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Educator and Administrator Perceptions of Sheltered Instruction in Stem Courses

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Doctor of Education in Organizational Leadership

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Dedication

This dissertation is dedicated to my children: Keegan, Kennedy, Katie, Georgia, and Brynlee. You all have always been my light. You have kept me humble, centered, and motivated to keep reaching for my dreams, no matter how big or small. Keegan, I know you are smiling down on me from Heaven. I hope you know how much you inspired me and kept me going when all I wanted to do was quit. I love you and miss you to the moon and back my precious son.

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Abstract

The purpose of this qualitative case study was to explore the perceptions held by educators and administrators regarding sheltered instruction of English Language Learners (ELLs) in science, technology, engineering, and mathematics (STEM) classrooms; relevant professional development; and the use of the English Language Proficiency Standards (ELPS) within lesson plans. ELLs represent a subpopulation of students with significant achievement gaps in STEM, ultimately affecting student engagement and career interest in STEM. Ten STEM teachers and two administrators from a midsized middle school in west Texas participated in the study. Online semistructured one-on-one interviews and document analysis of submitted lesson plans from the 2019–2020 school year served as the primary data sources for the study. Data collection and analysis of interview transcripts revealed seven dominant themes regarding the implementation of sheltered instruction: (a) experience with ELLs, (b) positive relationships, (c) good teaching, (d) language barriers, (e) instructional focus, (f) achievement, and (g) lack of adequate training. Additionally, five themes emerged related to sheltered instruction professional development: (a) lack of professional support, (b) resources and strategies, (c) collaboration, (d) relevance, and (e) structure. Document analysis of lesson plans revealed ambiguity in how STEM teachers addressed the ELPS and an overreliance on low-engagement activities. The findings of this study provide STEM teachers and campus administrators a vision for revamped professional development and improved lesson planning, leading to enhanced ELL-focused instruction in the STEM classroom.

Keywords: English language learners, sheltered instruction, STEM, professional development

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Chapter 1: Introduction

Student engagement holds significant predictive power for numerous developmental and academic outcomes (Fredricks et al., 2004). The relatedness between student engagement and achievement serves as a focus for educators and researchers (Lam et al., 2014). Disengaged students often struggle academically and face higher dropout rates and limited career opportunities after high school (Chase et al., 2014). Currently, the United States suffers from widespread student disengagement, with estimates of 25 to 60% of students disengaged from their studies (Lee, 2014). The steepest declines in student engagement exist within the content areas of science, technology, engineering, and mathematics (STEM; Patall et al., 2018). Moreover, current pedagogical practices observed in STEM-based content areas create a widening gap in achievement between various subpopulations of students (Lee, 2005). Specifically, STEM education exhibits ever-widening achievement gaps within the English Language Learner (ELL) student population despite enormous amounts of money and expertise poured into ELL educational reform (Settlage et al., 2005).

ELLs and Sheltered Instruction

ELLs remain the fastest-growing student subpopulation in the nation (Besterman et al., 2018). One estimate placed ELLs as comprising one-half of the entire American student population by 2030 (Allison & Rehm, 2011). Relatedly, ELLs have received an increased focus on STEM achievement. The increased attention originates from the fact that ELL students must attempt STEM-based standardized exams regardless of their reading fluency (Maarouf, 2019). One instructional approach showing promise is sheltered instruction. Sheltered instruction approaches ELL education through linguistic modifications of grade-level content focused on making academic language more accessible to students (Echevarría, Short, & Powers, 2008;

Reeves, 2006). However, content-based educators, especially in STEM, reported a range in fidelity with sheltered instruction despite acknowledging the importance of the approach, often falling back on less engaging instruction.

Current Pedagogical Trends in STEM Education

Inherently, STEM-based content offers educators the potential for increased student engagement through hands-on activities, inquiry, and discovery. Yet, low-engagement forms of delivery, such as lecture, remain the predominant form of instruction (Gasiewski et al., 2012; Strati et al., 2017). Despite the focus on increasing engagement, students in secondary STEM courses reported declining engagement with their studies throughout their K–12 school years (Sinatra et al., 2017). As every career requires a basic understanding of mathematics, declining engagement is problematic, and advanced careers require knowledge of multiple STEM-related content areas (Fredricks et al., 2016). Current research supports STEM educators' preference for lecture-based content delivery over more engaging, hands-on, inquiry-driven instructional practices (Fredricks et al., 2016; Gasiewski et al., 2012; Strati et al., 2017). Today, STEM-based educators appear no more able to operationalize STEM-based content since becoming a national focus in the 1990s (Kelley & Knowles, 2016).

Study Setting

Anytown Middle School (pseudonym) serves approximately 920 students in the sixth, seventh, and eighth grades. The school employs 61 educators and support staff, three administrators, two counselors, and one instructional specialist in terms of faculty. The range of teaching experience encompasses first-year educators and administrators to those with 30 years or more in education. Anytown Middle School offers various programs, including services for the Gifted and Talented population, students receiving special education, and Newcomers, or

students in their first year in the United States. The diversity exhibited at Anytown Middle School requires high-quality educators and administrators equipped with culturally relevant, differentiated, and challenging instructional pedagogy.

Anytown Middle School enrolled a relatively large number of ELLs in the 2019–2020 school year. Of the 920 enrolled students, 116 attended English as a Second Language (ESL) classes or attended Newcomer classes, accounting for approximately 12.8% of the student population. ESL students attended general education classes with their English Language Arts and Reading (ELAR) courses taught by a teacher with an ESL certification. Newcomer students participated in general education courses with their ELAR classes replaced by Newcomer courses. The Newcomer course instructors taught the Texas Essential Knowledge and Skills standards with emphasis on English language acquisition. ELLs in STEM courses received instruction in English, with teachers rarely holding ESL certification.

Campus leadership attempted several resolutions to meet the needs of ELL students. For instance, the master schedule allowed a Newcomer teacher to support ELL students in science and social studies, resembling a co-teach/instructional support model. However, enrollment numbers and staffing problems disallowed the flexibility within the master schedule. Historically, the district purchased and provided professional development focused on sheltered instruction to new teachers in the ELL program and a refresher course to returning educators before the academic school year. However, the district has since canceled the contract with the service and opted for a campus-based approach to professional development.

Statement of the Problem

Although the United States demonstrates global supremacy in STEM, new concerns over the American STEM workforce's adequacy and availability threaten the country’s dominance

(Xue & Larson, 2015). For instance, recent economic forecasts estimated the need for 1 million STEM graduates to meet workforce demands over the next decade. Yet, projections predict the United States will fall short of the required number of STEM workers (Shin et al., 2016). Driven by workforce concerns, the United States invests heavily in STEM education through focused initiatives aimed at increasing engagement through content delivery (McDonald, 2016). A recent economic forecast estimated that 90% of growth in the U.S. labor force would consist of immigrants and their children in the next three decades, suggesting that current ELL student populations serve as an untapped resource for future STEM job demands (Maarouf, 2019). However, the nation's ELL population continues outpacing all other student subpopulations in size, underachievement, and representation in STEM (Shi, 2017). ELLs face substantial academic gaps, with 71% of ELLs scoring below-basic in content areas such as math, making them hardest hit by failing initiatives focused on preparing a STEM-focused labor force (Master et al., 2016).

Reforms within ELL-based education overlap initiatives aimed at increasing interest and engagement within STEM-based courses. Besterman et al. (2018) recognized similarities in best-practice strategies in teaching both STEM and ELLs, including hands-on learning, the use of manipulatives, and collaborative groups. However, they emphasized the existence of an increasing achievement gap within ELLs and achievement in STEM. In turn, ineffective pedagogy within STEM-based delivery may decrease efficacy in ELLs. For instance, Casey et al. (2018) suggested that many classroom teachers create an educational climate in which students must "remain silent," preventing ELLs from drawing upon their cultural wealth and fully engaging within a lesson (p. 52).

Therefore, a problem of practice exists in that STEM educators at Anytown Middle School persist with low-engagement, culturally irrelevant, lecture-based instruction in ELL inclusion classrooms despite professional development and district-wide initiatives mandating a sheltered instruction approach teaching. Observations at Anytown Middle School resemble similar low-engagement instructional methods observed nationally (Fredricks et al., 2016; Gasiewski et al., 2012; McDonald, 2016; Sinatra et al., 2017; Strati et al., 2017). Moreover, educator persistence with low-engagement pedagogy creates a predicament for campus leadership tasked with providing effective professional development.

Purpose of the Study

The purpose of this qualitative case study was to explore the perceptions held by educators and administrators regarding sheltered instruction of ELL students in the STEM classroom, relevant professional development, and the use of the English Language Proficiency Standards (ELPS) within lesson plans. Understanding current perceptions of ELL-based pedagogy and instructional use of sheltered instruction provides insight and knowledge beneficial to enhancing engagement with STEM content. Moreover, the research may offer campus leadership valuable information to professional development and campus improvement foci. The study utilized semistructured online interviews with open-ended questions focused on obtaining educator and administrator perceptions of the implementation of sheltered instruction and relevant professional development. Lastly, document analysis of submitted lesson plans provided insight into how educators address the ELPS of reading, writing, speaking, and listening through posted language objectives and student activities.

Research Questions

The following research questions guided the study:

RQ1: What are the perceptions of campus leadership and STEM teachers regarding sheltered instruction as an instructional approach?

RQ2: What perceptions do STEM educators and campus leadership hold regarding professional development in sheltered instruction?

RQ3: How do STEM educators address English Language Proficiency Standards through stated language objectives and student activities in lesson plans?

Definition of Key Terms

Differentiated instruction. Differentiated instruction refers to a variety of teaching techniques used by a teacher to instruct a diverse student population (Great Schools Partnership, 2014a).

District of innovation. Legislation passed in Texas allows school districts to seek exemptions from state requirements in teacher certification, class sizes, and student-teacher ratios (Texas Association of School Boards, 2018).

English language learners (ELLs). This term and acronym refer to students who cannot communicate fluently or learn effectively in English, who often come from non-English-speaking homes, and typically require specialized or modified instruction in both the English language and in their academic courses (Great Schools Partnership, 2014b).

English language proficiency standards (ELPS). This term and acronym refer to English language proficiency level descriptors and student expectations for ELLs within the four domains of reading, writing, speaking, and listening as outlined in 19 Tex. Admin. Code § 74.4 (González & Ayala, 2009).

Pedagogy. Pedagogy refers to the art or science of teaching (Merriam-Webster, n.d..).

Professional development. A wide variety of specialized training, formal education, or advanced professional learning intended to help administrators or educators improve their professional knowledge, skill, competence, and effectiveness (Great Schools Partnership, 2014c).

Professional learning communities (PLC). A group of educators that meets regularly, shares expertise, and work collaboratively to improve teaching skills and the academic performance of students is known as a professional learning community or PLC (Great Schools Partnership, 2014d).

Sheltered instruction. Programs or instructional approaches in which English-language learners are "sheltered" together to learn English and academic content simultaneously (Great Schools Partnership, 2014e).

STEM. This acronym refers to curriculum from the content areas of science, technology, engineering, and mathematics (McDonald, 2016).

Summary

The STEM content areas face a decline in student engagement with long-lasting effects nationally and globally. Specifically, declining engagement with STEM content appears to decrease preparedness for STEM-based careers with American students. A potential root cause for the decline is unengaging, undifferentiated pedagogy. The lack of differentiation primarily affects student populations that benefit most from differentiation and culturally relevant instruction, such as ELLs. Sheltered instruction is differentiated, culturally relevant instruction that targets student learners whose native language is not English. The anticipated exponential population growth of ELLs in the school district, coupled with the existing educational predisposition for unengaging, culturally irrelevant instruction, exposes a problem of practice with a detrimental impact if not checked.

The purpose of this qualitative case study was to explore the perceptions held by educators and administrators regarding sheltered instruction of ELL students in the STEM classroom, relevant professional development, and the use of the ELPS within lesson plans. Chapter 2 includes the current body of knowledge regarding student engagement of ELLs in STEM and culturally relevant pedagogy.

Chapter 2: Review of the Literature

The purpose of this qualitative case study was to explore the perceptions held by educators and administrators regarding sheltered instruction of ELL students in the STEM classroom, relevant professional development, and the use of the ELPS within lesson plans. Through literature review, I present a scholarly overview of current research encompassing various aspects of student engagement in STEM and ELL-based education. The literature review begins with background on the decline of student engagement becoming a national priority with global consequences, especially in the context of the widening achievement gap between ELLs and their non-ELL counterparts. The analysis of the literature details recent challenges regarding declining ELL student engagement, including instructional strategies and professional development. Finally, a survey of the existing body of knowledge regarding the research-worthy aspects of ELL instruction, such as the sheltered instruction framework, culturally relevant professional development, and educator attitudes toward teaching ELL students, finalizes the review.

The Abilene Christian University Online Library and Google Scholar served as the primary search engines for scholarly literature. Primarily, the literature review began with a keyword search for the phrase “student engagement.” The following search consisted of the phrases “student engagement in STEM” and “student engagement, English Language Learners.” Moreover, reference pages of scholarly articles advanced efforts in finding other scholarly works relevant to the research parameters.

Theoretical Framework

The theoretical underpinnings of the sheltered instruction model coincide with the Second Language Acquisition (SLA) theory proposed by Krashen (1982). Specifically, Krashen

proposed his monitor model, or input hypothesis, which consisted of five hypotheses. Krashen (1985) centered his monitor theory around:

1. The acquisition-learning hypothesis
2. The natural order hypothesis
3. The monitor hypothesis
4. The input hypothesis
5. The affective filter hypothesis

Of the five hypotheses presented, my research focuses on two: input hypothesis and affective filter hypothesis.

Input Hypothesis

Input hypothesis consistently appears throughout second language acquisition professional development sessions delivered to Anytown Middle School, however typically, the verbiage centers around the term *comprehensible input.* Krashen (1985) defined comprehensible input as receiving "input" slightly above the student's current competence level. Krashen conceptualized the hypothesis mathematically with the formula i + 1, with *i* representing the current competence level and *+ 1* symbolizing the "next level along a natural order" (p. 2). The intersection of comprehensible input and sheltered instruction exists within academic vocabulary and concepts accompanied by associated meaning (Krashen, 1991). Within the sheltered instruction approach, comprehensible input most often includes content and language objectives, building background knowledge, scaffolded questioning, and manipulatives such as pictures (Daniel & Conlin, 2015).

The utilization of comprehensible input within the sheltered instruction framework occurs throughout several scholarly publications. One such study linked the instructional practice of

scaffolding to comprehensible input within the sheltered instruction environment. Schall-Leckrone (2018) asserted that teacher scaffolding, or the act of providing instructional support until mastery, allowed teachers to provide comprehensible input to students in line with Krashen's hypothesis. The sample consisted of five educators with varying experience levels. Schall-Leckrone concluded that while scaffolding occurred, most of the instructional support occurred through lesson preparation rather than interactional or "in-the-moment efforts" (p. 48). In sum, while scaffolding occurred through lesson planning for visuals, vocabulary, and graphic organizers, comprehensible input that "stretched the students' language use" (Schall-Leckrone, 2018, p. 48) was not observed consistently. The qualitative study's implications suggested enhanced professional development to increase teacher capital in providing comprehensible input to ELLs.

In another study, researchers quantitatively examined instructional approaches of two "highly-effective" classrooms with a majority of ELL students. Merritt et al. (2017) utilized comprehensible input and sheltered instruction as a guide in investigating instructional practices within two classrooms that witnessed significant gains on mathematics achievement tests. The researchers compared accepted practices within the sheltered instruction approach to observed practices in the classroom. The team identified the consistent use of multiple representations of mathematic concepts, attention to vocabulary building, individual and group checks for understanding, and error analysis, well in line with that of the sheltered instruction and the comprehensible input framework. However, the researchers stated several important limitations. First, the sample classrooms utilized in the study consisted of relatively small class sizes (12–19 students). It was unclear if the teachers within the study received sheltered instruction training at any point.

While central to Krashen's SLA theory, comprehensive input may not fully encompass a student's second language acquisition in that comprehensible input alone did not guarantee a learner would attend as a learner (Hite & Evans, 2006). Instead, the student reserved the choice to learn based on perceived value or need. Krashen (1985) emphasized that comprehensible input could not stand alone in second language acquisition. To flow along with the natural order, a student required a lower affective filter to maximize the effect of comprehensible input.

Affective Filter Hypothesis

According to Krashen's (1985) monitor theory, or input hypothesis, an affective filter's existence plays a key role in second language acquisition. Krashen defined *affective filter* as "a mental block that prevents acquirers from fully utilizing the comprehensible input they receive for language acquisition (p. 3). ELLs raise their affective filter creating barriers to comprehensible input in response to anxiety and embarrassment of using a second language in English-only content areas (Lucas et al., 2008). ELLs often enter classrooms with a high sensitivity to anxiety and frustration and rely on educators' emphasis and skills on lowering the affective filter (Allison & Rehm, 2011). A source of anxiety and frustration, resulting in a higher affective filter originates from the existence of the dual roles ELLs perform. ELL students must meet the demands of learning and adjusting to a new school, culture, and language while also mastering academic content alongside English-speaking peers. Comparing the academic success of ELLs, or lack thereof, to that of their English-speaking peers often manifests in discouragement, anger, and frustration (Carrier, 2005).

Krashen's affective filter hypothesis situates throughout literature focused on ELL education. For example, Curran (2003) articulated how educators could narrow the gap between the increase in linguistically diverse classrooms and the preparedness in teaching linguistically

diverse student populations, thus lowering affective filter of ELLs. Moreover, Curran asserted that educator actions such as “pronouncing students’ names correctly, displaying welcome signs in many languages, and making eye contact with students” (2003, p. 337) served as small but significant actions that lower an affective filter.

Other studies further demonstrated and provided exemplar approaches to lowering affective filters in sheltered classrooms. Hite and Evans (2006) situated their study, in part, within Krashen’s theoretical framework, specifically his affective filter hypothesis. The researchers examined instructional strategies in eight Title I schools in Florida, with 22 first-grade teachers completing initial surveys and 19 teachers completing the interview process. Hite and Evans observed several instructional strategies deemed effective in teaching ELLs. Regarding affective filters, the team discovered that teachers consistently acknowledged and prioritized the concept and acted to lower students’ affective filters. Explicitly, teachers communicated regularly with parents and utilized ability grouping to lower acculturation's emotional and psychological effects in the classroom.

