategies, so that all students could benefit, including EB students. District specialists would co-plan and co-teach so that both pieces are integrated into the model lessons for teachers. This training integration would equip all fifth-grade science teachers, especially those new to the school district, with shared curriculum alignment and teaching expectations between middle schools.

Integration of sheltered instruction, such as the SIOP model, with the curriculum documents' scope and sequence in the content areas would align these essential pieces of second language instruction to make teacher planning for implementation easier. This integration would provide seasoned teachers, as well as new teachers to the district, with tangibles to help them visualize elements from their science and SIOP model trainings and see how they actually transfer into their lesson plans. Aligning these instruction pieces would also align with the district's focus to move away from the idea of "working in separate silos" and provide an integrative approach to teaching the whole child. If the specialists do not make this adjustment to incorporate an integrative vision of what the SIOP model would look like in fifth-grade science class with students, then student learning and achievement may suffer.

Teachers' Views: Purposeful Lesson Planning Time for the SIOP Model Implementation

Along with the need for additional modeling and support from specific school district curriculum specialists, the science teachers agreed unanimously that more time for purposeful lesson planning was needed to apply their knowledge of science content with the SIOP. When asked what the teachers' perceptions were about their effectiveness as a teacher of EB students, all four teachers responded with the need for more

"purposeful planning" and for the time necessary to plan after a training. During professional development trainings, teachers are provided with copious amounts of data, curriculum content updates and resources. However, teachers lack the time needed afterward to process and synthesize this information concerning how it would be planned into the science time block for class and what that will look like for their diverse student populations, including EB students. Ashley clarified with the following examples:

> What would be ideal is to have time after I have finished professional development for planning my implementation into my lessons. I am already thinking about how I am going to differentiate for my EBs and how I am going to embed it in the lesson. Then I am thinking about what sheltered instruction strategies I can use with them that would be best for this science objective, how I'm going to teach the vocabulary for it, and what outcomes the students need to be able to complete to show mastery of that objective. However, where is that time I need to get this all down into my lesson plan and organize it so it's ready to go for my science classes?

Additionally, the teacher focus group asserted that collaboration as a science department with other fifth-grade science teachers from the middle schools in the district was valuable and welcomed. Having the necessary time to plan after PD, in addition to planning in a collaborative group with fellow teaching colleagues, would lend itself to improved lesson planning with the ability to fully develop the second-language learning strategies and differentiation needed to address the array of student needs in the fifth-grade science classroom, including those of the EB students served. The SIOP model was designed to improve academic language proficiency and is rigorous for second language development; the same rigor, in relation to teacher professional development, should be provided for teachers. In support of this rigor, research completed by Echevarría et al.

(2011) asserted that the fidelity to which teachers implement research-based practices in the content areas, such as the SIOP model, greatly affects student achievement. Without it, teachers and administrators take continued risks that the achievement gap for EBs in science learning, as well as in EB achievement in their L2, will remain unchanged, causing further detrimental results to their intended goal of continuous improvement to meet the needs of the changing demographics within the school district.

Administrators' View: Purposeful Lesson Planning Time for the SIOP Model Implementation

The fifth-grade science teachers and administrators disagreed about how much time teachers were provided to purposefully plan to integrate sheltered instruction strategies into science lessons after professional development training. While administrators thought that their teachers had sufficient time to plan after their professional development trainings, the teachers voiced that they needed more time for this to happen effectively. This planning time for teachers was reported to have typically taken place outside of the daily planning period, and thus, outside of the typical workday. Unfortunately, this has been the professional development trend in this district, and in the education community, for many years.

In White's (2023) dissertation, it was previously reinforced that principals' perceptions concerning how they faced the difficult task of improving student achievement while simultaneously closing gaps in learning of low socioeconomic students (low SES) is paramount in making effective school changes. In the high-performing schools in Texas, it was notable that an effective principal leadership behavior was making data-driven decisions leading to changes that affect student achievement (White, 2023). When asked what challenges the principals faced when addressing the learning gaps of their low SES population, the results showed a need for

more teacher professional development opportunities and social emotional learning support for both their staff and their students (White, 2023). Time is essential for purposeful planning.

In results of a study by Castañeda et al. (2021), the researchers asserted that "while there was a high level of agreement on the importance of enriched professional learning environments" by teachers in the study, "there were also some teachers who mentioned the limited time available for training and learning from others" (p.11). Short and Echevarría (2016) asserted that thoughtful and reflective planning allows for greater teacher effectiveness and, thus, more effective learning experiences for students in the classroom. In Laniah's interview, the school district's Executive Director of Middle Schools, she posited that there are focused teaching efforts in the areas of reading and math instruction to develop a strong foundation for learning, however, science is not taught to the maximum extent that it needs to be in order for students to be successful in fifth-grade science. When administrators do not allow for sufficient planning time or the opportunity to collaborate with teacher colleagues across the district to synthesize their learning, then teaching practices and content area lesson delivery suffer and, thus, student learning is not maximized and ultimately suffers as a result.

Implications for Practice: Purposeful Lesson Planning Time for the SIOP Model Implementation

The science teachers noted that their trainings in the SIOP model were the same yearly basic trainings that covered the theory behind using the strategies with EB students and did not link the strategies to the content areas in practical ways to equip more advanced EB learners. This inadequate training left the teachers frustrated with attending the professional development for bilingual and ESL updates, devoid of any constructive take-aways for instructional implementation of the SIOP with their students. When

teachers participate in purposeful lesson planning, student engagement in the classroom increases and, as a result, student achievement increases (Ronfeldt et al., 2015). Purposeful teacher preparation in the content area, such as science, affects the quality of teaching practices and the depth of learning in science for which all students are held accountable, including EB students. Lochmiller & Acker-Hocevar (2016) asserted the importance of instructional planning for this reason, whilst also being supported by teachers' administrators to have time to do so. Using the SIOP model as a flexible approach to deliver quality science instruction in English allows for EB students who are in the process of learning English to also grasp complex science content simultaneously (Echevarría et al., 2017). Connections between science concepts may be clearer due to the addition of sheltered instruction strategies purposefully chosen to enhance lesson content to help EBs scaffold their learning. However, in this study, in-depth training is not being offered, therefore, the need for teachers to purposefully plan to use the SIOP model, to implement with their students, is not being met by the school district. If teachers are unable to apply the SIOP strategies with students, then students' English language acquisition and content area learning suffer. Since a lack of training in areas of need is a reoccurring theme throughout this study, it will be necessary for the science teachers to do their own research in a collaborative effort to guide them with instructional planning integrating the SIOP model. The teachers could form their own study group, research together, and share and model for one another within the group how a lesson would look with EB students. Afterward, the teacher collaborative could reflect on the effectiveness of the lesson and make any adjustments for planning. This could potentially be completed during the teachers' planning time together each week, where all teachers bring teaching and activity ideas to the group and use this time for SIOP strategy collaboration, clarify content and language objectives for class lessons, and develop a

plan for scaffolding supports to grow students' academic language and the different ways students are able to successfully communicate their science learning. This purposeful planning time together with the SIOP model in mind would also eliminate the extra time teachers used for planning outside of the school day.

Teachers' Views: Accountability and Follow-up with In-Class Implementation

Initially, the fifth-grade science teachers had voiced their frustrations with the beginning of each school year because incoming students did not come to fifth grade with a strong science background. At the lower grade levels, the focus of learning lies in developing a foundation in reading and math, thus the science content has often not been taught with fidelity. In addition, the general school structure of the grade levels on elementary campuses, welcoming kindergarten to fourth grade students, versus that of the middle school campuses, which houses fifth and sixth grades, made it difficult for teachers to collaborate across grade levels in science.

The fifth-grade teacher focus group also spoke about how they find the value in professional accountability and follow-up with the in-class implementation of the SIOP model within the content of science. The science teachers felt quite a disconnect between receiving students at the fifth-grade level and the content that these students should have already learned in previous science lessons at prior grade levels. Science instruction at the elementary levels was supposed to lay a strong foundational base upon which science content learned in the upper grade levels is built with more depth and complexity, like that in fifth-grade science. Sometimes educators assume that students come with the schema necessary to be successful in science class because they have a knowledge of English-Spanish cognates of the academic vocabulary. However, it cannot be assumed that students know the meaning of these words and can use them effectively when communicating their science knowledge, even though the words look very similar in both

languages. Such knowledge must be explicitly taught, as well as how to use these words to communicate using complete thoughts and sentences in English. Additionally, when students do not come with that foundational knowledge and academic vocabulary in science, the fifth-grade science teachers are tasked with remediating science instruction on top of the current curriculum. Furthermore, the EB students are not only tasked to learn additional foundational content that they missed in the lower grades, but they have the additional issue with learning the complex language of science.

The fifth-grade teacher focus group asserted that they truly felt supported in the content area of science by Ingrid, the district's science content specialist. Ingrid has facilitated and modeled many science trainings, regularly attended the science teachers' planning meetings to assist with planning and modeled and co-taught science lessons with teachers in the classroom. Ingrid's passion and hands-on approach to teaching science were evident by the manner in which she fully supports teachers and is evident in her approachability and responsiveness when teachers and administrators reached out to her for her assistance. The teachers felt that they had ample opportunities for learning the needed curriculum content in science.

However, the fifth-grade teachers believed that more support for the implementation of the SIOP model by the bilingual specialists was crucial for their program's success in addressing the English language learning needs of their EB students. All teachers in this study would welcome additional support in this area because they see not only the added value of implementing sheltered instructional strategies in their science classroom, but how it helps their EB students grasp science content while learning the English vocabulary and structure to express their learning in meaningful ways, holding all students accountable for this learning.