Student Engagement

Student engagement encompasses many different definitions, but research concludes that engagement follows a multi-dimensional construct consisting of behavioral, cognitive, and emotional/affective dimensions (Fredricks et al., 2016). While the interrelatedness of student engagement should not be understated, the research focuses on the aspect of emotional engagement. Fredricks et al. (2004) defined *emotional engagement* as encompassing the feelings, attitudes, interests, and sense of belonging, both positive and negative, toward the school, instructors, and the content. The lowering of a student’s affective filter depends significantly on the student’s level of emotional engagement in that engaged students are more willing to learn

the content (Havik & Westergård, 2020). Students engaged emotionally in STEM also showed more interest in STEM careers, especially in non-White, low-income students such as ELLs (Kenny et al., 2006). Moreover, emotional engagement may mediate other dimensions of student engagement. As students became more emotionally engaged, their behavioral engagement increased, resulting in fewer discipline incidents and greater academic success (Lee, 2014).

Implications of Student Engagement

Further study into ELL student engagement in STEM benefits administrators, educators, and students through the positive association between enhanced engagement and student outcomes. Failure to address the low engagement of ELLs in STEM could threaten achievement outcomes and threaten national status as a global leader in STEM. Students not engaged with STEM content carries global, far-reaching implications establishing a critical need for reevaluation into the current state of STEM-based education (Hall & Miro, 2016). For instance, students who have not regularly engaged in STEM content led to fewer students interested in STEM careers (Proudfoot & Kebritchi, 2017). Observations into today's STEM-based classrooms reflected low-engagement and unchallenging instruction, making STEM education reform a "national priority" (Strati et al., 2017).

Student Engagement and Achievement

The relationship between student engagement and achievement forms the foundation of the research and well-studied educational instruction aspect. Student engagement relates to achievement bi-directionally and serves as an antecedent to academic success, with low academic success associated with dropout rates, unemployment, substance abuse, and adult delinquency (Chase et al., 2014). The quantitative study sampled 710 American students from data collected from a previous, more extensive longitudinal study. The researchers concluded

that all three dimensions of student engagement (behavioral, emotional, and cognitive) served as predictors of GPA. Inversely, GPA predicted levels of engagement. In short, GPA predicted engagement, and level of engagement could predict GPA. The findings of the study reflect the importance of student engagement efforts in enhancing positive student outcomes.

Most importantly, behavioral and emotional student engagement impacted GPA more than cognitive engagement, suggesting that focused targeting on these aspects of engagement provides educational leaders with the most considerable leverage in producing positive student outcomes. Problematically, educators spend little time focusing on emotional engagement as they fail to see the connection to academic learning (Lee, 2014). When educators provide scaffolded instruction emphasizing student autonomy and peer-to-peer connections, emotional engagement increases resulting in an enhanced feeling of belongingness, interconnection, and engagement with the content (McKellar et al., 2020). The characteristics incorporated within the emotional dimension of student engagement form the foundation for ELL sheltered instruction.

Sheltered Instruction

Sheltered instruction is a framework in which educators present content-area knowledge to ELL students through focused techniques and strategies aiding comprehension (Short et al., 2011). Sheltered instruction addresses English language deficiencies while concurrently progressing an ELL student through content-level knowledge (Markos & Himmel, 2016). Settlage et al. (2005) noted the alignment of sheltered instruction with the inquiry-based nature of science. They suggested further study as “a promising method for providing high-quality science learning experiences to students who are still working to attain English fluency” (Settlage et al., 2005, p. 40). However, a sheltered instruction approach may present unintended consequences for ELLs in STEM content areas. For instance, sheltered instruction may

oversimplify academic vocabulary and concepts, eliminating keywords or phrases to make the content more attainable (Lee & Stephens, 2020). Proponents of a sheltered instruction approach emphasize that school-wide buy-in with educators and administrators working collaboratively with frequent modeling and feedback results in a successful, rigorous implementation (Thomas, 2019). Utilizing student engagement and sheltered instruction frameworks informs the research design by investigating educator and campus leadership's perceptions of use, efficacy, and assessment of needs.

Fundamentals of Sheltered Instruction

While the definition of a sheltered instruction approach remains constant, models of the approach vary. Fundamentally, a sheltered instruction approach focuses on content and language objectives that specify *what* a student is to learn and *how* the student learns it through student activities. For instance, a lesson could require students to recite content orally or write a summary. Moreover, the implementation of sheltered instruction emphasizes making a connection between a student's cultural background, prior knowledge of academic concepts, and new concepts (Markos & Himmel, 2016). Additionally, sheltered instruction provides students of varying English proficiency opportunities to practice using the English language through collaboration and peer-led academic exercises that focus on reading, writing, speaking, and listening (Short et al., 2011). Other sheltered instruction models adapt content to match English proficiency, such as explaining new concepts in the student's native language or providing ELL-specific linguistic modifications such as Spanish-English dictionaries (Buxton & Caswell, 2020; Prabjandee, 2016). In sum, sheltered instruction uses various techniques to deliver content knowledge and English language proficiency through linguistic differentiation, peer collaboration, and cultural awareness.

A Question of Pedagogy

With the multitude of engaging and exciting pedagogical approaches inherent to STEM, the decline in engagement and subsequent interest seems complex and enigmatic. Approximately 25% to 60% of U.S. students disengage from school regularly, with long-lasting effects nationally and globally (Lee, 2014). Rankings of American youth in STEM-based content areas continue declining despite the intensified focus on enhancing STEM curriculum (Proudfoot & Kebritchi, 2017). Decreased engagement in STEM is surprising, given the opportunity for hands-on, inquiry-based, and discovery-based instruction not typically available with other content areas (Strati et al., 2017). In their quantitative study of 223 students and 11 teachers in a secondary science setting, the team observed low-level, unchallenging instruction and, in turn, students that were "somewhat engaged" (p. 137). Moreover, upticks in momentary engagement followed increased challenge and support from the classroom teachers. Most notably, teachers in the study tended to "water down" the content to make science more accessible and less threatening, thus detrimentally lessening the challenge to the students (Strati et al., 2017).

A similar study investigated educator challenge and support in the postsecondary context. Gasiewski et al. (2012) attributed engagement and interest attrition in STEM-based classes to a reliance on lecture-based and unengaging pedagogy from "gatekeeper" educators. A "gatekeeper" educator is one with the intention of "eliminating all but the top tier students" (p. 230). Moreover, educators demonstrated a tendency to deliver enormous amounts of content through lectures. The low-engagement approach aided in the attrition in science engagement and interest in the content. The study's findings align closely with that of affective filter hypothesis in that the use of a hands-on, collaborative approach with teacher support correlated with decreased feelings of intimidation and inadequacy (Gasiewski et al., 2012).

The instructor's role plays an important, if not the most crucial, role in increasing student engagement in STEM (McDonald, 2016). Specifically, pedagogical strategies that enhance student engagement, such as inquiry-based practices, authentic settings, reasoning and problem-solving, and the development of creativity through peer-to-peer collaboration, appear most effective. However, as students move from elementary to secondary, they often find teachers who exhibit more classroom control, limiting opportunities for student-centered activities, thus decreasing overall student engagement (Havik & Westergård, 2020). Educators often rely on adequate training and continued professional development in nurturing the implementation of high-engagement collaborative instructional strategies (McDonald, 2016). However, educators generally perceive a large gap between what is expected to occur in the STEM classroom and the effectiveness of current professional development efforts in modeling strategies (Shernoff et al., 2017).

Professional Development and the STEM Environment

A primary focus of addressing declining student engagement is how teachers and administrators approach students in specific student engagement domains. For example, Hall and Miro (2016) suggested a critical need for revamped professional development for teachers in implementing STEM-focused instruction in achieving student motivation and interest. Promoting student engagement relied on providing effective teaching strategies emphasizing establishing a positive environment (Lee, 2014). However, an exemplar model of what constitutes a positive educational environment generates several definitions.

While research offers insight into the characteristic makeup of positive school-wide environments, the STEM environment may lack a complete understanding, possibly dampening professional development efforts. For instance, the function of teacher-mediated effects with

student grouping during inquiry-based activities in STEM-based activities remains unclear. Relatedly, greater insight into peer-to-peer relationships and student engagement may result in changing educators' perceptions of their impact on students as some educators question their ability to single-handedly transform a student's interest or level of engagement (Kelly & Zhang, 2016). In sum, educators may question the correct approach to establishing a positive educational experience. The conflict in approach becomes more complex in inclusive classrooms with subpopulations of students, including special education, gifted and talented, and ELLs. A sobering study by Kahn et al. (2014) found that general education teachers lack experience in delivering differentiated, culturally relevant instruction. Non-mainstream student populations that benefit most from establishing positive student environments, especially ELL students, seemed particularly affected by the lack of differentiation expertise.

STEM Education and ELLs

While decreasing student engagement in STEM-based content areas poses a risk to students across the board, specific subpopulations may experience a more significant detriment in access to education, specifically, ELL students. A primary approach to ELL education consists of educators trained explicitly in ESL content and strategies. However, the success of this approach rests upon the educator's knowledge of ELL instructional strategies and academic content knowledge, with one often suffering at the other's expense (Besterman et al., 2018). Adding more complexity to the problem is that ELLs can demonstrate academic knowledge in STEM but find difficulty expressing or showing mastery due to language and literacy barriers (Maarouf, 2019). Llosa et al. (2016) built upon research investigating STEM-based engagement through the lens of ELL students, citing the urgent and complex demands of achievement in science in the face of "the growing diversity of the U.S. student population, persistent science

achievement gaps, and the increasing demands of high-stakes assessment and accountability in science" (p. 395). Thus, addressing diversity requires shifting from a practice of transferring content-area knowledge unilaterally to a practice of incorporating ELL students' language and diverse culture within lessons (Echevarría, Vogt, & Short, 2008).

The transfer of content knowledge, along with staying culturally responsive, carries multiple definitions and several misconceptions. One particular misconception held by ELL educators suggests that exposure to non-ELL students remains sufficient in learning a content-area language (Harper & De Jong, 2004). Moreover, educators believe that what works for native speakers should work for nonnative speakers (Hollie, 2019). Misconceptions and misaligned pedagogy call for revamped professional development in the area of cultural diversity, and teachers must "be prepared to teach students who come from different linguistic, cultural, and educational backgrounds (Harper & De Jong, 2004, p. 152).

Sheltered Instruction and STEM

Sheltered instruction provides educators with ELL-inclusive content areas a framework for delivering content-specific material to students with varying ability levels. Invested focus on sheltered instruction may provide crucial insight into how ELLs can benefit educationally in STEM-based content areas. Echevarría (2005) emphasized that sheltered instruction "advocates for more interactive, less teacher-dominated instruction" (p. 62), echoing previous observations of lecture-intensive content delivery, especially in STEM-based content areas. Markos and Himmel (2016) asserted the close relationship between sheltered instruction and the integration of reading, listening, speaking, and writing, or ELPS within classroom lessons. In overview, sheltered instruction provides comprehensible content-specific knowledge and opportunities for second language acquisition through reading, listening, speaking, and writing to ELL students.

Sheltered instruction incorporates key characteristics within the framework allowing flexibility for teachers. However, scholarly research suggests barriers to fidelity.

Characteristics of Sheltered Instruction in STEM

Sheltered instruction aims to make content comprehensible for ELLs while supporting English language proficiency (Echevarría, Vogt, & Short, 2008). Studies focused on sheltered instruction in content-based courses suggest several characteristics of effective sheltered instruction. Short et al. (2012) examined sheltered instruction with the English classroom and listed language objectives, oral language practice opportunities, development of vocabulary, and understanding students' cultural backgrounds as best practices. Specifically, sheltered instruction utilizes a combination of a student's cultural background and previous experiences to connect meaning to content vocabulary and concepts, along with visuals and alternate assessments in gauging academic proficiency (Markos & Himmel, 2016). Pawan and Greene (2017) similarly described sheltered instruction as a method of enhancing ELL instruction in "building students' background knowledge, in providing comprehensible input, and in sustaining content and language teaching objectives" (p. 18) through the context of student interaction, peer collaboration, and scaffolding instruction. Moreover, scaffolding requires variety, educator enthusiasm, showing relevancy, understanding students' cultural backgrounds, vocabulary development, and developing confidence demonstrating the most effective combination in ELL education (Ardasheva et al., 2018).

Interestingly, science and math are relatively more comprehensible to ELLs due to the subject area's hands-on, motivating, and interactive nature (Hansen-Thomas, 2008). Not only do hands-on, collaborative instructional approaches benefit students, but teachers also demonstrated more positive attitudes as a result of seeing engaged students (Proudfoot & Kebritchi, 2017).

However, a tendency toward low-engagement, lecture-based instruction exists in STEM classrooms (Gasiewski et al., 2012; Strati et al., 2017). Sheltered instruction diverts an educator's focus on academic language and how language is used and supports learning within lessons. Teachers with ESL certifications readily understand and apply the focus within their lessons. Still, content-area teachers often lecture for a majority of the period or hold quick question-and-answer sessions, all but eliminating language development for one-way content delivery (Short et al., 2012).

Challenges in Sheltered Instruction Fidelity in STEM

Sheltered instruction within the STEM content areas finds significant challenges and barriers in practicing and accomplishing the ELPS when paired with educators ill-prepared in teaching science to ELLs (Hoffman & Zollman, 2016). For instance, ELL students in science may find a level of discomfort in speaking the language of inquiry or collaborating with peers in making predictions and observations. Therefore, teachers need to understand their students' cultural backgrounds and inherent challenges and respond with culturally relevant strategies that scaffold their ability to read, speak, listen, and write within the content area (Markos & Himmel, 2016).

Sheltered instruction suffers from a wide range of fidelity in implementation that ultimately resembled the traditional teacher-dominated form of delivery under observation (Daniel & Conlin, 2015). Some schools may offer sheltered instruction in one content area, but not others, regardless of an ELL's course load, creating inconsistency throughout the school day (Short & Echevarría, 1999). Other schools may offer sheltered instruction throughout most courses but carry varying levels of understanding of intent. For instance, educators often focused on the teacher-centric aspects of sheltered instruction, such as vocabulary building, while

somewhat ignoring the student-centric aspects, such as wait time, opportunities for reflection, and collaboration (Daniel & Conlin, 2015).

Another significant barrier in sheltered instruction fidelity emanates from misconceptions about ELL education. Pawan and Greene (2017) discovered teacher sentiments that educating ELLs meant “dumbing down” (p. 3) the material to make it more understandable. Moreover, educators in content-area courses often displayed “turfism,” exhibiting low regard for ELL-specific educators in their ability to teach subject-specific material. In return, ELL educators exhibited little trust in content-specific educators in having the resources and knowledge to educate ELLs. The mutual distrust between content-area teachers and ELL-specific educators significantly hinders meaningful discussions, active engagement, planning, and implementing effective sheltered instruction practices (Lee & Buxton, 2013).

Success in implementing sheltered instruction rests partly on educators' willingness to utilize sheltered instruction within their classrooms (Short et al., 2011). In short, the more enthusiastic an educator appeared toward sheltered instruction and educating ELLs, the deeper the implementation. Educators in ELL-inclusive classrooms hold a wide array of attitudes toward ELL education, ranging from optimistic to ambivalent to entirely unwelcoming (Reeves, 2006). Negative attitudes toward ELL inclusion originated from the time required to adjust teaching styles and lesson plans, perceived addition to already enormous workloads, and the perception that ELLs do not value the English language or place any effort into learning it (Mellom et al., 2018; Reeves, 2006). Therefore, an investigation into educators' perceptions, attitudes, and actions appears warranted as the variables seemingly dictate instructional fidelity. For example, lesson planning allows educators to state instructional objectives, assessments, and differentiation strategies that guide content delivery to mainstream and non-mainstream students.

ELL and STEM Professional Development

Understanding the current state of professional development of ELL education benefits from an examination over time. Efforts aimed at improving ELL education, specifically in STEM education, exist. However, a level of disconnect between efforts and educator implementation becomes apparent. Besterman et al. (2018) utilized quantitative survey data over 4 years to gauge ELL education aspects in STEM. Unsurprisingly, the percentage of ELL students entering STEM-based courses increased over the 4 years. However, the number of STEM teachers receiving professional development focused on ELL education rose only slightly and well below a rate proportionate to ELL population growth (Besterman et al., 2018).

STEM educators also find difficulty reconciling STEM education and the approach to ELL-based education, creating several disconnects (Hoffman & Zollman, 2016). For instance, an assumption held by some educators within their study cited that individual ELL students "are not as capable as other students" compared to non-ELL populations (Hoffman & Zollman, 2016, p. 92). Subsequently, during observations, the educators asked only lower-level questions as not to embarrass their ELL students. Moreover, STEM educators found difficulty in distinguishing social language from academic language. For instance, an educator could overhear an ELL speaking English amongst friends, assuming that trouble acquiring and utilizing the academic vocabulary in the classroom was not related to English proficiency skills but rather from a lack of compliance (Hoffman & Zollman, 2016).

Moreover, educators could interpret the compliance barrier as either behavioral or cognitive, further complicating the appropriate academic learning approach. In sum, the resources and professional development emphasizing best strategies for ELLs in STEM exist, but educators seem apprehensive or outright unwilling to seek and implement the instructional

supports (Besterman et al., 2018; Harper & De Jong; Settlage et al., 2005). Despite a unified national effort in increasing educators' capital in teaching ELL students, educators perceive their situation as "unprepared and lacking professional development opportunities to develop the necessary skills" to meet ELL students' educational needs (Besterman et al., 2018, p. 33). If true, insight into educator attitudes and perceptions toward ELLs in STEM-based content areas may benefit educational leaders in providing a pathway to improved ELL education.

Educator Attitudes and Perceptions Toward ELL Education

Educator perceptions of ELL-based education in STEM content areas seem logical for examining the persistent achievement gaps for second-language students. ESL and bilingual education teachers reported feelings of isolation in that they lack collaboration and assistance from mainstream teachers (Batt, 2008). Respondents in the same survey suggested that mainstream teachers lack knowledge and skills when educating ELL students, especially in diversity and multiculturism. Also noted was the respondents' frustration that ultimately led to educators leaving the profession with understaffing and extra duties for those remaining on campus. Of respondents holding ESL certification but not currently teaching ESL, most respondents pointed to the added stress and paperwork inherent with ELL education. (Batt, 2008). When prompted for solutions to the perceived problems, respondents suggested improved professional development focusing on ESL methods, sheltered instruction, and first and second language literacy methods (p. 42). However, the respondents' recommendations did not directly address the lack of willingness or enthusiasm staff-wide that generated ELL educators' reported frustration.

Other studies examined characteristics exhibited by educators considered effective ELL teachers. Master et al. (2016) analyzed student data from the New York Public School System

from 2001 to 2008. They discovered three characteristics that led to differential teacher effectiveness with ELL students: prior experience with ELL students, specialized training and certification, and teacher preferences (p. 24). Teacher preference provided an interesting variable of effectiveness in teaching ELL students. In short, teachers who prefer to teach ELL students and exhibited enthusiasm and motivation in doing so significantly predicted differential effectiveness.

It remains unclear if characteristics of effective educators of ELL students, such as teacher preference, exist independently or something achieved through professional development. A similar phenomenon, opposite of preference, manifests in teacher resistance to ELL-based education. Short (2017) conducted a mixed-methods investigation into achievement outcomes based on sheltered instruction implementation length. The study utilized two cohorts, with the first representing new implementation and another cohort with experience in sheltered instruction. When educators felt supported by ongoing professional development, fidelity increased. Additionally, Short observed that fidelity of ELL instructional strategies, specifically within STEM-based classes, suffered due to resistance in teaching both content area skills and language skills. The author suggested that historically, math and science teachers never needed to worry about teaching content and language objectives.

Harper and De Jong (2004) noted that similar resistance held especially true in their study of secondary math and science teachers as they did not see themselves “as language teachers” (p. 156). Fredricks et al. (2016) reasoned for the inclusion of emotional/affective engagement as modern educational theory posits instructional approaches that deliver both content and skills, benefiting positive interpersonal relationships. A potential approach may exist in the realm of cultural relevancy paired with sheltered instruction of STEM-based education combining

background awareness, scaffolding, speech acquisition through collaboration, and content-specific mastery.

Teacher Lesson Planning

Anytown Middle School requires submission of written lesson plans, thus establishing a need to investigate lesson plan use perceptions, especially ELL education. As student populations become more diverse, effective lesson planning becomes more important in preparation for the variety of individualized student needs (Schmidt, 2005). Generally, educators hold positive perceptions of lesson plans when questioned about the value of planning. Specifically, educators found the practice of lesson preparation and written planning cumbersome but found great value in the process of organizing and troubleshooting instructional time (Sahin-Taskin, 2017). At a minimum, lesson plans should address what is taught, how it is learned, and how the teacher will assess learning (Santoyo & Zhang, 2016). However, educators tend to plan lessons and instructional activities based on non-ELLs and later adjust plans retroactively to serve ELL students (Ewing, 2018).

Lesson Planning With STEM and Sheltered Instruction

Lesson planning in the context of STEM and ELL education provides greater insight into instructional practices and a form of data triangulation within the case study. Wang et al. (2011) utilized lesson plans in examining teacher efficacy in STEM-based concepts citing that lesson plans served as a means of verifying observations, understanding content foci, and documented evidence of teacher beliefs in STEM education. In sheltered instruction, several researchers utilized lesson plans to disseminate data and identify instructional best practices. For instance, Short (2017) reviewed lesson plans submitted by teachers and administrators in determining sheltered instruction implementation and fidelity, emphasizing that effective teachers routinely

plan in advance, as evidenced by lesson plans when preparing lessons for ELLs. Conversely, ineffective educators in ELL-inclusive classrooms tended to follow a one size fits all approach with an overemphasis on speaking and writing activities (Gonzalez, 2016).

Moreover, ineffective lesson plans failed in demonstrating relevancy or connecting content with students' cultural backgrounds. Lastly, teacher candidates' completing lesson plans lacked skill in utilizing data, such as the student's current language competency, in differentiating lessons. Some educators suggested that the "one-size-fits-all" mentality of lesson plans results from collaborative or handed-down plans. For instance, lesson plans built by collaborative teams or department chairs appeared rigid, leaving no flexibility for the educator to adjust for special populations, such as ELLs (Ewing et al., 2019). Thus, teacher preparation programs should reconsider the skills taught to upcoming teachers in the context of ELL education (Gonzalez, 2016).

An examination into the perceptions and efficacy of educator-built lesson plans in serving ELL students with the Anytown Middle School campus could provide campus leadership with insight into ELL education's current state and a basis for a growth focus. Utilizing lesson plans within instruction provides educators and campus leadership focus and clarity, especially in the context of ELL-based teaching (Kelly, 1997). Lesson planning within the sheltered instruction framework "requires teachers to plan for a lesson objective and content standard but also consider the academic language demands of content-specific vocabulary," thus requiring knowledge of linguistic differentiation (Gonzalez, 2016, p. 5).

Differentiation Within Lesson Plans

In the context of ELLs, it is essential to distinguish sheltered instruction from differentiation. However, the terms hold similar meanings and are often used interchangeably.

Differentiation refers to the act of adjusting instruction to meet the individual needs of learners (Tomlinson, 2014). Differentiation typically targets specific subgroups of students based on ability levels. In contrast, sheltered instruction provides whole-class modifications providing comprehensible input based on varying language proficiencies through language modifications (Baecher et al., 2012). Therefore, sheltered instruction acts as a foundation for differentiated instruction for ELLs.

In their review of several case studies, Baecher et al. (2012) identified several principles for differentiating instruction for ELL students. While some principles manifest through lesson activities, work within professional learning communities (PLCs), or material preparation, some should appear in posted lesson plans. For example, lesson plans with both a content and language objective served as a form of differentiation (Echevarría, Short, & Powers, 2008). Content objectives state "what" the students should learn, and the language objective states "how" students will learn it. The "how" should incorporate one or more of the ELPS domains of reading, writing, speaking, and listening (Echevarría, Short, & Powers, 2008). Tomlinson (2014) asserted that language objectives help ELL students bridge the content and language ability gap. In the context of STEM-based education, creating language objectives for ELLs appears especially troublesome. In their article, Nargund-Joshi and Bautista (2016) noted the difficulty in integrating science vocabulary with English language proficiency efforts in the science classroom. Moreover, vocabulary development alone proved ineffective. Instead, content and language objectives created meaning and addressed multiple dimensions of language proficiency.

Studies into incorporating content and language objectives within lesson plans, especially in STEM, demonstrate a wide range of inconsistencies in implementation. For example,

Gonzalez (2016) reported a tendency for teachers to concentrate on the speaking and writing domains of English proficiency. Abadiano and Turner (2002) found that participants in a study encountered difficulty composing language objectives for their content area. Specifically, the teacher-participants often focused on vocabulary development while ignoring the other domains of language proficiency, such as listening, reading, and writing.

Failure in addressing multiple domains of English proficiency within a lesson potentially stems from inadequate training of sheltered instruction in both teacher preparation programs and on-campus professional development. In one study, Regalla (2012) examined four teachers completing a workshop focused on sheltered instruction and lesson plan development. All four teachers within the study completed lesson plans focused on vocabulary development, specifically residing within the listening and writing domains, thus missing opportunities to extend their linguistic awareness and achieve meaningful learning.

Cultural Relevancy

Cultural relevancy often manifests within educational circles under the term *Culturally Relevant Teaching* (CRT). Developed by Ladson-Billings (1992), CRT incorporates a student's cultural background to create meaning and understand the world. The CRT framework incorporates three primary concepts: high expectations, cultural competence, and critical consciousness (Byrd, 2016; Ladson-Billings, 1995). Byrd (2016) investigated CRT's effectiveness through a quantitative study of 315 ethnically diverse 6^{th}–12^{th} graders and examined the effects of high expectations; challenging and scaffolding instruction; and inclusive, respectful classroom climates. *Cultural competence* relates to the educator understanding diverse communities and home lives while also encouraging students' knowledge of their cultural background. Byrd reported significant relationships between CRT and academic outcomes—

specifically, student engagement. CRT created an educational atmosphere where students made real-life connections to the content, which stimulated and enhanced their engagement.

Evolutionary mechanics transform theories and ideas as scholars debate and redefine concepts. Culturally relevant teaching is no exception. Hollie (2019) argued that CRT faced criticism, deservedly, on the vagueness and overly-theory-based approach, thus lacking practical implementation. As part of the author's overview, Hollie asserted that school districts worldwide find themselves in a stagnate state. As defined by Hollie, *stagnation* described schools that kept providing professional development, time, money, and other resources towards cultural relevancy with little positive change in ethnic and racial disproportionality. Hollie (2019) argued that teacher preparation programs fail in addressing CRT methodology by leaving the construct as a theoretical approach to pedagogy by not providing concrete, practical examples.

Schools must reassess their role in educating increasing diverse student populations. However, where the responsibility lands and the overall approach to cultural relevancy remains a scholarly research topic. One study suggests that the catalytic role of CRT implementation falls on campus leadership. For example, the campus leadership role requires attention in enhancing achievement outcomes, given an increasingly diverse student population while emphasizing cultural awareness and response (Figueiredo-Brown et al., 2015). However, campuses tend to adopt a "one size fits all general approach rationalized as broad in nature and of benefit to all" (Harrington, 2013, p. 25). Barriers to cultural competency through professional development center around the fluidity of environmental context and comfort level (Kahn et al., 2014).

Again, educators find difficulty reconciling between two educational frameworks, often feeling forced to choose between them. For instance, Pollock et al. (2016) investigated preservice educators' perceptions of culturally relevant professional development. Educators within their

study found culturally relevant teaching and teaching content as two different job demands. Furthermore, the study's educators viewed culture and diversity as an uncomfortably sensitive, polarizing, and extraneous topic of education. The research study interviews alluded to educators' feeling a demand for perfection, isolation, oversimplification of cultural identity, and culturally relevant education overriding subject-matter content (Pollock et al., 2016). As a result, educators devalued the benefit of culture-based professional development. Similarly, Byrd (2016) noted teachers' tendency to strive towards "not seeing color" (p. 7) and hesitance in acknowledging racial differences as not to stereotype.

An integral first step in addressing culturally relevant instructional strategies lies within the perceived value of diversity training. Through professional development, educators enhance self-awareness about the true nature of pedagogy (McMahan & Garza, 2016). Mensah (2013) asserted that historically, many relegate multicultural education to an unnecessary addition to the curriculum or a "holidays and heroes' approach to teaching" (p. 67). However, instances where organizations offered focused and purposeful cultural and diversity training demonstrated long-lasting effects. For instance, students who enrolled in a culture and diversity class reported feeling "compelled to change aspects of their personal and professional lives" (Martin & Dagostino-Kalniz, 2015, p. 46). Lastly, culture training provides a mechanism in which educators and administrators can reflect on their own biases. Figueiredo-Brown et al. (2015) suggested that leaders, often unaware of their own biases, find methods to enhance self-awareness, thus learning a meaningful way to implement culturally aware practices within their leadership style.

The Role of Leadership in Addressing Cultural Responsiveness

While current literature focuses primarily on educators' actions, attitudes, and perceptions in the classroom, campus leadership plays a crucial role in creating a culturally responsive environment through sheltered instruction. The achievement gap between ELL and non-ELL students originates from a conflict between their culture and the culture of their new surroundings. In turn, it creates conflict between administrators attempting to achieve Adequate Yearly Progress (AYP) measures and teachers following instructional initiatives aimed at achieving AYP (Horsford et al., 2011). Given the situational conflict, principals and other school leaders must demonstrate specific traits and characteristics. For instance, school leaders must exhibit a firm voice when raising issues of inequity and instructional awareness, targeting inclusive practices for ELLs (Theoharis & O'Toole, 2011).

Figueiredo-Brown et al. (2015) stated that implementing diversity concepts largely depends on the principal's self-efficacy beliefs. Similarly, belief in task-accomplishment and success in culture and diversity issues largely depends on a leader's relative strength in collaboration, individual focus on voicing concerns, and the ability to reflect on learning (Harrington, 2013). However, the complexity of multiple conceptualizations, definitions, and interpretations of what culture is and how it functions within schools often inhibits a leader's understanding and capital for implementation (Horsford et al., 2011, p. 583). Additionally, all leaders hold some level of bias regarding culture and diversity and must examine their own beliefs, values, stereotypes, biases, and experiences (Figueiredo-Brown et al., 2015). Moreover, Harrington (2013) emphasized individual and whole-school reflection as part of becoming more culturally responsive.

Characteristics of Culturally Competent School Leaders

When educators and staff express their concerns, beliefs, attitudes, and perceptions, many become aware of subconscious or unknown biases that perpetuate inequalities, providing leaders with a foundation for cultural change (Kahn et al., 2014). Cultural competence is not achieved through professional development, a diversity class, or experiencing other cultures alone. Instead, Kahn et al. suggest achieving cultural competence resembles "a continuous pursuit that requires thoughtful and constant development and growth of one's beliefs, skills, and knowledge of systems of power, privilege, and positionality" (2014, p. 54). Smith (2005) described culturally competent leaders as adopting and developing a school vision that genuinely addresses all students' needs, regardless of cultural background. Secondly, culturally competent leaders demonstrate a high awareness of their own beliefs, assumptions, and sensitivity to cultural differences. Moreover, competent leaders exhibit the ability to respond to those differences accordingly and appropriately. Lastly, described the culturally competent leader as one that integrates diversity and appropriate pedagogical practices in educating those from different cultures (Kahn et al., 2014)

Shared Role of Campus Staff and Leadership

Previous research studies indicated a shared, reciprocal role between educators and campus leadership in becoming culturally responsive or demonstrating culturally relevant teaching. A quantitative study conducted by Ringler et al. (2013) provided a characteristic make-up of an effective leader perceived by educators implementing culturally responsive teaching and sheltered instruction. In their study, educators reported that regular and continuous feedback from their principal served as the most significant aspect of successful implementation in educating diverse student populations. As a result, teachers and administrators began working

synergistically towards a shared goal and vision of instruction. Secondly, teachers appreciated when principals engaged in professional development alongside teachers. Teachers expressed feelings of togetherness and shared responsibility for educational goals. Principals who developed relationships with educators through collaboration, shared planning, continuous feedback, and enhanced teacher-leaders' capital effectuated optimal educational climates for teachers in culturally diverse schools (Ringler et al., 2013). Moreover, campus leadership may experience difficulty balancing achievement gap progress measures with providing culturally responsive environments (Figueiredo-Brown et al., 2015; Horsford et al., 2011; Kahn et al., 2014; Ringler et al., 2013). Ultimately, acknowledging the inevitable increase in ELL populations and the stagnant progress of STEM-based education creates an educational environment allowing underrepresented minorities to remain underrepresented in the STEM workforce.

Summary

Chapter two presented an overview of current scholarly literature concerning student engagement of ELLs in the STEM content areas. Through the literature review, the reader was introduced to the evolution of student engagement as a framework and a national focus of improvement. Moreover, the importance of the research was outlined by connecting student engagement to national interest outcomes, such as achievement, dropout rates, and postsecondary careers. Supporting literature reinforced the drastic decline in both student engagement and interest in STEM-based occupations. The decline in engagement and interest appeared to be connected to low-engagement strategies and similar instructional practices.

Existing literature maintains that a subpopulation of American students is significantly impacted by low-engagement strategies—ELLs. Literature offered to the reader (Besterman et

al., 2018; Casey et al., 2018; Maarouf, 2019; Shi, 2017) contended that low-engagement strategies considerably widen the STEM achievement gap for ELL students, more so than non-ELL learners. National trends pointed toward the continued increase of ELL populations in American schools, suggesting continued conflicts within the education system. One in which, without intervention, the achievement gap between ELL students and non-ELL students will continue to widen. Secondly, the conflict between educational leaders, classroom teachers, and students will continue due to state and federal accountability pressures, instructional initiatives and mandates, and pressures placed upon campus leadership in creating an efficient educational environment in increasingly diverse settings.

Professional development serves as a common area of focus for campus, state, and national leaders. However, educators and educational leaders continue struggling with balancing content delivery with cultural relevance. Therefore, improving professional development alone without addressing cultural relevancy may not be enough to alter current engagement trajectories. Through this literature review, I presented a survey of current knowledge encompassing a specific area of ELL-based education called sheltered instruction, which gives educators a framework for ELL instruction. Specifically, the sheltered instruction framework provided key characteristics of instruction and lesson preparation commonly considered by researchers as applicable in educating ELL students. However, attitudes toward the sheltered instruction framework and relevant professional development, especially in the context of STEM, remained unclear and a worthy area of research at Anytown Middle School.

Chapter 3: Research Method

Educators at Anytown Middle School persist with low-engagement, culturally irrelevant instructional practices in ELL inclusive STEM-based courses. The purpose of this qualitative case study was to explore the perceptions held by educators and administrators regarding sheltered instruction of ELL students in the STEM classroom, relevant professional development, and the use of the ELPS within lesson plans. The following chapter outlines the qualitative case study's methodological approach to obtaining educators' perceptions and use of sheltered instruction. The chapter describes the research approach, design, population, data collection, and data analysis procedures. Furthermore, the chapter includes a discussion of the limitations, delimitations, and ethical concerns. The following research questions guided the study:

RQ1: What are the perceptions of campus leadership and STEM teachers regarding sheltered instruction as an instructional approach?

RQ2: What perceptions do STEM educators and campus leadership hold regarding professional development in sheltered instruction?

RQ3: How do STEM educators address English Language Proficiency Standards through stated language objectives and student activities in lesson plans?

Research Design and Methodology

Approaching the research through a qualitative case study design allowed for an in-depth examination of a real-life phenomenon within a given environmental context (Ridder, 2017). Baxter and Jack (2008) suggested using a case study when a researcher investigates the behaviors of those involved in the study that cannot be manipulated and contextual conditions relevant to the study's phenomenon. Corcoran et al. (2004) described how, in the educational

environment, qualitative case studies benefited research in that “they incorporate beliefs about what is important and how what is important can be achieved in particular circumstances” (p. 11). Field-specific investigations, such as examinations of the educational environment and its processes, fit perfectly with qualitative case studies' characteristics and benefits (Stake, 2010).

The goal of obtaining STEM educators' and administrators’ perceptions of sheltered instruction implementation and professional development while also examining posted lesson plans for sheltered instruction indicators required a structured research method. Lambert and Lambert (2012) summarized qualitative case studies as encapsulating the individuals' experiences within the study context. Semistructured interviews of STEM educators serving ELL students functioned as the primary data collection tool for the research. Semistructured interviews provided researchers and interviewees with a predetermined list of questions along with the flexibility of asking follow-up questions based on respondents’ answers providing rich data (DiCicco-Bloom & Crabtree, 2006). Due to COVID-19 protocols, interviews were held online for the safety of all participants. Additionally, all documents remained in electronic form to minimize document handling between participants.

Population

Anytown Middle School employed 61 educators and staff and enrolled approximately 920 students from the sixth, seventh, and eighth grades during the 2019–2020 school year. Anytown Middle School enrolled a relatively large number of ELL students active and monitored (138 students) and employed three full-time ESL teachers. The high number, relative to other middle schools, existed in part to the campus serving as the district’s Newcomer Academy. The Newcomer Academy serves students in their first 2 years in U.S. schools.

Demographically, the educator population consists of 73% female teachers, not atypical of the district's demographics. Anytown Middle School demonstrates a similar ethnic makeup compared to other schools in the district, with 61% White, 28% Hispanic, and 11% African-American. Anytown Middle School exhibits a relatively high number of veteran teachers than other schools in the district, with 30% holding 20 or more years of service. Approximately 35% of the teachers on campus hold five or fewer years of experience. The campus employed 19 teachers and three campus administrators meeting the criteria of educating ELLs or directly involved with creating and delivering sheltered instruction professional development during the 2019–2020 school year.