Administrators' View: Accountability and Follow-up with In-Class Implementation

Elyn, the Bilingual/ESL Director, noted that the bilingual/ESL specialists in her department are not only tasked to complete federal and state compliance paperwork on each EB throughout the year on every district campus, but they have initiated one-on-one supports for specific teachers who work with EB students, in bilingual, dual language and ESL programs, on different campuses this school year. Their additional work this year consisted of more of a coaching role, supporting and offering suggestions to classroom teachers about strategies to improve classroom management of student behaviors and offering sheltered instruction teaching ideas and strategy suggestions to support lessons. Abigail confirmed that this coaching made a difference with her teachers in how they meet their EB's academic language-learning needs. Ingrid, the school district's science specialist in grades K through sixth, noted that she spends a great amount of time searching for materials, planning with and coaching science teachers in the classroom, and preparing relevant professional development experiences to train teachers to implement in science classrooms.

In the C&I department, there is only one specialist for dual language serving kindergarten through sixth grade, so in collaboration with the Bilingual/ ESL department now there are four specialists to assist teachers of EB students. There are eleven elementary schools and four middle schools in the district, many of which serve EB students representing a variety of learning and language-acquisition needs. All four out of the four teachers and five of the six administrators from this study reiterated more than twice during the focus group and interviews that the content specialists, including the bilingual and science specialists, were spread too thinly in their workload to address such a vast array of K6 school needs. It was highlighted, however, in each participant's communication that they believed that each specialist exemplified high expectations for

their work ethic and the efforts and resources they brought forth to support the teachers' needs and the needs these teachers had in instructing at high levels with their students.

Implications for Practice: Accountability and Follow-up with In-Class Implementation

Knowing that science instruction typically is not taught with fidelity in the elementary grades, it is unrealistic to expect that any changes to increase students' learning and achievement scores in the area of science will happen without increased accountability to teach and assess student learning, with fidelity, at the elementary school level. If science is not taught with fidelity and effective, in-depth training in the SIOP model is not happening, how then can the schools and district assume growth in student learning will take place without addressing these issues? In Choi et al.'s study (2023), the findings concluded that, regardless of the language in which the class was taught or whether or not the class was a Dual Language bilingual education, DLBE, class or traditional English class, all teachers in the study exhibited strong fidelity when implementing sheltered instruction in their classrooms with students, as measured using the SIOP model.

What are the administrators' perspectives of the implementation of the SIOP model in fifth-grade science?

Creating a Teachers' Needs Assessment

Abigail, a middle school principal, spoke passionately about creating an equitable school schedule that maximized the instructional time for students while meeting the needs of the teachers required to service students from different programs, such as special education and ESL. Applying her previous experience as a school counselor and creating a master schedule for special education and ESL students, Abigail was keen and mindful in how to group students in those programs so that the teachers who served them could

also meet their needs within the class. She noted that the ESL students at her school are successful in their second language acquisition, highlighting that students often reclassify as non-EB students and enter their four years of monitoring after reclassification to ensure that they continue showing academic progress. Reclassification of EB students means that students have reached "High" levels of English language proficiency on TELPAS and have met grade-level standards on the STAAR test in reading (Texas Education Agency Online, 2014).

Another issue that surfaced in Abigail's interview was the intent of the school district to dissolve ESL positions and reassign ESL teachers across the district. The district now requires that all teachers earn their ESL certification, to be in compliance with TEA, so that ESL students may be scheduled with any ESL certified teacher in any class. This would alleviate large class sizes, having to accommodate several ESL students and staff the class with a separate ESL teacher, and ESL students would continue to receive ESL support services by the content area teacher. The job of the ESL teacher would typically be to push into the class to provide ESL support to ESL students or pull these students out of the class to provide ESL services.

A third issue that Abigail communicated was that of collaboration with EB specialists to identify and purchase the ESL resources necessary to meet the needs of newcomer EBs in her school. These new EB's came without a foundation in the English language and were fluent only in their home language, L1.

Implications for Practice: Creating a Teachers' Needs Assessment

Without Abigail's prior experience and schema as a counselor and scheduler, she may not have experienced this success in creating an instructional environment in which all teachers can be intentional with timely student support in ESL and special education. Without designated sections for particular programs, principals risk staffing classes with

teachers who lack the necessary training and knowledge and, therefore, students do not receive the support needed to experience academic success in the content areas. In addition, if the number of ESL students reclassifying from the ESL program were low, this would signify an issue that would require attention. The principal would have to gather data to identify the root cause of this issue and plan for the next school year that focused on ways to assist their ESL students in reclassification.

While content area teachers complied with the new reality of acquiring an additional ESL certification requirement and took the ESL certification test, the teachers reported that they still felt overwhelmed and inadequately prepared to meet the needs of these EB students in their acquisition of English in their subject areas. School administrators, with the support of the Bilingual and ESL department and specialists, must provide instructional support for these teachers in the areas of sheltered instruction, like the SIOP model, so that teachers are equipped with the knowledge and strategies need to maximize their EB students' second language learning while simultaneously teaching the subject content, such as science. Without this support, school districts risk that teachers may experience feelings of dissatisfaction in their current roles and look elsewhere where more support may be provided to them. Also, it will be essential for ESL teachers within a campus, or within the school district, to seek out other ESL teachers in their content area or within their grade level band, such as fifth and sixth grades, and collaborate together regularly to share sheltered instruction strategies, like that of the SIOP model, and what is working well with their ESL students. This ESL teacher cohort could potentially plan together, research and present best practices with their group, and then return to their home campuses to share this knowledge with their colleagues during professional development. This type of collaboration shares the responsibility of providing ESL content to EB students, while also building teacher

capacity and confidence in teaching ESL as they share their knowledge and how to integrate sheltered instructional strategies with their with fellow teachers. It would be beneficial, too, to share the different strategies they use to teach the English language, as all teachers in some fashion teach the English language and structures of academic writing within the context of their subject area. What are other ESL teachers doing in the content area that affects growth in student learning? These are the nuggets of best teaching practices for ESL instruction that teachers need to share.