Sample

The sample for the study consisted of educators on the Anytown Middle School campus within STEM-based content areas serving ELL students and campus administrators, including principals and assistant principals. Obtaining relevant data relied on educators' and administrators' knowledge and experience in delivering instruction to ELL students, thus creating a target population better attained through convenience or nonrandom sampling. Nonrandom sampling most likely occurs when researchers require easily attainable, willing subjects or persons with knowledge pertinent to the focus of research (Etikan et al., 2016). The nonrandom, purposive sampling technique offered information-rich members the ability to "communicate experiences and opinions in an articulate, expressive, and reflective manner" relevant to the research question (Etikan et al., 2016, p. 2).

The final sample number depended on availability and participation. Due to COVID-19 protocols, all communication and subsequent interviews occurred online. Nineteen STEM teachers and three administrators received solicitation emails inviting recipients to participate in

the research (Appendix A). Ten STEM teachers and two administrators agreed to participate in the online interviews.

Materials/Instruments

Data collection for the qualitative case study relied on several materials and instruments. The use of online semistructured interviews functioned as the primary method of data collection. The interviews consisted of open-ended questions regarding the implementation and relevant professional development of sheltered instruction on the Anytown Middle School Campus. The study incorporated a predetermined set of interview questions for teachers and a slightly different set of questions for administrators (Appendix B). Interviews occurred through the online teleconferencing software Zoom. Zoom's audio transcription service processed recorded audio and video of the interviews and generated an electronic transcript. Microsoft Office and Excel served as a method for the manual electronic coding of interview transcripts.

Adobe Reader allowed for viewing the PDF file of lesson plans, highlighting within the document, and facilitating the entering and displaying codes associated with the ELPS. Additionally, an Excel spreadsheet enabled the categorization and organization of information regarding posted language objectives and student activities from lesson plans. Lastly, Eduphoria, an online educational platform, stored all submitted lesson plans and generated a PDF document of lesson plans filtered to only include STEM teachers.

Data Collection

Interviews

Data collection relied on semistructured interviews with open-ended questions and lesson plan document analysis. Semistructured interviews provided the study with a way of obtaining multiple perspectives, perceptions, and realities through descriptions of episodes, linkages, and

explanations (Stake, 1995). The interviews consisted of open-ended questions regarding sheltered instruction to the sample of teachers and administrators. Utilizing the Zoom online conferencing software allowed for audio and video recording of the interview. A function within the Zoom software simultaneously transcribed and subsequently generated an electronic transcript of the interview. Transcriptions of interviews underwent minor editing for grammar and clarity. Moreover, each respondent was renamed "Teacher A, Teacher B," and so forth for anonymity and confidentiality protocols.

Lesson Plans

Throughout the 2019–2020 school year, teachers submitted lesson plans online to a software program called Eduphoria. As a campus expectation and requirement, teachers posted the following week's lesson plan no later than the Thursday of the previous week. While the teacher held a level of flexibility in the sections included within the lesson plan, one nonnegotiable area was their planned objective and activities. Data collection on the objectives and student activity portion of lesson plans provided insight into how educators addressed the ELPS domains within lessons.

Data Analysis

Analysis of data collected from interviews followed a coding approach and thematic analysis. Saldaña (2015) defined a *code* as "a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and evocative attribute for a portion of language-based or visual data" (p. 3). The use of qualitative coding allowed for communication and connection with the data to "facilitate the comprehension of the emerging phenomena" (Basit, 2003, p. 152). The coding approach employed within the study consisted of three phases: open coding, axial coding, and selective coding (Blair, 2015). Open coding involved the application of codes or categories

to data. Moreover, axial coding involved the association of categories and sub-categories, while selective coding organized the categories around a central explanatory concept. For this study, transcripts of the open-ended question responses from the interviews served as data for the coding process.

Coding Process

Before the coding process, raw interview transcripts underwent a check for accuracy, grammar, and punctuation, followed by reformatting for consistency and clarity. Reformatting consisted of indicating in the text where interviewer questions occurred and the respondents' answers. Moreover, each respondent received a unique pseudonym, for example, "Teacher A" or "Administrator A," to maintain confidentiality while concurrently allocating responses to a particular individual for subsequent analysis. Coding of the interview transcripts followed a manual, inductive approach.

An inductive coding approach utilizes detailed readings of raw data to derive concepts and themes with several cycles or passes used as a method of refinement (Thomas, 2006). Precoding occurred as brief notes were taken during the interviews marking noteworthy responses or points of interest for later review. Inductive coding began with an open-coding pass where codes and categories were freely generated, followed by a second round of coding where codes were refined and grouped into higher, broader categories (Elo & Kyngäs, 2008). The comment function within Microsoft word functioned as a way to assign and store codes. A similar process followed for all transcripts that underwent several coding passes and recoding until completion.

Microsoft Word's macro function created a separate document displaying the code assigned in the comment box, the original text associated with the code, and the location of the

text within the transcript. Exporting the second Word document into Microsoft Excel allowed for efficient sorting and regrouping of codes and categories. Within Excel, broader categories to codes were assigned within the text, indicating them in separate columns. After several rounds of the inductive coding process and categorization, broad categories emerged, aiding the development of interpretive themes (Thomas, 2006).

Triangulation

Triangulation in qualitative research refers to using multiple sources of evidence converging on the same set of facts while making confidentiality and the use of information explicitly clear while having frequent member checks to ensure an accurate representation of responses (Yazan, 2015). The study relied on a within-method type of methodological triangulation incorporating semistructured interviews of educators and administrators and document analysis of lesson plans. Within-method triangulation incorporates multiple data collection methods within a qualitative paradigm to increase internal credibility (Hussein, 2009). For this study, I utilized an interview protocol that gathered responses from teachers and administrators regarding the implementation of sheltered instruction and relevant professional development. Responses from both were compared in developing a description of the current state of sheltered instruction and ELL-based education within the study site. Moreover, I relied on document analysis for data related to how teachers address the ELPS within submitted lesson plans. Interview data provided insight into the salience and meaning of the organizational phenomenon while concurrently providing interpretations of data collected by other methods such as document analysis (Paul, 1996; Stake, 1995, 2010).

Lesson Plan Analysis

Research question 3 required the collection and analysis of submitted lesson plans. Educators at Anytown Middle School submitted completed lesson plans via an online platform called Eduphoria. The platform requires a username and password login, and as the researcher, I have administrator rights to view all submitted lesson plans. A district representative granted permission to access, download, and review lesson plans to collect data (Appendix C). Lesson plans were downloaded and archived for the data collection process. Any identifiable information was redacted from the cumulative file of submitted lesson plans.

Lesson plan analysis included reviewing each daily entry for indicators of differentiation through language objectives. Differentiated instruction refers to instruction that consists of an educator's efforts to meet diverse learners' needs through adapting instruction, assessment, product, or environment (Tomlinson, 2014). For example, differentiation in ELL students' context originated primarily from the ELPS of reading, writing, speaking, and listening. Effective instruction of ELL students rests upon providing students with opportunities to practice all domains within a lesson cycle (Echevarría, Short, & Powers, 2008; Echevarría, Vogt, & Short 2008; Lee, 2005).

Language objectives articulate how students participate and demonstrate mastery for the given content through the ELPS of reading, writing, speaking, and listening through student activity (Echevarría, Vogt, & Short, 2008). For instance, a language objective could read, “Students will summarize the differences between solids, liquids, and gases in a written report.” In this objective, the students must utilize their writing skills to both participate and eventually demonstrate proficiency. In short, each submitted lesson plan’s objective and subsequent activities should demonstrate a combination of reading, writing, listening, or speaking activities.

In the lesson plan analysis, I evaluated each submitted lesson plan, identified the objective or student action, and indicated whether that action targeted writing, reading, listening, or speaking. The document analysis process consisted of highlighting the stated student activity from the lesson plan and assigning the relevant code through Adobe Reader's comment function. For example, a lesson plan stating, "Students will write a summary of their observations" received highlighting. The verb "write" indicated the ELPS domain of writing and was entered into the comment section as "W." This method incorporated a skimming, reading, and interpretation-based process common for document analysis (Bowen, 2009) to obtain information on the frequency of addressed ELPS domains.

Trustworthiness in Research

Establishing trustworthiness served as a vital aspect of the research, with several components requiring consideration. For instance, Shenton (2004) asserted that the use of conventional and familiar data collection methods, familiarity with the setting's culture, and triangulation, in part, established trustworthiness. Carcary (2009) discussed trustworthiness in qualitative studies through both the interpretivist's and positivist's viewpoints. The author suggested that researchers implement an *audit trail* that allows readers to "trace through the research logic" (p. 16) as a means to establish trustworthiness in terms of reliability, validity, and generalizability. Trustworthiness in the study consisted of keeping all raw data, field notes, analyzed data, and member checks of interview participants postanalysis of data.

Researcher's Role

Interviews held during the case study involved direct interaction between researcher and participant. Therefore, the role of the researcher required consideration**.** My educational career began in 2011 as a science teacher. During my time in the classroom, I recognized the difficulty

of addressing diversity, especially ELL students in science. Moreover, I also recognized inattention and apathy towards educating subpopulations of students through low-engagement instruction such as lectures. In 2017, I became an assistant principal and observed similar low-engagement tendencies with other staff at a different school district. Thus, the observations over my educational career led to this case study.

In qualitative case studies, the researcher takes an active role as a data collector, interpreter, planner, and arranger (Stake, 2010). As a researcher in my educational environment, I held work-related relationships with the participants. As an assistant principal, I held a supervisory role over a majority of the participants. Such a dual-role introduced bias into the research. Maxwell (2005) discussed researcher and reactivity bias and their influence on qualitative studies. The author defined *research bias* as selecting data to fit preconceptions, values, or existing theories held by the researcher. Maxwell (2005) described reactivity bias as the researcher's effect on the respondent, in this case, as a work supervisor leading the study. Minimizing the bias within the case study relied primarily on language and confidentiality. For instance, the language within the informed consent document and semistructured interviews remained short, direct, and nontechnical. Moreover, participants were reminded about the confidentiality safeguards before starting the interview. Stake (2010) asserted that addressing subjectivity, objectivity, and bias rested on explication and triangulation.

Ethical Considerations

Qualitative case studies present several ethical considerations, including informed consent, recruiting participants, gaining access to diverse communities, confidentiality, researcher dual roles and multiple relationships, and data interpretation (Ponterotto, 2010). While the research into educational practices posed minimal risk to participants, consideration and

accountability regarding confidentiality occurred. The issue of confidentially manifested most noticeably when considering educator and leadership data submissions from a small sample. Combatting potential identification required diligence in masking any identifying information, such as demographic or content area information, unless inclusion was necessary.

Before any data collection began, Abilene Christian University's Institutional Review Board reviewed and granted permission for the study (Appendix D). The principles published by the IRB guided the ethics of the research. They served as a foundation for minimizing any potential harm while maximizing potential benefits to education. Participants received an informed consent form electronically delivered through HelloSign that provided an overview of the study and associated risks of participation. Participants received an opportunity to review the form and ask any questions before the interviews. Once participants signed the form, interviewees scheduled their online interviews via email. Subsequently, participants received an online invitation through Zoom with their preferred date and time for the online interview.

Assumptions

Qualitative case studies present several assumptions. Hathaway (1995) presented two broad assumptions within research. Specifically, the author cited the assumption within qualitative research that "reality is constructed by shared understandings of participants" (p. 554) instead of the existence of one true reality. Ochieng (2009) explored other qualitative case study research assumptions, including its descriptive and inductive nature through fieldwork. Moreover, the researcher serves as the primary data collection instrument. Stake (2010) addressed similar assumptions, suggesting that qualitative case study research introduces subjectivity to fellow researchers' disdain interested in eliminating such a variable. However, the

author cited the importance of subjectivity as “an essential element of understanding human activity” (p. 29).

Limitations

The qualitative case study faced certain limitations. For one, the study was limited to a single midsized middle school campus located in west Texas. Secondly, the researcher and work supervisor's dual role potentially introduced reactivity bias (Maxwell, 2005; Stake, 2010). Moreover, my role as an ELL administrator potentially limited objectivity. Relatedly, the interpretive approach remained relatively subjective. Minimizing the limitation relied on explication and triangulation through member checks and confidentiality safeguards. Lastly, the inconsistency of expectations in lesson plan submission presented a limitation. As a rule, each content department dictated what must appear in lesson plans and what was considered optional. In effect, omissions from lesson plans may not accurately reflect classroom behaviors or activities.

Delimitations

The study was designed to gain insight into the perceptions held by educators and administrators regarding sheltered instruction in the STEM classroom. Furthermore, I sought insight into how lesson plans addressed differentiated instruction, such as sheltered instruction of ELLs through the ELPS domains. The study’s design combined the perceptions of STEM teachers campus-wide rather than by department or content area. Moreover, it was not an intention to gather observational data from strategies used inside the classroom as a way to investigate fidelity within lesson plans.

Summary

The education of ELLs in STEM, coupled with an increasing achievement gap between ELL students and their non-ELL peers, deserved further research. Despite professional development in sheltered instruction and other efforts to enhance STEM instruction, educators continue implementing low-engagement, culturally irrelevant instruction such as lectures and worksheets. Therefore, the purpose of this qualitative case study was to explore the perceptions held by educators and administrators regarding sheltered instruction of ELL students in the STEM classroom, relevant professional development, and the use of the ELPS within lesson plans.

This chapter provided a detailed outline of the methodological approach of the research process. The research context and setting appeared appropriate for a qualitative case study. The research questions required a level of inductive, interpretative, context-focused approach. Additionally, a qualitative case study presented several assumptions and limitations that further guided the study and required in-depth considerations on the instruments and data collection processes. Given the data collection methods that best fit the approach, ethical concerns arose regarding informed consent, confidentiality, and data interpretation. Thus, adherence to Institutional Review Board (IRB) guidelines benefited trustworthiness and credibility while maintaining a safe environment conducive to research.

The methodology described in chapter three provided a structured yet flexible research approach. First, the utilization of semistructured interviews provided an opportunity to gather rich, detailed insight into ELL education in STEM courses. Additionally, the online submission and storage of lesson plans in Eduphoria allowed easy access and retrieval for collection and analysis that proved convenient and safe for all participants. Lastly, the implementation of

member checks minimized certain biases inherent to qualitative case study research. The above methodology's cumulative effect ensured the collection of valuable data and insight into educators' and administrators' perceptions of sheltered instruction and how educators use lesson plans to address the ELPS and differentiated instruction.

Chapter 4: Results

The purpose of this qualitative case study was to explore the perceptions held by educators and administrators regarding sheltered instruction of ELL students in the STEM classroom, relevant professional development, and the use of the ELPS within lesson plans. Ten STEM teachers and two campus administrators from Anytown Middle School participated in interviews. The participants shared their perceptions of sheltered instruction's implementation and professional development. Additionally, submitted lesson plans underwent analysis to identify and code objectives and activities associated with the ELPS dimensions. This chapter presents the results of the thematic analysis of teacher and administrator interviews regarding the implementation of sheltered instruction on the Anytown Middle School campus. Furthermore, the chapter provides document analysis results of lesson plans submitted in the 2019–2020 school year that reflect how teachers addressed the ELPS. The following research questions guided the study:

RQ1: What are the perceptions of campus leadership and STEM teachers regarding sheltered instruction as an instructional approach?

RQ2: What perceptions do STEM educators and campus leadership hold regarding professional development in sheltered instruction?

RQ3: How do STEM educators address English Language Proficiency Standards through stated language objectives and student activities in lesson plans?

Teacher and Administrator Interviews

Before the interview process, 19 staff members identified as teachers of STEM-based courses received solicitation emails inviting them to participate in the online interviews. Additionally, three campus administrators received email invitations. The solicitation emails

provided a brief overview of the research and a clickable hyperlink if they chose to participate. The hyperlink directed potential participants to the electronic consent form hosted by HelloSign, an online service providing e-signature services. Once signed by the participant, a follow-up email to the participant detailed instructions on scheduling a date and time for the online interview. Ten STEM teachers and two administrators agreed and participated in the online interviews.

Interview Format

Interviews of teachers and administrators followed a semistructured format. Due to COVID-19 protocols, the interviews were held via Zoom and lasted approximately 15–20 minutes. The interview protocol consisted of two sections of focus, implementation of sheltered instruction and professional development related to sheltered instruction. Teacher interview questions within the first section consisted of acquiring information related to comfort in implementing sheltered instruction, the impact of sheltered instruction on their approach to ELL students, feelings towards sheltered instruction, positive or negative experiences, and successes and challenges related to teaching ELL students. Administrator interviews also included questions about implementing sheltered instruction in STEM and if sheltered instruction has changed any aspect of their approach to leadership. Additionally, both teachers and administrators answered questions regarding professional development associated with sheltered instruction and their perceptions of needed changes within the system during the second section of the interview protocol.

Interviews were audio and video recorded for transcription through the online conference software Zoom. The software also offers a transcription function that generates text in an electronic format. Transcribed interviews underwent minor editing for grammar and clarity.

Additionally, edited transcripts were emailed to individual participants to review and confirm meaning and accuracy postediting.

Interview Participants

The interview participants included 10 teachers of STEM courses inclusive of ELL students and two administrators from the same study site. Of the teacher sample, four represented the content area of science, four represented math, and two taught electives representing engineering and technology. Demographically, the sample consisted of 11 female participants and one male participant. Experience levels of the teachers consisted of two teachers with fewer than 5 years of experience, one with 5–10 years of experience, and seven with more than 10 years of experience. Both administrators had fewer than 5 years of experience in a campus administrative role.

Coding Process

Upon completion of the interviews, the data analysis process began. An inductive coding process consisting of open, axial, and selective coding (Blair, 2015) generated several codes and categories for thematic analysis. The first stage of the process involved reading through the entirety of interview transcripts. The next phase included several open coding passes designed to transform the interviewee's words and experiences into concepts (Williams & Moser, 2019). I utilized Microsoft Word and the comment feature for the open coding process by highlighting text and adding the code as a comment. Microsoft Word's macro function generated a spreadsheet that reflected the applied code and correlating text from the interview. The codes applied throughout the interviews were sorted and organized within the spreadsheet to effectuate axial and selective coding.

Viewing codes and interviewee's words in Excel enhanced my capacity in performing axial coding. Viewing codes in a vertical format and the ability to move rows made connecting concepts and categories an effective and cyclical process, the primary function of axial coding (Kolb, 2012). As axial coding proceeded, broader categories emerged and led to the progression into selective coding.

I refined the textual codes into categories and then applied the selective coding process in generating themes. The process withstood several passes until dominant themes emerged, which were compared to other categories for incorporation or generation of different themes that ultimately answered the research questions (Vollstedt & Rezat, 2019; Williams & Moser, 2019). As an administrator and researcher, I served a dual role within the study. Such a role introduced a level of subjectivity during the coding process. However, a level of subjectivity is expected, accepted, and beneficial within coding qualitative research as long as the researcher maintains awareness of the existence of the bias (Blair, 2015). At the conclusion of the coding process, several dominant themes emerged relevant to the perceptions of teachers and administrators of sheltered instruction in STEM courses and relevant professional development.

Perceptions of Sheltered Instruction in STEM

Seven themes emerged as the dominant perceptions held by teachers and administrators in the implementation of sheltered instruction in the STEM classroom:

1. experience with ELLs,
2. positive relationships,
3. good teaching,
4. language barriers,
5. instructional focus,

6. achievement, and
7. lack of adequate training.

Table 1 provides an overview of the identified themes and subthemes.

Table 1

Themes Identified in the Implementation of Sheltered Instruction

Themes	Summary
Theme 1: Experience with ELLs	• Experience with teaching ELLs enhances comfort • Comfort with curriculum/content
Theme 2: Positive Relationships	• Relating to ELLs/Cultural connections • Reciprocal relationships
Theme 3: Good Teaching	• All can benefit • Provide the same resources • Conflict within implementation and observations
Theme 4: Language Barriers	• Uncomfortable • Unable to monitor • Limits students to interacting with ELL peers
Theme 5: Instructional Focus	• Overall small impact on teaching • Lack of alignment between TEKS and ELPS • Subtheme 5.1: Content and Vocabulary • Subtheme 5.2: Interaction
Theme 6: Achievement	• Academic and social achievement • Growth in language ability • Lack of progress/pressure
Theme 7: Lack of Adequate Training	• No help and feeling “thrown in” • No training • No focus/No priority

Theme 1: Experience With ELLs

During the interviews, teachers correlated their comfort level with the implementation of sheltered instruction to their exposure to ELL education. Exposure symbolized experience with

teaching ELLs in previous years and familiarity with ELL instructional practices. Responses included an enhanced comfort level as a product of having ELLs enrolled in their courses currently and in previous years. Moreover, previous experience also led to a feeling of empathy toward ELLs for some respondents. Less personally, respondents felt comfortable with their content relevant to the needs of ELLs. The theme signified that exposure to ELLs and ELL-based education produced an enhanced level of comfort. Teachers E, G, and H described an enhanced comfort level through familiarity with the content and ELL students.

> Teacher E: I'm fairly comfortable, probably above average, but below super. Because a lot of it is vocabulary that's based on root words and suffixes that can be easily translated for the students, and then usually, there's some sort of diagram or picture that can go with it, which kind of helps English language learners.
>
> Teacher G: I'm pretty comfortable with it because I've been doing it for so many years.
>
> Teacher H: I taught for 17 years at another campus which was almost all ELLs. I think I'm pretty comfortable with it.

Teacher B described an enhanced comfort level due to a personal connection with ELL education and instructional practices. The participant described the experience of being an ELL student.

> Teacher B: I'm really comfortable considering I was an ELL, or I am an ELL, so I think having that connection helps me understand how difficult it is to speak and learn the English language along with content such as science. So, I am really comfortable.

Administrator participants of the interviews also discussed their comfort levels but in terms of comfort addressing sheltered instruction in STEM content areas. Administrator B expressed that previous experience with ELLs enhanced their comfort with addressing ELL education and sheltered instruction on the campus.

Administrator B: I feel comfortable with the curriculum, the TEKS; it's all the same, listening, speaking, that part. I understand the ELAR instruction and curriculum, the TEKS, which we do that SLAR, too. It's vertical. It's aligned.

Theme 2: Positive Relationships

Participants reflected on whether using sheltered instruction in their classroom had been an overall positive or negative experience. A clear theme emerged demonstrating how relationships built with ELL students made the overall experience positive. Positive relationships incorporated the respondents' ability to related to ELLs in a way the extended beyond the curriculum. More specifically, respondents described making cultural connections with their ELL students. Importantly, participants described a level of positivity in their perception that the relationships were reciprocal. Positive relationships between students and teachers exist as a foundation for sheltered instruction and student engagement (Echevarría, Vogt, & Short, 2008; Fredricks et al., 2004). Moreover, positive interactions between students and teachers lower a student's affective filter (Krashen, 1985). The following participants reflected on making cultural connections and overcoming barriers.

Teacher B: I can relate to them. They can feel comfortable around me.

Teacher C: I've learned a lot culturally from my ELL students. I have a student who I believe is from Nigeria, and we were able to discuss his Thanksgiving traditions. It's really refreshing from a student perspective. I've gained insight into learning from other people.

Teacher H: They like interacting, and like being active, and like trying to say the English word. Some kids are shy, but most kids will try to mimic you.

> Teacher J: It's been positive for me because I work differently with the ELLs, but at the same time, I'm trying to assist them in speaking English. I think they assist me in speaking Spanish. So, in my content, it's a lot easier if I can speak some of the Spanish because you can learn how to say add and subtract. When they don't understand, I can assist them through the language itself, and then I'll ask them, "how do you say something in Spanish" to make them understand. So, I feel like it's a positive experience it helps me as well as them.

Administrator A noted observing teachers building relationships with ELL students.

> Administrator A: We have a lot of teachers that care a lot. Even if they don't know why kids are not getting something because of sheltered instruction or the gaps from a language, they care enough to keep trying and investigating to close that gap. I think that's a win.

Theme 3: Good Teaching

Discussing overall comfort levels also revealed a theme centered on best practices for all, or what several participants described as "just good teaching." The sentiment shared within the theme of good teaching coincides with previous research asserting that teachers' perceptions of good teaching practices for all followed a one-size-fits-all mentality among teachers and administrators (Gonzalez, 2016; Harrington, 2013). Interestingly, teacher respondents described a benefit to all students by using sheltered instruction strategies. Conversely, one of the administrators cited concern with the lack of observable use of sheltered instruction. The different perceptions of teachers and administration create a gap in practice discussed in the next chapter. Teachers A, C, D, H, and J described their mentality toward sheltered instruction reflecting overall best practices for all students.

> Teacher A: I think it made me a better teacher, having to do all those different things because it's not just ELLs that can benefit from those particular strategies. So, I think it's a good thing.
>
> Teacher C: I have English language learners right now in my class. I provide them the same resources that I would provide any students, which are lots of vocabulary and lots of visual representations of concepts. So just good general instruction I try to provide everyone, and I feel like English language learners benefit from that.
>
> Teacher D: I've learned over time that any strategy that works well for ESL, it'll work great for SPED, and it'll work great for a regular student. A lot of those things are super interchangeable because what's good for one kid is really just good for all kids. Good practice is good practice, no matter what type of kids you have sitting in front of you.
>
> Teacher H: It boils down to just good teaching.
>
> Teacher J: I feel like we do pretty much the same for the regular students as we do the ELLs because we do want all of them to have the chance to speak out loud, to write, too, so when one writes, they all write. Good teaching is good teaching, and strategies work for all kids.

Administrator A described somewhat of a disconnection between classroom teaching and administrator observations. While many teachers suggested sheltered instruction resembled "good teaching," Administrator A suggested a lack of it.

> Administrator A: I don't see many people doing hardly anything with ELL or sheltered instruction, other than our ELL teacher and our newcomer teacher.

However, Administrator A also added that their current comfort level with ELL education and sheltered instruction diminishes their ability to address issues.

> Administrator A: So just because I know about it doesn't mean I can walk into a classroom and say, “Why is this not happening” or “this should be happening.” What's the reason that it's not? There could be two to three teachers on campus that I would qualify as science STEM and then maybe four to six teachers of math STEM that could and should be implementing ELL support or sheltered instruction, and they're not doing that.

The theme of good teaching appeared in other areas of the interview. Two respondents reported neutral feelings towards implementation, echoing the theme of good teaching.

> Teacher C: I feel like sheltered instruction is just good teaching, but maybe I might misunderstand what that means. I don’t think it would affect very much because those things like incorporating vocabulary, visuals, and this is how you annotate a passage, and this is how you break down a text and the question, those are things that I would want to do, regardless.
>
> Teacher J: It’s really hard for me to separate it out and think sheltered instruction is any kind is different instruction, so I just don’t treat it as two separate things. I treat it as one type of instruction. Because to me, the non-ELLs benefit just as much as the ELLs benefit from that same instruction.

Theme 4: Language Barriers

A theme centered on language barriers appeared throughout the interviews. Teachers acknowledged that language barriers impacted their comfort level. Moreover, language barriers created a challenge for teachers monitoring behavior and student progress. Barriers in language also created a challenge with implementing peer-to-peer interactions within the ELPS domains as ELLs often interacted and socialized with other ELLs rather than non-ELL peers. The language

barrier theme created challenges for teachers in implementing the ELPS and implicates students' affective filters. Teachers C and F shared how the language barrier affected communication and monitoring student progress.

> Teacher C: I wouldn't really understand if they were completely lost or if they're even with me. It was hard to gauge where they were at. I think it'd be pretty uncomfortable just because I wouldn't know how to monitor how successful the instruction actually was.
>
> Teacher F: Because of the language barrier, if they are not very proficient in English, it's really hard. I struggle with thinking outside of the box and how I can enable learning content because science in itself is very difficult to relay in a different language. I know that there is a lot of languages, a lot of vocabulary terms that are Latin-based, but it's really hard to explain that, so I have difficulty with it.

When teachers answered interview questions focused on perceived challenges of sheltered instruction implementation, the language barrier aspect appeared throughout several interview responses. The following participants described how the language barrier served as a specific challenge in implementing sheltered instruction.

> Teacher A: If there wasn't something that I could act out or do, I couldn't necessarily get it across to them unless there was some other student in the class that could translate. That was definitely a challenge.
>
> Teacher D: Sometimes they get limited to where they're only trying to talk to people that also speak Spanish, and it's hard for them to branch out, so then you have to be really super specific about where you sit them and how you group them, and you want them to be with kids that they can be comfortable with, but over time you want to try to push

them and stretch them. I guess from the students' standpoint. I would see that as a barrier to overcome.

Teacher G: The language barrier pretty much is the challenge.

Teacher H: They will look at you and understand what you're saying to a certain degree, but they don't feel comfortable enough to speak back to you in the English language. So those are the hardest ones to reach. The challenge is the ones that are too shy to talk.

Teacher A added that the language barrier posed a challenge overall but could sometimes serve a dual purpose.

Teacher A: Although it was good to teach and not know that second language, I didn't use it with them, and they had to do the English, so it's a double-edged sword there.

Teacher D also described a dichotomy within the language barrier and added the need for balancing between using the students' native language and English.

Teacher D: You want to try to help that child every way you can, but you also don't want that to become a crutch, and really walking that fine line in balancing things, helping them versus hurting them because they just don't know the language. That hurts them long-term, and it takes them longer to exit an ESL program or things like that. It creates a kind of havoc in the environment, trying to do right by every student.

Theme 5: Instructional Focus

The second interview question required teachers to determine if sheltered instruction changed any aspect of their teaching approach in STEM. The respondents described how sheltered instruction changed their instructional focus. However, respondents characterized the impact as minor. The instructional focus theme overlaps with the good teaching theme in that respondents saw instructional practices that benefited ELLs also benefited non-ELLs, thus not

seeing a distinct difference between the two approaches. Administrators also described an impact on their instructional focus in the alignment of the ELPS and the TEKS. When analyzed, two subthemes emerged specifically detailing how respondents changed their instructional focus. Approximately half of the teachers focused on content and vocabulary, while the other half focused more on interactions. The importance of the instructional focus theme exists within the dichotomy of the answers represented by the subthemes. In short, sheltered instruction relies on the concurrent implementation of content and vocabulary with interactions that provide opportunities to practice the ELPS (Short et al., 2011). Teachers A, D, E, F, G, H, and J discussed how sheltered instruction influenced their instructional approach.

> Teacher A: Less talking for me and more hands-on and having them talk through things. So not just for my content but also for the language part to pick the words with what's actually going on.
>
> Teacher D: I did sheltered instruction early on in my career. I already had embedded in there. I don't know that I could say that since I didn't teach it before and then learn it. I don't know that it really changed the enhanced things that I did and maybe helped me focus on doing some things better and for those types of students.
>
> Teacher E: You always have to go back and reuse stuff, but if you pre-teach some of the vocabulary, which I used to never do, and some of the diagrams, pictures, any kind of visual before you teach the lesson. I used not to do that before I had ELLs. Then I noticed when I did that not only did the ELL improve, but the other students as well.
>
> Teacher F: The only thing that's really changed in my teaching approach is just breaking down those vocabulary terms in a more student-friendly version. Instead of just giving

them the vocabulary terms, here is what it is. It has changed just a little but not significantly.

Teacher G: More visuals. I guess more repetitive instruction or demonstration instead of just talking someone through it vocally.

Teacher H: I may have stood next to them more, showed them more visuals, and everybody else pointed to words. But it's just a natural thing for teachers. I think it's to help all kids because even poverty kids need sheltered instruction.

Teacher J: I think maybe it is improved because I've been more visual.

Administrators answered a similar question about the impact of sheltered instruction but through the lens of their approach to leadership. Both Administrators A and B agreed that sheltered instruction led to a shift in their leadership approach through the context of instructional focus.

Administrator A: We have two ELL teachers or teachers who work with our newcomers and ESL kids. I definitely support their instruction more because of our Newcomer population that we serve as campus leaders. Across the board, I will say PLCs are the only thing that comes to mind as something that might change. I'm asking a lot more questions about what this kid needs. How do you know that within our science and math PLC? Coaching those teachers towards ELL support and instruction, I don't know if I've ever specifically said, "Hey, your ELLs would benefit from this type of tool or this type of differentiation or scaffolding." I don't know if I've done anything specific. Having a newcomer Academy and having a large percentage of English language learners is definitely something I consider with all of my leadership with our campus improvement plan with our data with our analysis with our PD but is it anywhere where we need to be? Absolutely not.

> Administrator B: The integration of the ELPS with the TEKS and just focusing on that. The third interview question followed up on the second in assessing teachers' priorities when teaching STEM-based content to ELLs.

When analyzed, the following subthemes emerged that help clarifies the overall theme of instructional focus: content and vocabulary, and interaction.

Subtheme 5.1: Content and Vocabulary. Participants recalled specific instructional priorities when asked about the foci of their instruction in response to sheltered instruction. The follow-up question during the interview generated two subthemes. The content and vocabulary (subtheme 5.1) encompassed curricular and vocabulary-building activities. Teachers A, E, F, G, H, and I described their instructional focus as content and vocabulary mastery.

> Teacher A: Did they know how to do it? The language part can come as long as they have a good understanding of the content in STEM because it's a global thing anyway.
>
> Teacher E: A lot of times, with the math background that I have, I noticed that a lot of Latin is used, which basically feeds into all the languages that show up in my classroom. The students can be more successful if they can see a bridge between their native language and English. Sometimes, you can use that with STEM words because a lot of science and math words are roots from Latin, which is where most languages are derived. So, I think it just makes them more successful when they see that there's a connection.
>
> Teacher F: For STEM education, mostly my priority is probably getting the content across and relaying the information. I don't have those first comers, so my job is mostly getting them the information then finding growth. My priority is growing them. It's not really that you need to be incredibly proficient. You don't have to be mastering in any

shape, way, or form. I'm just looking for growth. So that's really what I'm looking for in my students that are first-year English language learners.

Teacher G: To make sure that they get it or make sure that they become more confident and using technology later on in life because I want them to learn that.

Teacher H: A lot of vocabulary. I compared word parts to the Spanish language because those are the ELLs that I had. And I would show them that word part. I have a Spanish, English, Math dictionary and show them the English word part and how it corresponded with the Spanish word part, so they could remember one word for another. Probably the vocabulary first. They know their numbers. They just have to be introduced to more vocabulary and have more concrete pictures of what you're looking for when you're teaching them.

Teacher I: My main priority is making sure that they have the basic foundation.

Surprisingly, Teacher D described a conflict that resulted in a verbal argument related to the priorities within STEM instruction and ELL education.

Teacher D: Years ago, I actually had quite a big argument with the, at the time, the ESL teacher that was helping me with my ELL kids, and I was told that the entire reason why they sat in my class was just to learn the English language. They didn't care if they picked up STEM or any of that information or learn science. They literally were just there to hear me speak in English. I said, "No, if they're going to sit in my class, they're going to learn." I think it's important that they learn the content and pick up the English language at the same time. I know other people kind of disagree with that.

In response to the question assessing overall feelings about implementing sheltered instruction in STEM, Administrator B described a gap between teachers' perceptions and that of

administration in terms of content and alignment with the needs of ELL students. However, Administrator A felt that the teachers' level of content knowledge served as a strength and a steppingstone to build upon students' needs.

> Administrator B: We don't align them together. We don't put them side by side and say this is my science TEK, and this is my ELPS TEK. How can I make them go together and help support some of our ELLs?
>
> Administrator A: Our teacher's content knowledge. When you're strong in content, that gives you more room to focus on student needs and student challenges

Subtheme 5.2: Interaction. Other interviewees described an instructional focus on interaction. Interaction included a focus on having students interact, often hands-on, with material and content. Additionally, interaction manifested through social interactions with peers and teachers through speaking and collaboration. Teachers B, C, I, and J commented on their effort to get students engaged through hands-on activities and practicing the English language.

> Teacher B: A lot of hands-on, but also speaking trying to get them to speak and a lot of hands-on, also speaking trying to get them to speak.
>
> Teacher C: I want to provide them as many hands-on activities as I can, where they're actually getting to work with people and collaborative groups. I focused more this year on models, hands-on activities, and collaborative groupings and made sure that they're always constantly working.
>
> Teacher I: I've gotten students who are limited in their English, but they were great math students. It's just having to break that language barrier.
>
> Teacher J: A priority for me is that they're always trying to speak the language, and that's one of my biggest criteria in class is you always have to try to say it, you always have to

> answer, and then if you can't, we'll adjust and try to help you out. I've been more visual in showing things. That actually helped all kids in terms of just writing things down, looking things up, and speaking. Not everybody's doing that, so I think that has helped because I realized that all kids need it.

The instructional focus theme appeared in other interview questions, specifically when obtaining overall experience, whether positive or negative, of implementing sheltered instruction. Two teachers stated that the impact of sheltered instruction on their instructional focus led to positive results, albeit in one case a neutral to minor impact.

> Teacher A: It made me a better teacher. It really did, and there's so much hands-on. It really helped me hone-in on what was really important in the instruction because it doesn't matter if they're learning the language or not. It's just good teaching.
>
> Teacher F: I guess it can be positive in that it's given me a new insight and into how to teach students but for the most part, it hasn't really impacted my teaching a whole lot.