With the influx of monolingual newcomer students to school districts around the United States, and especially in school districts in the state of Texas, it is essential to prepare for schools to serve large populations of students identified as EBs by having the necessary resources and materials in English to do so successfully. When students are identified as EB, and their L1 is Spanish, then they could potentially participate in a bilingual or dual language program in which their L1 would be supported, and L2 acquisition would be supported in the English language. New teachers to the school district would not know what resources are available for them to use with their EB students to build a foundational understanding in English, thus, fostering students' acquisition of their L2. Principals and content specialists must be explicit in teaching new teachers about the content area resources, texts, supplementary materials, and resources that have been purchased for their content. It would be essential to plan explicit professional development to teach these teachers how to use each resource effectively and how they complement other resources to purposefully plan to meet their students' needs, like those of EB students.

To address the departmentalization of the school district's main office, the superintendent should create opportunities for the different departments to get acquainted with one another and begin building stronger relationships between them. Just as teachers

take time at the beginning of the school year to set clear expectations and begin to build relationships with students, this is the dynamic that is required of the district office if the goal is to integrate the work between district departments, instead of each one working in their own separate silos on their own content. Each district office's work is tied to students achieving at high levels, so it will be essential for each department to define what they do that contributes to this vision. How do they impact students' safety, students' learning, and/or students' achievement? What do they do, specifically, to make an impact on students' learning and growth? In the larger scope of ensuring that the school district runs efficiently and effectively, it is critical that all stakeholders in each department have a clear vision of how their work impacts students, and everyone should be able to articulate this well when asked about it.

Coordinating Support for Teachers with District Specialists

During his first year as the school district's new superintendent, Brian challenged the district's staff to begin to address: 1) how to build strong, working relationships with and collaborate between departments and 2) how this collaboration will benefit teachers' in further developing their best instructional practices to have the greatest impact on student learning. This move will be essential in fostering growth for the school district because its student demographics have been progressively changing from year to year. Although the district's professional development practices and curriculum have remained strong for years, everything has remained fairly unchanged. What has always worked in the past may not continue to work, because the students and their needs have changed considerably.

Just as the teachers noted their need to collaborate more with district bilingual specialists, the principals agreed that more bilingual/ES specialist support would be valuable to assist teacher with classroom instruction in the content areas with their EB

students. The administrators noted that there was a concern with how to build newcomer EB students' foundational skills in English. Typically, this group of students is enrolled in the bilingual or dual language program in the school in which they are zoned, however their as newcomer EBs they have little to no language base in English. This may be especially true for newcomer EB students that also lack language skills in their primary language, L1, and therefore, it will be increasingly difficult for these students to acquire English, L2, because of this lack of a primary language foundation in L1. This is a struggle for teachers to find equitable time during content-area instruction that should be devoted to these new English-language learners, but often is not. Students without this explicit teaching run the risk in not developing a strong foundation in English, and therefore not excelling enough in their language acquisition of English in order to make a year's worth of progress, every year, and exiting the program. This is how EB students stay EBs for their entire school careers, and are therefore, behind in academics in comparison with their non-EB, English-speaking peers.

Implications for Practice: Coordinating Support for Teachers with District Specialists

For district administrators and school leadership, it is recommended that individual school data and its students' data be meticulously analyzed to uncover areas of student need, to develop a plan of action to address these needs throughout the upcoming school year. Although STAAR and TELPAS data for the 2022-2023 will not be released until the middle of August 2023, these pieces will add to each student's snapshot on their individual strengths and their academic needs. TELPAS data should be used to plan to plan for accelerating EB students' English language learning in the content areas, like science at fifth grade. Also, administrators will need to consider how to support their teachers in celebrating students' strengths and in planning for closing achievement gaps

with all students, if needed. Additionally, teachers may need support concerning how to extend learning for students who are already mastering grade level content. It will be imperative to assist all students at all levels to improve their learning, whether that be accelerated learning and closing gaps or extending learning through enrichment opportunities.

In order to assist the district's ESL and bilingual/dual language teachers, the Bilingual/ESL Program leadership should survey teachers about their learning needs as instructional leaders in their classrooms with EB students. For example, if teachers are expressing a high need for time with their newcomer EB students, then perhaps a section of their day can be spent with just newcomers to front-load English language learning and vocabulary before the lesson with all EB students of different levels. Based on these results, professional development opportunities should be planned accordingly with the teachers' needs in mind and allow time after PD for teachers to synthesize this information and learning into lesson planning and activities to implement with their EB students. Without this time, teachers will never be able to implement what they have learned effectively with students if planning for implementation is not a priority and an integral part of the PD process. It is also recommended that administrative leadership in bilingual and ESL.