Theme 6: Achievement

Achievement serves as a key principle and chief outcome of student engagement (Fredricks et al., 2004). Logically, the theme of achievement permeated throughout the teacher interviews. Respondents described achievement in terms of content mastery, language development, growth, and in some instances, success beyond the classroom. Respondents stated how achievement led to overall positive attitudes toward sheltered instruction in the STEM classroom. The development of the theme coincided with previous research demonstrating the reciprocal association between teacher effects, student engagement, and achievement (Chase et al., 2014; Fredricks et al., 2004; Havik & Westergård, 2020; Kenny et al., 2006; Lee, 2014).

Teachers D, G, and H explained how success affected their positivity toward sheltered instruction.

> Teacher D: It is a good feeling when you're able to help reach kids or teach kids and help them overcome a barrier that they have.
>
> Teacher G: I have good feelings toward that because they need to learn and be successful because most of them probably don't have that access. I mean, as they do now from where they came from, especially some of the ones I have this year. They're super proud when you print it out, and they see what they've accomplished. I think that's pretty important.
>
> Teacher H: It's a positive. You see more success with it. The kids are more successful. They feel more confident.

The theme of achievement consistently appeared when asking teachers about their successes with sheltered instruction in the STEM classroom. Teachers A, C, D, E, F, G, H, I, and J described instances where achievement served as a positive product of their experience with ELL students.

> Teacher A: I had one last year come back to me, and she could not speak English at all when I had her 5 years ago. She was graduating from high school looking to be a teacher at some point going through that program. Still, she also decided that she wanted to join the Marines out of high school because she wanted to give back to the country that gave her many opportunities. She came back and told me that I believed in her, and I had patience with her when she couldn't speak the language, and I cried because that was really cool. I've had several that that have reached back out. Not as much as her, but several that have reached back out and said that being able to talk in my class and talk to

me and do the things that we did really help them gain confidence so that they were more successful later.

Teacher C: The one group that I had that was almost all Spanish speakers. When we finally were able to have that "wait, yes, this is what I'm talking about" moment. The "I understand" moments are really fun. It ended up being a really fun class for the little time that I had them. It was just like really bare to as simple as you could make it and just breaking it down as simple as you could. And that moment where they kind of understand something is really rewarding

Teacher D: A lot of times when kids get here directly from another country, at first, they're so shy that you know they won't hardly talk to you and then over time you start getting a "Hi, Miss," and then you can just see their progress as the year goes on and you can see them actually learning the language and using more words, and that's always great.

Teacher E: A lot of times, kids feel more strength in the subjects that teach STEM subjects because they feel the connection to their language. They're happy to come into class, they don't get frustrated as often, and they feel comfortable.

Teacher F: I think maybe the only success I can really think of was several years ago. I had a student who refused to speak English and just downright said that she couldn't speak English and then come to find out she did speak English. We were finally able to break down that barrier and create a rapport. She started learning things after that, as she was kind of using it as an excuse not to do anything in class. Once we finally were able to break it down and understand the barriers that she was having difficulties with, she was able to actually start learning.

Teacher G: Seeing them successful in what they're trying to achieve. If they can make a spreadsheet or make a poster or make a birthday card or anything like that.

Teacher H: One time, I taught this boy. We went to a dual-language campus where it was slowly introducing them to English throughout the years. This boy was caught in a gap between English and Spanish. He wasn't literate in either one of them. I was a fifth-grade teacher at the time. He came away able to comprehend what he was reading, and he was able to pass because we did so much vocabulary with him. I had to point at words. He'd have to read it to me, and we did a lot of exercises with pronouns, so we'd circle the pronoun and write down the name of the person who is about different things like that. He really learned a lot just from individualized instruction with him. He was in a group by himself that he was more literate in English that year than he had been any other time.

Teacher I: Those students going from second-grade level up to seventh-grade level. I started looking at where they started and where they end up, which is good. A lot of them were successful that following year in algebra, so I gave them essential skills that they need to be successful.

Teacher J: My biggest successes are those kids end up being my highest scoring kids when it comes to STAAR. I'm thinking of one specifically that I have this six weeks, and he's outscoring every student I have every single test. So, there's got to be something to that.

Teacher D commented on how a student's success may not be simply learning and demonstrating mastery in content but rather achievement in language abilities.

Teacher D: Just to see them advance even in one year's time in their ability, even if it's just conversation English and not necessarily content. It's really great just to see them

> progress. I don't really get to see many of the kids after they leave my class. I don't really keep up with them, I don't see the outcome, or you know how they do in high school or what were they go after. But you know just watching them at least through a year of progress, is really awesome.

Two teachers, during their interviews, stated a negative side to achievement in terms of getting students to the point of success or mastery.

> Teacher B: There have been challenges such as getting them to master to advanced high. And as far as TELPAS goes, you always want your students to write more and be more successful when it comes to like complete sentences.
>
> Teacher I: The challenge I experienced is getting through the amount of content that we have to. Sometimes you have to limit what you get through to make sure that the key is to get the essential stuff they will need for Algebra I and Geometry.

Theme 7: Lack of Adequate Training

The first section of the interviews culminated with participants' descriptions of challenges within their implementation of sheltered instruction. The participants' responses revealed that teachers perceive an overall lack of adequate training in implementing sheltered instruction in their STEM-based content area. Lack of adequate training permeated throughout the interviews and occurred again when asking participants about relevant professional development. While the discussion between implementation and professional development intertwines throughout the following excerpts, participants primarily described their overall lack of adequate training. Respondents described a lack of training opportunities leaving the perceptions of no help and no direction once inside the classroom. Moreover, the lack of adequate training also generated perceptions of lacking priority or focus for ELL education.

Teachers A, C, E, G, H, and J described their experience with the professional development framework associated with sheltered instruction on the Anytown Middle School campus.

> Teacher A: We use to get a lot more training than we have in the last few years, and there was more support than there has been recently.
>
> Teacher C: I didn't even know what it was or what it should look like. They (students) were just completely on their own, and I did not know what to do with that and how to be successful there, especially teaching a new content area that was science.
>
> Teacher E: They tell us two things, here do it this way, read this book and figure out how to do this. We don't actually have good modeling. Until you get the modeling, you can't use it correctly unless you see the model. I'm just reading how to do it, and after seeing it being done, they are two different things. So, the challenge I had was, I was kind of thrown in and them saying, okay, now you've got ELLs. Here, this is what you're going to do without any kind of modeling. When I was reading it, I thought I was already doing that. You see a model correctly, then you're like, oh, wow, that's what I was supposed to do. So, I just didn't know how to implement it until it was modeled.
>
> Teacher G: Well, because being an elective, we don't have anybody that comes in with us to help you know where the ELLs have ESL aids in the core content. I think that's really important.
>
> Teacher H: So, it's kind of hard when you're thrown in that situation with no training.
>
> Teacher J: Well, to be honest, I don't feel like they prepare us very well at all for it. Things change rapidly, and all of them are not the same in terms of the ELLs, especially the ones that I struggle with are the ones that leave the country for a while. Then they

> come back. The ones who stay here consistently seem to be able to move out of the program very well, but the others keep lagging behind, and I don't know how to fix that.

Teacher F described their lack of adequate training concerning other subpopulations of students who receive more focus and support. In short, the participant perceived that the campus overly focuses on other student populations such as special education and Section 504 students compared to ELLs.

> Teacher F: But it's because we don't have this focus on it. We do have our focus on 504s and SPED; like the beginning of the year, you need to know who your 504s are or know the accommodations you should be giving them. I should also know who my ELLs are. While it should be a teacher and responsibility, it's really kind of hard to think about those students at the beginning of the year when your focus is on other populations. We're focusing on 504s, and we're focusing on our SPED students. We're focusing on this special pop kid. ELLs aren't a conversation topic at the beginning of the year.

Administrator A voiced a lack of adequate training that affected their comfort level in addressing ELL education and served as an overall challenge with implementation.

> Administrator A: I'm uncomfortable because of the lack of support and training that I think our teachers have received. I feel okay doing it just because of my content knowledge, but it's not something I have addressed campus-wide because of the lack of support that I have. I think in order for ELL instruction to happen, it's got to be a district push. It should be something coming from way above me just because of our ELL numbers and the need of our kids here on campus.

Administrator A expanded the discussion to include the lack of adequate training for new teachers.

> Administrator A: So, when I'm a brand-new teacher, and I think we have like 16 DOI (District of Innovation) or year one teachers this year when I'm a brand-new teacher out of college or receive no training, and I don't even know what I don't know about ELL, just because they speak Spanish doesn't mean they're necessarily ELL or doesn't mean they're not. And I don't think they even know qualifications for ELL. They definitely don't know the tools and support services for ELL. They don't know differentiated instruction period but much less for a specific Sub Pop of kid. I know this kid is SPED, or I know this kid is ELL. Now what? They still don't receive support or PD.

Perceptions of Sheltered Instruction Professional Development

The second section of the teacher and administrator interviews focused on obtaining their perceptions of professional development associated with sheltered instruction. The interviewees described the types of professional development received, if the professional development adequately prepared teachers for implementing sheltered instruction, effective and ineffective characteristics of training, and what aspects of the system required change. Thematic analysis generated five dominant themes, including (a) lack of professional support, (b) resources and strategies, (c) collaboration, (d) relevance, and (e) structure. Theme 2 included a subtheme of modeling strategies, and theme 5 encompassed three subthemes: more professional development, more collaboration, and teaming. Table 2 encompasses an overview of the dominant and subthemes related to the professional development of sheltered instruction and ELL education on the Anytown Middle School campus.

Table 2

Themes Identified in the Professional Development of Sheltered Instruction

Themes	Summary

Theme 1: Lack of Professional Support	• No opportunity • No resources • No continuation • New teachers are vulnerable
Theme 2: Resources and Strategies	• Need for classroom resources • Teachers desire strategies • Subtheme 2.1: Modeling
Theme 3: Collaboration	• Working with other teachers • Need for experienced teachers
Theme 4: Relevance	• Actions, not theory • Lecture-based not effective • Presentation
Theme 5: Structure	• More qualified personnel • Shift in focus/priority • Subtheme 5.1: More PD, • Subtheme 5.2: Collaboration, and • Subtheme 5.3: Teaming

Theme 1: Lack of Professional Support

As part of the interview, I asked teachers and administrators to describe professional development received at any time related to sheltered instruction and the education of ELLs. Several teachers noted a lack of professional support in the dimension of professional development. Respondents described few professional development opportunities, no continuation of training, and a lack of relevant resources. Participants of the interviews stated specific concerns for new teachers to the profession and the professional development opportunities. Administrators shared the same concerns. Interestingly, teachers appeared to look toward campus leadership to relieve these challenges, while administrators looked towards district-level administrators. Teachers C, D, F, H, and J described a lack of professional development opportunities and unmemorable, noninteractive training.

Teacher C: If I have, it wasn't memorable, or if it wasn't formal.

Teacher D: I know at this point in time it's been years since I've been to an ELL trading of any type.

Teacher F: I think the only thing that I've ever gotten, honestly, is something that I signed up for, and it was a PD that the district had offered. We could sign up if we wanted to. I just felt like it was best practices, different activities, and things you can do with vocabulary terms. I felt like I struggled in that area.

Teacher H: The first time was more from the bilingual department. They'd show you the PowerPoint, they explain it, and you'd move on, no interaction.

Teacher J: Well, we don't really have any (professional development). We just have what's on the computer. We don't get any assistance on that. We're just told to read them. I just think maybe we should have a little bit more guidance in those areas.

Administrators A and B also perceived a lack of professional support in sheltered instruction.

Administrator A: None that's come to me. I have reached out to the English Language Arts Department asking for assistance with newcomer kids and how it works within Anytown ISD or TELPAS and how that works within Anytown ISD, but nothing. Not only have I not received it, but I don't even know where to get it. So, it's not even an option, as far as I'm aware of, to even get help associated with that population. We led a few trainings last year we've led a few trainings this year, but three to four hours doesn't cover sheltered instruction and how that looks within an ELL classroom.

Administrator B: I think most of the time they say here's your ELAR TEKS and here's your SLAR TEKS, they put them side by side, and then they say here's your ELPS. And

then, they expect teachers and administration to understand how to tie those together into making a lesson plan or build great objectives.

Moreover, several teachers disclosed that the only professional development received originated from their teacher certification courses.

Teacher G: I did a couple of classes at UTPB that was instructional.

Teacher I: That was during my training whenever I was actually getting my certification. Besides that, I really hadn't received any additional training.

Teacher J: At one time, I did my own ESL certification and that type of stuff through UTPB, but then nothing ever continued from that.

During the interview section specifically focused on professional development, I asked participants if they perceived professional development as adequate in preparing teachers to deliver sheltered instruction. Teachers B, D, and F commented on the inadequacy of current professional development.

Teacher B: No, I think there's always room for more. More support, more professional development.

Teacher D: I don't know that any one single training, even if it's a great training, teaches you or prepares you for all the things you need to be able to do.

Teacher F: It is as important as some of these other PDs that we're doing. There's been no opportunity. There was that one was out there if we wanted to sign up for it. But not anything that was required. It was just if you're interested in doing it. I don't feel like I've ever been pushed to do any type of PD for my ELLs at my current district.

During the interview, two teachers noted a specific concern for new teachers on campus and the lack of support for professional development in sheltered instruction.

Teacher A: The newer teachers aren't getting what we got.

Teacher G: Some in the past that I used to get, yes, but now we don't do any professional development, so yeah, it helped me, but I don't think it would help the new teachers coming in. I think they need more help with that.

Administrator A stated a lack of support and resources from central office, while Administrator B suggested a lack of depth in the professional development.

Administrator A: We don't have a master teacher, any of that associated with ELLs here on campus. I know we have an ELL department for the district… I think just lack of outside support, getting our teachers those tools

Administrator B: It's been more on lesson planning.

Theme 2: Resources and Strategies

While many teachers and administrators expressed an overall perception of receiving little support from leadership through professional development in sheltered instruction, several participants shared instances where professional development opportunities proved helpful. Analysis of the dialogue generated a core theme of resources and strategies. Participants appreciated tangible resources such as posters, manipulatives, and books, along with strategies applicable to their content and classroom dynamic. Relatedly, participants benefited from seeing resources and strategies in action during professional development, thus generating a subtheme of modeling. The participants' responses form parameters of what effective professional development should provide, specifically in terms of ELL-based education. The following participants described specific resources and strategies gained from professional development perceived as useful.

Teacher A: I don't remember what it was called that I went to, but we talked about sentence stems, and it's just little things like that really made such a good, a big impact, like a poster I have in my room that said if I don't know how to get more information to make them speak… ways just to get them to interact, which then gave them confidence. It was Seidlitz PD; they were very helpful.

Teacher B: I think one of the professional developments that I went regarding how you can incorporate English because they had the same meaning in Spanish, and we were focusing on the prefix, and the root words and, and the Latin word for you can relate it to English that's one of the ones that really helped me.

Teacher E: I sit through where somebody was telling me how to do it. But the only time it actually helped was when I had someone modeling it to me in a classroom setting during (a conference). They were showing us how to use it, not just this is what you do it. And this is how you this is what you do. This is how you use it. Now let us show you. So, I've seen all three, the book, the lecture, and the actual implementation, and it didn't hit until the implementation.

Teacher F: It was best practices, different activities, and things you can do with vocabulary terms. And because I felt like I struggled in that area, I'm not a word wall kind of gal. I tried many a year, you know, put up the word wall. And it does not work for me because I'm just not the one that's going to keep up with that. So, I wanted some other strategies to be able to introduce and use vocabulary terms, especially in science, because we have so many new ones. So, I signed up for this one thing, and it had a lot of different activities that we can do and best practices. So, it was specifically catered to

ELLs. But once I got into the class, I did see that I could use it across the board for all the students.

Teacher H: And then the other two times that we had it. It was the people who had it from the PowerPoint, were presenting different aspects of the book. And so, everybody had their own book. And we'd go over different strategies and show them exactly how to do it like I was saying before the train with the music going to stop and let me talk. They showed how to write closed sentences, so it's more interactive when the people who are trained at Central Office train the staff that they were working with.

Teacher D: I've been through the sheltered instruction, but it wasn't called shelter instruction. I've been through Lead 4ward, which has an ESL component in there, and there's another one that's pretty old. I went to it a long time ago, where we got those flip charts and how to write your learning objective for ELL learners, and learning how to include the writing, speaking, listening, and stuff in every lesson or as many lessons as possible.

Question 3 in the professional development section of the interview required participants to describe characteristics of effective professional development in sheltered instruction. Respondents consistently described effective professional development as having access to resources and strategies in various ways.

Teacher A: Receiving them (resources) because I still have those books and go back and look at what I bookmarked and things that worked.

Teacher C: I think it was professional development provided by the campus, presented by someone who knows what they're doing, where you're actually setting practical steps for how to implement it in a classroom that's not overwhelming and not necessarily, adding

extra work to you, just like there are three things you need to do that you should probably already be doing in general, but just kind of building on top of that.

Teacher I: something just helping with the students getting the basic language for math.

Administrator A also suggested that access to resources and strategies remained a powerful component to sheltered instruction professional development.

Administrator A: I think something that's actionable and doesn't tell me all the theory and background and frameworks behind it but tell me. Here's the gaps that you could see in ELLs. And then I think just leaving with something that teachers can actually do. And here are some tools that you could do in the classroom that would be helpful, and if you teach science, here's a few things if you teach math, here's a few things.

Administrator B suggested resources that aid in observing and monitoring teacher preparation for STEM-based instruction.

Administrator B: I think I'd rather have a PD that does vertical teaming, like how to run a meeting with vertical teaming. Of course, you know, there's your PLC. That's always nice. What to look for when going through lesson plans, what to look for in the activity. Good objectives for the week, not just for the whole year, not the Year-at-a-glance (YAG). A good agenda that sets up myself and teachers and what to look through for my walkthrough and things like that.

Subtheme 2.1: Modeling. Many of the respondents' answers included visualizations and interacting with the resources and strategies offered during the professional development. I identified this as the subtheme of modeling. When respondents answered the interview question regarding effective professional development, four teachers responded with similar ideas within the modeling subtheme.

Teacher A: I prefer going through the actual strategies. Maybe just like seeing it modeled, like getting to sit in a classroom. That would be really, really beneficial to sit in the classroom with someone who does it well, who knows what they're doing, and just getting to observe it.

Teacher C: Just like seeing it modeled, like getting to sit in a classroom. It would be really beneficial to sit in the classroom with someone who does it well, knows what they're doing, and just gets to observe it.

Teacher D: I think what makes PDs most effective is when you're able to interact with the information when you're able to visually see how you could actually implement that into your classroom.

Teacher E: Once I learned to use sheltered instruction, it was positive. I didn't have very much background, and so I was trying to implement it on my own. I wasn't very successful until I actually got some more training on it by somebody who used it in the classroom. Because a lot of times, the training we receive in the school district I work in is somebody talking about it, that's never actually used it. Until I actually talked to somebody who had to use it in a classroom setting. I couldn't be successful until I had that background from that person.

Teacher J: I don't know, maybe even just some sitting and looking at various examples. Not just giving me the ELPS in written form but show me something that represents that. They do to a degree when you're looking at that TELPAS site, they show you some sample writings, but they'll show you one, and here's one set that looks like intermediate or here's one set.

> Teacher H: So, you're teaching the teachers, and they're looking at you because we're modeling what we're teaching.

Teacher E provided a specific instance where a strategy was modeled.

> Teacher E: I think it used to be called "Behind the Mirror," where you get to watch a classroom being taught using sheltered instruction, where students or colleagues, co-workers could watch it being done correctly, not just reading the book or being talked to about it, getting to actually see it with real students with real challenges in a real classroom study groups really shows the steps

Theme 3: Collaboration

As respondents answered questions related to the characteristics of effective professional development, another core theme emerged: collaboration. Teachers desire to work with other teachers to plan and implement approaches to sheltered instruction in STEM. On the Anytown campus, collaboration primarily takes the form of PLCs and professional development opportunities. The interview responses appeared more focused on team-based collaboration as opposed to content-based or campus-based opportunities. The importance of the theme exists within providing ELL-inclusive teachers opportunities to plan and share knowledge specific to ELL education alongside experienced teachers. Teachers D, H, and J discussed their desire to work collaboratively with other teachers.

> Teacher D: When you get to work with other teachers and things like that, I think that interactive PD is most effective, so a non-interactive PD would be the most ineffective.
>
> Teacher H: You'd read, and you discuss, but it was all hands-on. Most of it was hands-on. And you were teaching the audience how you're supposed to be teaching a sheltered instruction classroom.

> Teacher J: And I feel like we should do more coming together collaborating, as maybe a district, so that we're all in his district on the same page, maybe.

Similarly, collaboration appeared when respondents answered the question describing ineffective sheltered instruction professional development.

> Teacher C: You're not necessarily doing it with your team or with your campus so that you can get all kinds of walk into the next year, with like a vision and a goal. And you're not really doing that with the team, like on our campus. We have an ELL team. It'd be nice to do that underneath them so that we can understand like they know their students that I'm teaching and know what goals we need to set for our campus in general.
>
> Teacher J: So, we never come together. I don't even know who the people are that are in the ELL department, and they never come. They might come to the ESL teacher, so to speak, and I know when we had (name redacted) here. She was with us all the time she spoke to us. She said, "Hey, what's going on with this kid" she came in and asked, 'What can I do to help you with this kid,' and I don't feel like nobody's really tracking those kids right now.

Theme 4: Relevance

As teachers described characteristics of effective and ineffective sheltered instruction professional development, another theme emerged: relevance. Teachers and administrators echoed sentiments of relevancy in terms of usability in classrooms and the presentation of the information provided through professional development. Again, the respondents provided information contributing to a framework for professional development on the Anytown campus. The theme of relevance coincided with the theme of resources and strategies in developing the framework discussed in the next chapter. Within the theme of relevance, participants described

the need for actionable approaches rather than theory. Moreover, interviewees preferred interactive presentations by experienced educators rather than one-way lectures. The following teachers emphasized the importance of relevancy and usefulness of resources for classroom instruction.

> Teacher F: If I'm sitting through a PD that I don't find relevant for my students, it's just in one ear and out the other. We sit through PD all the time, it's not always with ELL, but whenever I don't feel like I can implement it into my classroom, it makes it ineffective because I'm not going to listen anymore.
>
> Teacher B: Repetition. Things that you already know. I think it doesn't hurt to hear more than once, but we already know that the information
>
> Teacher D: I think any PD, no matter what it is, is ineffective if all the person does is talk at you or read a PowerPoint to you. You know I can read a PowerPoint if that's all it is.

Teachers E, H, and C suggested that the experience level of the presenter affected the relevancy of the information presented.

> Teacher E: I remember the lady who spoke to us. She had many second- and third-year monitors. Well, then, my kids were newcomers. And it's completely different how you would approach a newcomer as a one or 2-year monitor.
>
> Teacher H: When it's led by an administrator, they don't know what's going on in your classroom. Most administrators don't. They've been out of the classroom for so long and then trying to just regurgitate what they think they heard at their own PD. It's like that a lot. For a lot of things, they'd send like the administrator and come back and teach it well. They don't know what's important. It's all dependent upon what they thought was

important from the training. So, comes better from a teacher who knows what it's like day in and day out

Teacher C: I feel like I've been in professional development, led by people who don't even know what they're presenting, to begin with, like they're not experts on it. That's frustrating. It seems like a waste of time.

Administrators A and B insisted that professional development's relevancy existed within the on-campus usability of the presented material.

Administrator A: Do not tell me all the theory and background and frameworks behind it

Administrator B: Just telling me the definition of a PLC, like I got that. I'm good with that. I need the guts.

Theme 5: Structure

As a concluding question, I asked participants about their ideas and suggestions for change in both the realm of professional development and how the campus addressed sheltered instruction and ELL education overall. The concept of structure emerged as the dominant theme. As a product of this line of questioning, participants were provided the opportunity to summarize and emphasize their perceptions of the primary areas requiring change or improvement. The structure of ELL-based education encompassed professional development, teacher-administrator interactions through collaboration, and teaming, which served as subthemes.

Subtheme 5.1: More Professional Development. As part of the overall theme of structure, participants described their need for change in the number of opportunities for professional development. The sentiments of the theme echoed the core ideas within previous themes and emphasized the importance to the participants. Additionally, the responses of the participants reflected some of the challenges faced by the campus. Specifically, Anytown Middle

School hosts the Newcomer Academy enrolling first-year ELLs to public schools in the United States impacted demographics. Lastly, the campus faces challenges in hiring and often exhibits a relatively high number of new teachers. In sum, the participants described their need for more opportunities for professional development in the context of campus challenges. Teachers D, E, G, and J and Administrator A desired more professional development. They described certain expectations such as year-long continuation and support.

> Teacher D: As teachers leave or we change teacher positions and stuff. People who maybe have not been trained in any type of ELL professional development stuff. We need to actually get them into that kind of training. I think from there, not necessarily that we have to farm out all of our PDs, but we definitely need to maybe set up some PDs periodically during the year where either someone from downtown or even some of our own teachers who do so well with their ELL students run a PD and maybe just talk about some different strategies that you can use in your classroom. You know, like Word walls or things like that really are effective for those students.
>
> Teacher E: Bring in somebody who's actually showed success at it, not just the author that's written about it, and someone who's shown success in the district similar to ours, to talk to us about it and then to have a reoccurring visit, where they come back and assist throughout the year so that we can bounce our challenges and, and ideas off of them, not just one and done at the beginning of the year.
>
> Teacher G: There needs to be more of it, especially because we are the campus with all the ELLs and the newcomers. I think it should be something that we hit on every year to tell you the truth. I don't know exactly what.

> Teacher J: I just don't feel trained enough to move them, and they're not ready to move, but we're expected to move them. They're on intermediate, for example, but they want us to move them to advance, but they've been out of the country now for a month time, and they come back, and they're not ready to move.
>
> Administrator A: We need professional development, number one. I think it needs to be cyclical throughout the school year…I think it needs to be tiered towards teachers and their experience. If I'm in brand new teacher, I'm going to know nothing. If I'm a veteran teacher and I've worked with these kids for a while, I could benefit from x y & z.

Subtheme 5.2: More Collaboration. As part of the theme addressing structure, teachers responded to questions concerning campus-wide change. The subtheme of collaboration emerged as participants shared their need for enhanced communication and shared lesson planning. Moreover, collaboration included working with peers in sharing strategies and knowledge. Teacher and administrator collaboration typically exists through PLCs and professional development. Interestingly, one teacher mentioned the effect of COVID-19 on collaboration. While staff on campus still had opportunities to meet and plan, COVID-19 created an environment where interaction occurred online through conferencing software. While no other participant mentioned the effect of COVID-19 on planning or collaborating, the effect must be taken into account. However, the perceptions shared during the interviews appear separate from COVID-19 restrictions. Therefore, the interviewees' perceptions regarding collaboration accompany the assumption that future school years should present more favorable conditions for face-to-face collaboration. Teachers A, B, C, D, F, I, and Administrator B discussed the need for more collaboration campus and district-wide.

Teacher A: I don't think it needs to be limited to the EL teachers think it needs to be open to anybody because they're just good strategies anyway.

Teacher B: I would like to see more communication between all the teachers. This year, because of COVID and everything, we haven't had meetings, like faculty meetings, to be on the same page. Yeah, they sent out on email, then we have conferences via zoom. Still, it's not the same as far as everybody being at the same time and coming up with ideas on how to successfully plan a lesson or. Just being in the meeting all together with all the teachers, getting advice from other teachers.

Teacher C: I think having more communication between those teachers who are like that is their primary responsibility, knowing what goals they want to set for those specific students, and what I can do to add and contribute to that.

Teacher D: I don't think it would hurt if everybody, even if you're not necessarily on the ELL team or maybe necessarily an ESL teacher, or have kids in your class, may need to go through the training just so we can have a good understanding of how we can support to other teachers that have those students, or just support the student body as a whole, or even maybe how we can help and support our newcomer program and things like that.

Teacher F: The priority of it would need to change. Seeing it from a perspective of like going from up-down, instead of going from down up, you know, these teachers that are ELL teachers are trying to push and come in and try and tell us things that we could potentially do for our students when it should be coming from higher up and putting importance on that so that I can understand, oh, that is really important for these students. Because all these years, it hasn't been a priority.

> Teacher I: A lot of training can actually happen with them, teacher to teacher as in master teachers or whatever they call them. But for those teachers to actually take some of the teachers under their wing and show them how to chunk their information and break it down. You know, so, you would be talking about more experienced teachers leading professional development leading like PLC is when it comes to sheltered instruction and ELLs.
>
> Administrator B: I think we need to work together—a good beginning of the year PD. I think we need qualified teachers—support from other departments that support our ELLs. Yes, we have academic directors, and we also have bilingual directors and coaches. I think we need their support.

Subtheme 5.3: Teaming. Another theme emerged when discussing the overall change needed at the campus level in sheltered instruction in the ELL-inclusive STEM classroom. While related to the overall structure, a subtheme of teaming developed. Teaming is best described as the organizational structure dictating how subpopulations, including ELLs, move through the school day as a single cohort. The Anytown Middle School campus groups ELLs in a way where students frequently share the same teachers and class periods. ELAR teachers of the ELL cohort hold an ESL Supplemental certification. However, STEM teachers of the ELL cohort often do not. PLCs meet based on team. Logically, teachers of the ELL cohort function within the same PLC and are primarily tasked with the management of ELLs. The subtheme of teaming included sentiments of tracking and monitoring and the inclusion of ELLs in STEM-based courses.

> Teacher E: With our ELL programs, it's all or none where they all have to go to certain classes together as if they're all the same. They're treated all on the same level. I know they're trying to not differentiate between them because you don't want to segregate

them or separate them, but that's not effective. You need to separate, and we have some high advanced kids that are in with beginners. That doesn't help because you can't enrich the high advanced and remediate the lower kids. It's just like you do in regular instruction. So, they have them all lumped together and put into one situation, so there needs to be better classification, better differentiation, of what their needs are, not just they're ELLs. They need to be inclusive. But I also think in other classes, some of the STEM classes, they need to be proficient to be in the higher classes, just like everyone else. Don't lump them all together, thinking they're inefficient when it could be a language issue.

Teacher F: I think maybe pick a content where they're immersed throughout all of the classes. They may not choose all of them. It makes it a lot easier when they all are together as a teacher to know how to just teach practices for them. But maybe just choose a core content class where they are immersed in other classes. I think probably for the big picture, I feel like my campus does do a good job in that it…it's hard to use the word segregate, but segregates them separately, but to be able to pull them out and move them into other classes that they can be in. Being immersed into the language would be a little bit better for them, rather than always putting them in a separate group, like it helps to be in a class with all of these ELLs. It's also difficult because they're talking to each other in Spanish, and they're not getting it from anywhere else. So, they're in their comfort zone, growth happens outside of the comfort zone, it's not going to happen when they're all around one another and, you know, enabling each other to use the language or not use English as their language.

> Teacher G: I think if they were more split up and you would be able to more focus on a smaller group at a time. You could pair them up with somebody because we used to have them mixed in. I could pair them up with a Spanish speaker to help, but now they're all ESL together, so you're running out of options with anybody to help translate or help you. They travel in packs. They go from class to class, and then they get comfortable with each other. And this year, they're just kind of out of control.
>
> Teacher J: We come together as a team. Still, not all of us share those ESL kids, and that's the problem. We're not really true teamed in order to have those discussions about those kids. So, I realize that scheduling is a nightmare in terms of getting us all together, but we have to get those kids in a consistent place where the teachers can come together to talk about them.

Administrator A also discussed the aspects of teaming during the interview when asked about their perceptions on overall needed change.

> Administrator A: It was just how Anytown kids were grouped according to the master schedule, and there are lots of pros to it. Pro number one is you have a certain sub pop of kids that you can receive PD on and become a master in and close those gaps with ELLs or with sped or with GT/Pre-AP. But when we're not receiving PD or services to close those gaps, we just have our kids grouped together, but that doesn't mean teachers' instruction is changing because of the grouping and label of kids.

Teacher J and Administrator A described their experience with the tracking and monitoring aspect of the team-based ELL cohort.

> Teacher J: We need to be tracking them way better across the campus than we are. I think the rest of that would work itself out if we were tracking, but I just feel like we're losing

a lot of them right now because we're not tracking as deeply as we should in every content.

Administrator A: I think just someone we can ask when we do have a question like, "Hey, this kid just enrolled. We have no history or folder on this kid." How should we move forward with working with this kid and the best way possible? When teachers have 120 kids they're working with, they always don't have time to get to know one kid. I think having a centralized brain or wheelhouse of ELL tools and support and PD and here's how you ask questions too, and if we don't know, we're going to come over and find out for you, or with you. I think that would be helpful. You don't know what you don't know. So I think our teachers A need to have a realization of this is how many ELLs we have, and this is their experiences, and this is their language scoring, and their listening scoring so when you're talking, they're hearing and understanding 20% or 15% of what you're saying I think almost a reality check with data, number one, and so I think some kind of, kind of PD or support about, here's what you do for beginners here's ideas for writing here's ideas for balanced literacy and some kind of coaching for the teachers.

Administrator B suggested that enacting change begins with listening to teachers' concerns and identifying the needs of ELL students.

Administrator B: I think we need to listen to the teachers, and we need to see what they need, especially our kids. Kids change every year, like their needs.

Lesson Plan Analysis for ELPS

Research question 3 was designed to gain insight into how teachers address the ELPS in submitted lesson plans. STEM teachers posted lesson plans for the 2019–2020 school year to an online software system called Eduphoria. Lesson plans were filtered by year of submission and

filtered by the teacher to only include STEM courses. Eduphoria generated all submitted lesson plans in PDF format. I reviewed the compilation of all lesson plans and omitted blank plans from the analysis. In total, I analyzed 894 submitted lesson plans and attached a code to every identified language objective or student activity.

Each code correlated to domains of the ELPS:

- Reading (R),
- Writing (W),
- Listening (L), and
- Speaking (S).

In many instances, the language objective or activity consisted of multiple ELPS domains. For example, a student activity could consist of listening and writing, thus receiving the code "L/W." Numerous language objectives or student activities proved difficult to categorize in the ELPS domain. In such instances, the objective or activity received the code "U" for unknown/unspecified. Table 3 presents the codes used in the document analysis with a sample language objective or student activity from the analyzed lesson plans.

Table 3

Code With Example of Language Objective of Student Activity

Code	Example Objective or Activity
U	I can list Newton's three laws of motion and give a short description.
R	I can read graphs to identify patterns of data.
R/W	I will understand the topics that will be covered in the Astronomy unit by completing the concept map.
R/W/L	I can understand the difference between codominance and incomplete dominance by completing a foldable.
R/W/L/S	Students can identify structures of the integumentary, skeletal, and muscular systems and describe how they work together by dissecting a chicken.
R/L/S	Students can describe and discuss the structure and function of the nervous system.
R/L	Teacher will explain the vocabulary activity and emphasize the importance of using, referring to, and completing the sketches for each vocabulary word.
L/S	Students can discuss examples of stimuli and response and how those help maintain homeostasis in the body (Tap and Talk)
L	Watch TedEd video of Cell Theory
R/S	I can present and explain my science fair project
W	Students will write down one thing that I should know about them
L/W	Students will observe teacher demo of bottle activity and record their observations

Lastly, it is important to note that actual instruction within the classroom consists of some level of all domains within the ELPS. In other words, it is expected that every delivered lesson contains a level of reading, writing, listening, and speaking. During instruction, teachers give directions, students listen, write notes, and read from presentations or workbooks that may not appear in posted lesson plans. Therefore, strictly assigning relevant domains to each listed language objective or student activity served as the primary task of the analysis. In total, 889 individual activities received codes. The results of the analysis appear in Table 4.

Table 4

English Language Proficiency Domains in STEM Lesson Plans

Domain	Code	Count
Unknown/Unspecified	U	240
Reading	R	216
Reading and Writing	R/W	134
Reading, Writing, and Listening	R/W/L	81
Reading, Writing, Listening, and Speaking	R/W/L/S	66
Reading, Listening, and Speaking	R/L/S	52
Reading and Listening	R/L	46
Listening and Speaking	L/S	25
Listening	L	18
Reading and Speaking	R/S	5
Writing	W	4
Listening and Writing	L/W	2
Total		889

Table 4 provides a numerical visualization of how teachers address ELPS domains within their lesson plans. From this data, several observations emerged. Primarily, teachers included objectives and student activities with no clear ELPS addressed (f = 240). Unknown or unspecified objectives and activities present a potential problem for teachers and administrators, as discussed in the next chapter.

When teachers addressed the ELPS within their objectives and activities, reading and reading alone occurred most often (f = 216). Objectives and student activities that received a code of "R" most often reflected students reading passages, clicking an answer on computer-based applications, and completing multiple-choice assessments. Objectives and activities coded "R" limit students from interacting with peers or otherwise practicing the other ELPS domains.

Activities coded "R/W" occurred third most frequently and second-most when an ELPS was addressed (f = 134). Activities coded "R/W" most often represented activities of which the students read passages and wrote summaries or explanations, completed guided notes from other sources, created foldables, produced postlab write-ups, or completed worksheets. The next most frequent code added was the domain of listening (L). Activities coded "R/W/L" most often symbolized note-taking from a presentation (PowerPoint or Google slides) or note-taking from a video. While addressing a third ELPS domain appeared more student-centered and engaging, the addition reflected teacher-centered instruction or lecture-based delivery.