If the SIOP model is not going to be used for teacher PD, the district needs to commit to research-based strategies in delivering sheltered instruction that will enable teachers to incorporate this element in the classroom to greatly impact EB students' growth in English-language acquisition. A suggestion for continuous improvement, and in alignment with integrating instruction content with the SIOP model strategies or sheltered instruction strategies, would be to focus in how to integrate the two for a more equitable use of time, such as through content-based instruction, or CBI. This

instructional approach integrates sheltered instruction strategies with content area, and it is heavily focused on building literacy in English for EB students; again, this is just great teaching for all students, but CBI is intentional on building content area literacy, like that in math, science, social studies, any content area, for EBs. This would allow for professional development to be more integrated between the district content area specialists as well as this model encourages more planning between all content specialists to meet the diverse needs of all students. Specialists in special education, bilingual and ESL, gifted and talented, and any special programs can have a seat at this collaborative table, curriculum plan together with all learners in mind, and explicitly develop exemplar lessons that build vocabulary in the content area, with a focus on how English is used for the different purposes in order to develop the skills of EB students' to communicate at high levels in the discipline. Addressing how teachers could also informally assess during instruction and formally assess students at the end of a unit would also be beneficial to monitor students' learning progress and create vertical alignment in holding all teachers accountable for the content they teach with all students, especially for the content areas other than math and reading, such as science and social studies. Differentiation for all learners and ensuring that this overlay between instructional specialists is updated to the curriculum documents for the content area in focus will be essential for setting the expectations for teacher instruction for new incoming teachers to the district, and, therefore, ultimately guiding teacher's best practices to improve student learning. District practices will also be fulfilling the need to vertically align instruction if these practices between district leadership and content area specialists become a routine practice over time.

Administrator Professional Development

Although school and district administrators are updated on the latest changes in the state's education policies and procedures and any curriculum changes that arise, five out of the six administrators agreed that the higher one moves in their administrative journey, the learning opportunities become fewer for professional development in leadership. Aside from the logistics of leading a school, leading a department within the school district, and leading an entire school district, there are also few opportunities to collaborate between colleagues in leadership and engage in meaningful professional development as leaders. This is attributed to the focus and actual presence required of the job of a school and district leader with a myriad of diverse priorities. There is little down time when leading a school of seventy teachers and staff who assist more than seven hundred students on a middle school campus. At the high school level, the numbers grow exponentially. Ophelia, the middle school principal at Ray M.S., posited that if PD is not readily available, growth opportunities need to be proactively sought after in order to grow in areas of need.

Implications for Practice: Administrator Professional Development

Positions in school leadership require effective and relevant professional development opportunities to grow and build leadership capacity in many areas. Just as teachers in this study desired to collaborate often with teaching colleagues, school administrators must create an environment in which to collaborate amongst themselves and initiate opportunities to assist in the development in one another's skill set. It is essential to spend time with like-minded, intrinsically-motived individuals to discuss in topics leadership, such as how to grow and motivate unmotivated teachers, strategies for improving teacher practices, how to coach teachers using data, how to help build a positive and collaborative climate and culture, how to budget, how to foster building

relationships between teachers and students, and, therefore, how to reduce office referrals as a result. This would be a collaborative cohort of leaders engaging in quality time with other professionals to collaborate and problem solve efficient and effective resolutions to tasks faced daily in the position. Regardless of school initiatives and programs, these soft people skills in leadership are transferable to any position. This cohort could also research what effective administrators are doing around the state on topics of interest and visit those schools to observe the administrators at work.

It would also benefit assistant principals to have a principal mentor, with more leadership experience than the assistant principal, in order to be coached on the role of an assistant principal, how to prioritize duties, what are effective practices in coaching to grow teacher practices, how to conference with students about discipline and follow up with their parents, how to have productive, crucial conversations with parents, and how to be groomed into the principal position, if that is the next step for an assistant principal.

It will be important for professionals in leadership to seek out opportunities in which to grow and to refresh the leader's mindset. In the state of Texas, there are many ways to get involved in personalized learning within the surrounding areas of school districts. The Region 4 Service Center offers professional development to teachers, school, and school districts around the Houston area and its surrounding school districts. Within "forty-eight school districts and forty-one open-enrollment charter schools, this center serves a region of Texas with more than 1.2 million students, 165,000 educators, and 1,500 campuses" (Region 4, 2023). There is training for every area of a school district, from child nutrition to behavior support, from information on alternative certification programs to accountability and leadership PD. For administrators, additional training is available through the Texas Elementary Principals and Supervisors Association PK-8 (TEPSA, 2023), as it provides an array of online webinars and

professional articles on the website, and in-person conferences to attend throughout the summer and school year. These services align with building executive leadership, human capital, building instructional leadership, school culture, and strategic operations. This is also true for the Texas Association of Secondary School Principals' (TASSP, 2023) website and services. There are national associations for both as well.

Recommendations

Recommendations for Teachers

The recommendations of this study included three emergent themes taken from the fifth-grade science teacher focus group: modeling and support, purposeful lesson planning time for sheltered instruction implementation, and accountability and follow-up with in-class implementation. All three of these emergent themes were examined to offer the implications and recommendations for teachers and future educators.

Three out of the four teachers reported that it was challenging to build teaching capacity in science, because their online ACP program instructional modules presented science just at the surface level. Learning by working through these online modules was not an effective manner in which to master science content to be able to comfortably teach it to a class full of fifth-grade students. When they were later hired after completing their program, the teachers felt additional frustration to self-educate and immerse themselves in the science content and sheltered instruction strategies to be able to present lessons in a way that made it comprehensible for their students, specifically with their EB students. This finding contradicted one of the conclusions from the U.S. Secretary of Education's Annual Report on Teacher Quality, stating that highly qualified "teachers matter for student achievement, but teacher education and certification are not related to teacher effectiveness" (Bland et al., 2023; U.S. Department of Education, 2015). Teachers voiced throughout this study that they purposefully seek out learning and

training opportunities to be effective in their classrooms, however, they are finding that when faced with the reality of being ill-prepared through their ACPs that they are not experiencing a "highly qualified" sense of teaching satisfaction that a trained, "highly qualified" teacher would expect to experience after ACP graduation. When school districts hire new teachers to the professions, their new teacher staff development should ensure that these teachers receive proper training concerning how to effectively teach science content and embed sheltered instruction, like the SIOP model, throughout their lessons. School districts should be well-educated on their diverse populations of students and the trends across the district within and between schools. This data would guide content curriculum planners and content support specialists to develop rigorous and equitable curriculum with which to coach new teachers and students deserve to attain high academic achievement. Not only would this type of proactive preparation help new teachers, but it would also set them up for success and set high expectations for learning from their students.

ACPs should incorporate a hybrid of online and face-to-face experiences to foster a deeper understanding of content area teaching and build capacity within these future educators. Should these changes to the ACP's structure concerning the learning environment for prospective teachers not be addressed, these programs may run the risk of continually producing new teachers who feel unprepared to do this work. Both new teachers and the students they teach also risk insufficient academic growth, causing students to get behind in their learning.

Additionally, all teachers who participated in this study have, in the past or are currently working on, post-graduate work or beyond. These teachers may further their "funds of knowledge" by exploring specific topics like integrating technology in the classroom, as Ashley is currently working on in a master's program at the local satellite

campus of a large suburban university (Horton, 2022; Moll, 2019). Savannah is studying for a master's degree in curriculum and instruction.

Teachers should embrace creating and teaching units across content areas to create cross-curricular connections, such as reading and writing about science content during their reading and language arts time. Teaching science in this manner allows students to engage in challenging content, reading and writing, through the incorporation of high interest topics of study and hands-on activities and experiments, like those conducted in science lessons. This teaching practice also addresses teacher accountability in teaching science content, which may lead in closing the vertical alignment gap between grade levels and student achievement in science. Strong (2007) posits that highly competent teachers have command of and utilize varied instructional strategies to engage student learning. Thoughtful and reflective planning allows for greater teacher effectiveness and, thus, more effective learning experiences for students in the classroom (Short & Echevarría, 2016).

Recommendations for School Administrators

Additional implications and recommendations were offered for district school administrators to address the emergent themes that surfaced from the administrator interviews: creating a teachers' needs assessment, coordinating support for teachers with district specialists, and administrator professional development.

It is evident that the teachers who participated in this study continue to take ongoing initiative to seek out professional development, deepening their understanding about teaching the science curriculum and implementing the SIOP to improve student outcomes in science and second-language acquisition. It would be time-effective and resourceful for the science and the bilingual/dual language specialists to collaborate with one another and co-teach professional development for the science teachers and the

ESL/bilingual/dual language teachers of EB students. Engaging in this collaboration when curriculum specialists prepare for professional development would support the need for teachers to get that "overlay" of perspective and differentiation piece that the teachers felt were missing currently during professional development training. This collaboration could lead to a shared vision, shared nomenclature, and shared expectations for teaching science and addressing the diverse language-learning needs of EB students, as well as with all student populations moving forward. This shared collaboration could also lead to including clearer expectations for lesson planning and curriculum development, as ideas could be added to the scope and sequence documents that would reflect the sheltered instruction strategies and differentiation strategies for EBs, as well as other student groups participating in gifted and talented and special education. Expanding upon the curriculum documents in this way would also support new teachers and experienced teachers welcomed into the district, setting the precedence.

For teachers with a vast knowledge of the SIOP model basics and pedagogy, the district could use them as trainers for their peers during content area professional development, as people learn best from their peers to connect the relevancy of their learning and if it indeed is successful with students. There are bilingual, ESL, and dual language teachers at every grade level in the district, and they can be co-facilitators to teach what sheltered instruction strategies would look like with real EBs in the classroom.

The school district could better meet the purposeful planning needs of its teachers by incorporating more planning days into the school calendar. This could be conducted by grade bands to provide collaboration opportunities in which all teachers at that grade level could participate. With a full day of planning once or twice within the nine-week grading period, teachers could focus solely on lesson planning, gathering and organizing necessary resources and materials (suggested in the scope and sequence curriculum

documents), and preparing for high levels of student engagement, differentiation and SIOP strategies, and, thus, mastery of the TEKS in the content areas.

Teachers and administrators both voiced the concern about the disconnect between different departments within the district, each one working in their own separate "silos." In Jim Collin's bestselling book *Good to Great: Why Some Companies Make the Leap…and Others Don't* (2001), the author posits that there are three specific factors that cause good companies to transform into great companies: disciplined people, disciplined thought, and disciplined action (2001). The new Superintendent of schools commented during his interview on the current state of the district and affirmed that the school district is a good district with a very proud heritage of doing great things, keeping students at the forefront when making the best decisions. However, having been in the district for many years, he observed the following:

> Our populations have changed, and our student demographics and socioeconomic status have changed. What has worked in the past, while growing a town into a suburb, needs to be updated and refreshed to reflect what our population looks like now and what our students' needs are today in the classroom. If what we are doing today is the same as what we were doing fifteen years ago, then did we really refresh?

With this in mind, the new Superintendent of schools may find it useful to conduct a needs assessment within the school district to gather data to focus on continuous improvement of what is working effectively and identify areas of needed attention and growth. The needs assessment could be conducted by each of its thirty departments and include all stakeholders, such as the Superintendent and district administrators, Curriculum & Instruction, Technology, Advanced Academics (gifted and talented services), Special Programs, Athletics, Maintenance, Food Service, etc., and

include students' input from the elementary schools, middle schools, junior high schools and high schools. Additionally, staffing could be adjusted to meet these changing needs within the district. This could include adding more curriculum specialists to support instruction in science, as there is only one specialist to support teachers and students in kindergarten through sixth grade at fifteen schools.

Collins (2001) asserted that good companies turned great companies due to a focused and specific plan, nothing over the top and ground-breaking, but a plan that involved all stakeholders and the specifics with how each employee made a difference and understood their role to improvement. It is essential for school principals, along with their leadership teams (i.e., assistant principals, department leaders, instructional coaches) and district leadership (i.e., at the district's education center) to evaluate the levels of capacity, or funds of knowledge, that their staff currently have in place before planning measures of accountability and professional development trainings. Using this data, along with students' demographic data, STAAR scores, TELPAS scores, etc., it is best practice that school leadership create a list of the most pertinent areas of need of focus on to impact all students' growth in their learning, especially in the areas of science and English-language acquisition. Knowing the school district's demographics have changed, it is not enough to proceed and educate students in the same manner as before. The mindset must change to embrace the vision that every grade level counts, and every subject area counts if we are to truly ensure that our schools are educating the whole child. Every student counts and deserves to be well-educated, and everything that is done within the district should be strongly scrutinized over and tied to the effect it will have on the students served. Everything done within schools, decisions made, money spent, trainings offered, etc., should be tied to specific needs of students that will have the

greatest impact on their learning and social-emotional foundation as future leaders in our communities.

Using this list of needs, school leaders can plan for the upcoming school year in how students need to be supported, teachers need to be supported, and what, if anything, is essential to meet those needs and what factors districts need to let go to allocate for what is needed. What are the goals, both short term and long term, and what specific actions will be required to ensure this happens? How will the plan be evaluated for effectiveness and what is the evidence that shows this effectiveness? A schedule for follow-up should be created to evaluate this plan and evaluate effectiveness, and then adjust where adjustments need to be made with a specific plan to do so. Will school leadership evaluate through classroom walkthroughs, student data every four weeks, or by other factors? Reevaluate again on the follow-up plan, constantly monitoring progress or lack thereof, and discuss what is working and what parts need to be addressed. This continuous improvement evaluation cycle is fluid and flexible but focused in scope on students and growing the district's greatest resources, the students.

Recommendations for Future Research

The research study was conducted to provide insight on the perceptions of fifth-grade science teachers and school administrators of the implementation of the SIOP model during lessons in science classrooms. This research offers further considerations in other areas related to implementing the SIOP model in fifth-grade science class. Since this study focused on the perceptions of the fifth-grade science teachers and school administrators, further research studies should focus on the perceptions and experiences from the students' perspective, specifically EBs, and which should also include the parents who witness the second language learning journey of these students from year to

year. Further research considerations should be extended to other grade levels in other schools to see if the same results hold or if there are different results.

Additionally, with focused professional development and training on how to implement the SIOP model with increased fidelity throughout the school year, and from year to year, teacher and student data could be gathered to offer insight on how the implementation is transferring into instruction and how it supports student achievement and growth.

Conclusion

In conclusion, this study was conducted to examine the perceptions of the implementation of the SIOP model in fifth-grade science. The results are based on the teachers' and school administrators' perceptions. After analyzing the data, three emergent themes were discovered for the teacher focus group: Modeling and Support, Purposeful Lesson Planning Time for Sheltered Instruction Implementation, and Accountability and Follow-up with In-class Implementation. The three emergent themes that were extracted from the individual administrator interviews were: Creating a Teachers' Needs Assessment, Coordinating Support for Teachers with District Specialists, and Administrator Professional Development. It was discovered that there were some differences, but many parallels, in thinking between the perceptions of the classroom science teachers in comparison to those of the school and district-level administrators.

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APPENDIX A:

TEACHER PROTOCOL

Teacher Protocol instructions:

1. Sign consent forms before beginning the focus group interviews.

2. Researcher will describe the purpose of the study and discuss confidentiality. There is no guarantee of confidentiality in a focus group, however every effort should be made to keep all comments confidential after the interviews.

3. Before speaking your response, please say your name (for transcribing purposes).

4. Please take turns and be respectful of the person speaking, ensuring that all voices are heard.

5. Every effort will be made to ensure all participants can participate fully.

Follow-up procedures:

Should clarification be needed on participant responses or if additional information is needed, the researcher will make a follow up call or Zoom meeting to inquire about additional information. Participants will also be able to contact the researcher by email and phone if they have any additional information they would like to add to their responses.

Teacher Questions:

1. What degrees do you hold?

2. In what areas are you certified as a teacher?

3. Did you graduate with a traditional teacher certification program or from an alternative teacher certification program like Texas Teachers or Region IV?

4. How many years of teaching experience do you have? What grade levels? How long at each grade level?

5. How did you come to be a middle school science teacher?

6. What teacher preparation courses have you had in science and ESL?

7. What are your perceptions of your teacher preparation courses in teaching science?

8. What are your perceptions of your teacher preparation courses in teaching ELs?

9. How much SIOP training have you attended? What are your perceptions of your training in the SIOP, Sheltered Instruction Observation Protocol?

10. What are your perceptions of your district professional development in the area of teaching fifth-grade science?

11. What are your perceptions of the support you are provided, if any, from your principal for teaching fifth-grade science?

- **i.** If none are provided, what support would you benefit from in the area of fifth-grade science?

12. What are your perceptions of the support you are provided, if any, from your district's science specialist for teaching fifth-grade science?

- **i.** If none are provided, what support would you benefit from in the area of fifth-grade science?

13. What are your perceptions of teaching ELs in fifth-grade science?

14. What are your perceptions of implementing the SIOP in fifth-grade science?

15. When implementing the SIOP in fifth-grade science, what are your perceptions of EL student learning as a result?

16. What are your perceptions of the support you are provided, if any, from the district's EL specialist for teaching fifth-grade ELs in science?

i. If none are provided, what support would you benefit from in the area of fifth-grade science to teach ELs?

17. What are your perceptions of your effectiveness in implementing the SIOP as a fifth-grade science teacher?

18. What would be the top 5 suggestions for improving your effectiveness in implementing the SIOP as a fifth-grade science teacher of ELs?

19. What additional information would you like to share that is important for you to add to our discussion today?

APPENDIX B:

ADMINISTRATOR PROTOCOL

School and District Administrator Questions:

1. What degrees do you hold?

2. In what areas are you certified?

3. Did you graduate with a traditional teacher certification program or from an alternative teacher certification program like Texas Teachers or Region IV?

4. Describe your previous or current classroom teaching experience. How many years of teaching experience do you have? At what grades and content areas?

5. How long have you been the district's science specialist?

6. What are your perceived barriers and successes in supporting fifth-grade science teachers with SIOP and Science?

7. What is your experience in teaching science? fifth-grade science? What are your perceptions of your teacher preparation courses in teaching science?

8. What is your experience in teaching ELs?

9. What are your perceptions of your training in the SIOP, Sheltered Instruction Observation Protocol? How much SIOP training have you attended?

10. What are your perceptions of your district professional development to support fifth-grade science teachers?

11. What are your perceptions of the professional development you receive personally as the district's science specialist?

12. What are your perceptions of the support you are given, if any, from your district principals for supporting fifth-grade science teachers?

i. If none are provided, what support would you benefit from?

13. What are your perceptions of the support you are given, if any, from your district's Director of Middle Schools?

- **i.** If none are provided, what support would you benefit from your district's Director of Middle Schools?

14. What are your perceptions of teaching using the SIOP with ELs in fifth-grade science?

15. What are your perceptions of the support you provide, if any to fifth-grade science teachers of ELs?

- **i.** What additional support do you believe teachers of ELs would benefit from using the SIOP in fifth-grade science?

16. What are your perceptions of your effectiveness as a district science specialist?

17. What would be the top 5 suggestions for improving your effectiveness as the science specialist? (Clarification: What are your current top 5 needs for your improvement in your effectiveness in supporting your fifth-grade science teachers?)

18. What would be the top 5 suggestions for improvement in your effectiveness in supporting fifth-grade teachers of ELs using the SIOP?

19. What additional information would you like to share that is important for you to add to our discussion today?