The final primary observation from the lesson plan analysis existed within the objectives and activities coded "R/W/L/S" or activities that addressed all four ELPS domains of reading, writing, listening, and speaking. These objectives or activities reflected labs and included relatively simple activities that added collaborative groups. For example, a worksheet with math problems added a partner check, peer tutoring, or a "tap and talk" aspect. Unfortunately,

language objectives or student activities coded for all four domains represented less than a tenth of the total lesson plan activities analyzed.

Summary

In this chapter, I presented the results of a qualitative case study that examined the perceptions of STEM teachers and administrators regarding sheltered instruction, relevant professional development, and how teachers addressed the ELPS in lesson plans. The case study primarily relied on online, semistructured interviews of ten STEM teachers of ELL-inclusive classrooms and two administrators from Anytown Middle School. Teachers answered questions that assessed: (a) their comfort level with implementing sheltered instruction in their classroom, (b) the impact of sheltered instruction on their approach to ELL students, (c) their feelings toward sheltered instruction overall, (d) whether sheltered instruction implementation was a positive or negative experience, and (e) their successes and challenges related to teaching ELL students. Administrator interviews included questions about implementing sheltered instruction in STEM-based courses on their campus and whether sheltered instruction has changed any aspect of their approach to leadership. Additionally, both teachers and administrators answered questions regarding professional development associated with ELL education and their insights into changes needed within the system.

Several rounds of coding interview transcripts and thematic analysis produced seven dominant themes related to the instructional implementation of sheltered instruction in the STEM classroom: (a) experience with ELLs, (b) positive relationships, (c) good teaching, (d) language barriers, (e) instructional focus, (f) achievement, and (g) lack of adequate training. The second part of the interviews gathered teachers' and administrators' thoughts on professional development associated with sheltered instruction. Qualitative analysis of interview transcripts

generated five themes: (a) lack of professional support, and (b) resources and strategies, (c) collaboration, (d) relevance, and (e) structure. The theme of instructional focus consisted of two subthemes: (a) content and vocabulary, and (b) interaction. The theme of resources and strategies incorporated one subtheme: modeling. The theme of structure included three subthemes: (a) more professional development, (b) more collaboration, and (c) teaming.

Document analysis of submitted lesson plans consisted of coding each language objective or student activity with letters corresponding to a dimension of the ELPS (i.e., reading, writing, listening, and speaking). The purpose of the analysis was to identify how teachers addressed the ELPS within lesson plans. Table 3 presented an example of a language objective or activity with its corresponding code. Table 4 depicted numerically the number of times each ELPS appeared in posted lesson plans. Out of 889 objectives and activities, 240 were unknown or unspecified. Reading alone was addressed 216 times while reading and writing together were addressed 134 times. Language objectives or student activities that addressed all four ELPS occurred in 66 instances, or less than a tenth of the total entries. Chapter five contains an in-depth discussion on the conclusions, implications, and recommendations relevant to sheltered instruction and the education of ELLs based on the results presented in this chapter.

Chapter 5: Discussion, Conclusion, and Recommendations

The purpose of this qualitative case study was to explore the perceptions held by educators and administrators regarding sheltered instruction of ELL students in the STEM classroom, relevant professional development, and the use of the ELPS within lesson plans. This chapter includes a discussion of findings, limitations of the study, interpretation of the results, and recommendations for change in professional development, lesson planning, and the classroom implementation of sheltered instruction in STEM. Lastly, I discuss recommendations for future research within the field of ELL education and ELL-inclusive STEM courses.

The qualitative case study consisted of semistructured interviews held online via Zoom. The format provided a forum for teachers and administrators to share their perceptions of sheltered instruction implementation and relevant professional development. Ten teachers of ELL-inclusive STEM classrooms and two administrators participated in the interviews. Interviews were transcribed electronically and withstood qualitative coding and thematic analysis. Additionally, document analysis of submitted lesson plans from STEM teachers in the 2019–2020 school year contributed to understanding how STEM teachers address the ELPS in their plans.

The case study faced certain limitations. First, a single campus in west Texas served as the site of study, which limited generalizability. Secondly, as a campus administrator tasked with overseeing ELL education, I served a dual role, thus introducing a level of reactivity and subjectivity in the interpretation of results. Lastly, how teachers formatted lesson plans and content-area expectations for included information served as a limitation. Postanalysis, the results of the study helped answer the following research questions.

RQ1: What are the perceptions of campus leadership and STEM teachers regarding sheltered instruction as an instructional approach?

RQ2: What perceptions do STEM educators and campus leadership hold regarding professional development in sheltered instruction?

RQ3: How do STEM educators address English Language Proficiency Standards through stated language objectives and student activities in lesson plans?

Discussion of Findings in Relation to Past Literature

Semistructured interviews were designed to obtain teachers' and administrators' perceptions of sheltered instruction in STEM in both implementation and professional development. The first section of the interview required participants to describe their perceptions of implementing sheltered instruction in their STEM classroom as an instructional approach, answering the first research question (RQ1). The second section of the interviews required interviewees to describe aspects of professional development in sheltered instruction, thus answering the second research question (RQ2). Lastly, the submitted lesson plans of Anytown Middle School's STEM teachers for the 2019–2020 school year underwent document analysis. The findings of the document analysis of lesson plans were used to answer research question 3 (RQ3). The following is a discussion of the findings in relation to past literature.

RQ1: Perceptions of Sheltered Instruction Implementation

Research question 1 (RQ1) was formulated to gain insight into the perceptions of teachers and administrators of the implementation of sheltered instruction in ELL-inclusive STEM courses. Teachers and administrators discussed their perceptions of implementing sheltered instruction in the STEM classrooms of Anytown Middle School through semistructured interview questions (Appendix B). Thematic analysis of interviews with teachers and

administrators resulted in seven dominant themes: (a) Experience with ELLs, (b) positive relationships, (c) good teaching, (d) language barriers, (e) instructional focus, (f) achievement, and (g) lack of adequate training. The theme of instructional focus included two subthemes: Content and vocabulary and interaction.

Experience With ELLs. When implementing sheltered instruction in the STEM classroom at Anytown Middle School, teachers described how previous experience with ELLs enhanced their comfort level overall. Relatedly, one administrator cited their experience with English and Spanish language TEKS as an influence in addressing sheltered instruction on campus. In short, educators and administrators related their level of comfort in implementing sheltered instruction in the STEM classroom to their exposure to ELL students. Teachers E and G described comfort through their experience in the length of time teaching ELLs. Administrator B discussed experiencing comfort through knowledge of the curriculum. Interestingly, Teachers C, D, and I expressed a higher comfort level in educating ELLs because of their specific STEM content area. The perception coincided with previous research citing a close relationship between the hands-on, interactive nature of STEM and the need for ELLs to interact with the content above a level of reading and writing (Besterman et al., 2018; Hansen-Thomas, 2008; Settlage et al., 2005).

Aside from content knowledge and professional experience with ELLs in the STEM classroom, one teacher described how her school experience as an ELL student enhanced comfortability. Teacher B stated that her personal connection to ELLs provided a level of empathy for students who struggle with learning English alongside content such as STEM. Teacher B's comments echo a foundational aspect of sheltered instruction: understanding cultural background.

Previous experience with ELLs served as a primary indicator of teacher success in the ELL classroom relative to teachers without previous ELL experience (Master et al., 2016). Teacher immersion created a forum for interacting and understanding a student's cultural background, which enhanced a student's interaction and engagement with the content (Echevarría, Vogt, & Short, 2008). Teachers achieve the enhanced engagement when students feel understood and comfortable, thus lowering their affective filter (Krashen, 1985). Based on the results of the interviews, teachers' and administrators' comfort depends on a mix of variables, including comfort with the content, previous exposure to ELL-inclusive classrooms, and the inherent hands-on nature of STEM content. As Teacher B suggested, a positive student-teacher relationship may form a more impactful variable.

Positive Relationships. Despite sharing challenges with implementing sheltered instruction, teachers reported an overall positive experience with the instructional approach in their STEM class. When interviewees were asked what made the experience positive, Teachers B, C, H, and J shared that their positivity originated from the positive relationships built with students. Teacher J described the reciprocity of the relationship in how she learns about their language concurrently while they learn English. Teacher C noted how she has learned about different cultures and gained insight into others' backgrounds. Administrator A pointed out that the level of care for students held by teachers signifies a strong point within the staff. The theme of positive relationships situates within multiple aspects of previous research. For instance, teacher-based actions such as empathy, attitude, persistence, and effort significantly reduce a student's affective filter (Krashen, 1985). Second language acquisition, as Krashen (1982) proposed, hypothesized that students acquiring a second language often construct an affective filter that creates a mental block against new learning. Krashen referred to the new material as

comprehensible input. ELL students often enter with preexisting levels of anxiety and frustration due to their language deficits. Teacher actions aimed at building positive relationships often diminish those emotions (Allison & Rehm, 2011). While the theme of positive relationships satisfies the aspect of the affective filter, the following theme of good teaching situates within the realm of comprehensible input.

Good Teaching. Interestingly, five teachers suggested only a minor, if any, distinction between sheltered instruction and "just good teaching" or best practices that benefit all students, not just ELLs. Teachers discussed how they provide a sheltered approach to all students in their classrooms because all students benefit. However, one administrator argued that sheltered instruction is not happening in the STEM classroom based on observations. The differing perceptions suggest a divergence on what sheltered instruction is and what it should look like from both the view of the teacher and the administrator observer.

At a minimum, sheltered instruction makes content-based knowledge accessible through focused techniques and strategies (Ewing et al., 2019; Lee & Stephens, 2020; Short et al., 2011). Other literature focused on specific aspects of the framework, such as connecting to a student's cultural background, accessing prior knowledge, and utilizing student-centered instruction and collaboration (Markos & Himmel, 2016; Morrison et al., 2020; Short et al., 2011). Administrator A followed up on the original dialogue stated that a lack of comfort inhibited their capital in addressing sheltered instruction through observations. Therefore, a gap between how teachers perceive sheltered instruction compared to administrators becomes apparent.

Lastly, the theme of just "good teaching" comes close to "one-size-fits-all" instruction, as concluded by previous literature exploring ELL education and sheltered instruction (Gonzalez, 2016; Harrington, 2013). If true, a one-size-fits-all instructional model logically and inherently

lacks a level of differentiation, a foundational characteristic of a sheltered instruction approach. Differentiation remains a key ingredient of ELL education and sheltered instruction. However, the misconception that what's good for ELLs is good for non-ELLs persistently remains a core belief of many educators (Hollie, 2019). Anytown Middle School STEM teachers echoed the core belief.

Language Barriers. A language barrier unsurprisingly emerged as a significant theme among the teacher interview participants. Teachers discussed how the language barrier prevented efficient academic and behavioral monitoring and diminished the level of comfort in implementing sheltered instruction. Teachers A, C, D, F, G, and H described the challenges of implementing sheltered instruction along with content-area knowledge while facing students' different language abilities and proficiencies. Teachers A and D specifically cited the difficulty in balancing English-only instruction and allowing students to utilize their native language. However, a specific model of sheltered instruction insisted that instruction should enable students with a low English proficiency level to use their native language when it benefits knowledge acquisition (Prabjandee, 2016). As echoed throughout the teacher interviews, language barriers present a difficult barrier for teachers to overcome. For instance, teachers find difficulty monitoring progress while students with low English proficiency struggle to show mastery, even when content has been mastered (Maarouf, 2019).

The language barrier experienced by the study participants and students in ELL-inclusive classrooms coincides with Krashen's (1985) affective filter hypothesis, the foundational framework for sheltered instruction. Language barriers create feelings of embarrassment, anxiety, and higher sensitivity (Afshari et al., 2019; Allison & Rehm, 2011; Buxton & Caswell, 2020; Lucas et al., 2008). One source of the feelings that are detrimental to language and content

acquisition may be dual role of ELLs in the STEM classroom. ELLs must not only learn a second language but must also learn STEM content concurrently. Additionally, ELL students must do so while also adjusting to the social and environmental aspects of the typical school day. Ultimately, students compare their progress to their non-ELL peers in the inclusive classroom, which often results in feelings of discouragement and anger, raising their affective filter (Carrier, 2005).

Instructional Focus. Ideally, sheltered instruction should impact teachers and administrators in a way that fosters an educational environment designed to lower a student's affective filter. Interviewees answered questions on how sheltered instruction influenced their approach to teaching STEM and what aspects are a top priority when instructing ELL students. Eight of the ten teachers responded with how sheltered instruction impacted their instructional approach, thus generating the theme of instructional focus. Subthemes developed as teachers described what aspects of their teaching approach specifically changed and what they prioritized. The subthemes of content and vocabulary, and interaction emerged. Administrators answered a similar question but focused on how sheltered instruction changed their approach to leadership. Administrators A and B both responded with reflections of being more intentional with instruction and coaching teachers. However, both teachers and administrators shared a sentiment that sheltered instruction carried little impact on their approach to teaching and leadership, respectively. An explanation for their feelings lies in the previous theme of good teaching. In short, "it's just a natural thing for teachers," as stated by Teacher H. The framework of sheltered instruction rests upon specific characteristics. Teachers should provide students an opportunity to practice language with their peers while integrating students' cultural background and previous experiences to bring meaning to vocabulary and content (Echevarría, Vogt, & Short, 2008;

Markos & Himmel, 2016; Short et al., 2012). Previous researchers detailed widespread inconsistency in sheltered instruction implementation ranging from ELL teachers ill-prepared for implementation, overemphasis on specific sheltered approaches, and inconsistencies within content areas offering a sheltered approach (Daniel & Conlin, 2015; Short & Echevarría, 1999). While the subthemes of content and vocabulary and interaction represent positive and effective hallmarks of a sheltered approach in STEM, teachers perceived implementation as a "one or the other" strategy rather than holistically.

Content and Vocabulary. Teachers A, F, G, I, E focused and prioritized content and vocabulary within their STEM class. Teachers A, F suggested that language development served as a secondary product to content attainment. Teacher E commented on the connection between Latin and academic-based STEM vocabulary and provided a method bridging the two to bring meaning to ELL students coinciding with a sheltered instruction framework (Echevarría, Vogt, & Short, 2008; Markos & Himmel, 2016; Short et al., 2012). Teacher D described a verbal conflict with an ESL teacher over priority in the STEM classroom. In short, one valued the content, and the other valued language acquisition. Similar conflicts appeared in previous research. One study described the phenomenon of turfism as a lack of trust between content-area teachers and ELL-only teachers over the correct instructional approaches toward ELL students (Pawan & Greene, 2017). Another research team described similar observations of mistrust and how conflict ultimately hindered meaningful discussions, engagement, and planning within the ELL team (Lee & Buxton, 2013). Administrator A perceived teachers' content knowledge as crucial to effective implementation. Administrator B shared a similar perception of content as a priority but suggested that teachers align TEKS and ELPS more effectively.

Interaction. Four teachers who previously stated that sheltered instruction impacted their instructional focus prioritized student interactions. Participants' responses ranged from students interacting through the hands-on nature of STEM to interacting with peers. Again, peer-to-peer interaction serves as a core aspect of the sheltered instruction framework (Echevarría, Vogt, & Short, 2008; Markos & Himmel, 2016; Short et al., 2012) and Krashen's (1985) input hypothesis. Importantly, peer-to-peer interactions appeal to a student's emotional engagement in STEM by supplying a sense of belonging and comfort toward peers, teachers, and the campus (Fredricks et al., 2004).

Achievement. Logically, achievement emerged as a fundamental theme after analysis of the interview data. In short, teachers experience enjoyment and positivity when students succeed. A majority of the interviews focused on achievement. Still, several teachers commented on other areas of achievement, such as social and relationship-based successes. Based on the data analysis, achievement was the most dominant factor in how successful teachers feel about implementing sheltered instruction and ELL-based education in STEM. The finding is significant as educator attitudes impact overall fidelity (Short et al., 2011). Previous studies indicated a wide range of teacher attitudes toward sheltered instruction from positive to entirely unwelcoming (Reeves, 2006). Practically, the more negatively a teacher felt toward sheltered instruction, the less the implementation and more negativity toward inclusion, workloads, and even ELL students overall (Mellom et al., 2018; Reeves, 2006).

Achievement serves a mutual purpose. When students reach a level of achievement, teachers, for the most part, display positivity toward ELL education in STEM. Reciprocally, enthusiastic teachers enhance student engagement, primarily through sheltered instruction of ELL students (Short et al., 2011). Previous literature supported a distinct connection between

student engagement and achievement. ELL students actively engaged in STEM content are more willing to learn, achieve mastery, show fewer poor behaviors in class, and ultimately show more interest in STEM careers (Havik & Westergård, 2020; Kenny et al., 2006; Lee, 2014). Moreover, achievement impacts postsecondary quality of life through lower dropout and unemployment rates (Chase et al., 2014). The impact of achievement permeates throughout a student's life and is ultimately reflected through the positivity shared by the teachers and administrators of this study, thus demonstrating the importance of the theme.

Lack of Adequate Training. Teachers and administrators perceive an overall lack of adequate training in the implementation of sheltered instruction. Specifically, teachers felt a lack of adequate training with resources such as co-teachers in the STEM classroom and unclear direction or guidance in implementation. They felt "throw in" without adequate training, as Teaches E and H described. An in-depth discussion of support in the realm of professional development occurs later in another section.

Additionally, teachers discussed their perceptions of campus-wide focus and priority of sheltered instruction and ELL education relative to other subpopulations of students such as special education and students under Section 504. Administrator A also relayed their concerns about support but from the district level. Administrator A also voiced a specific concern for teachers who are new to the profession and the lack of training provided by the district, bolstering teachers' perception of being "thrown in."

New teachers face a multitude of challenges upon entering the field of education. Specifically, new teachers often feel a lack of adequate training and support from peers and administrators that, left unchecked, could persist beyond the first year of teaching (Dias-Lacy & Guirguis, 2017). Unsurprisingly, teachers feeling unsupported extends beyond the first year of

teaching, especially in the context of ELL education. Interview participants described their difficulties with differentiating instruction based on English proficiency level and monitoring progress. Similar descriptions appeared in previous literature. In one study, participants described a lack of training in designing and applying formative assessments based on an ELL's proficiency level, organizing instruction, and engaging with parents of ELL students (Mellom et al., 2018). Addressing administrators' concerns about the lack of adequate training requires a macro-view of the structure, shared vision with teachers and district-level administrators, campus-wide collaboration, and professional development focused on not viewing ELLs through "deficit lenses" (Villegas, 2018, p. 133). In sum, changing how a STEM teacher or administrator feels regarding training and subsequent support may require a cultural shift beginning with adequate professional development led by experienced and successful educators.

RQ2: Perceptions of Professional Development in Sheltered Instruction

Teachers and administrators also answered interview questions focused on obtaining their perceptions of sheltered instruction professional development. Participants described the types of professional development received, whether it adequately prepared them for sheltered instruction implementation, and what made professional development effective or ineffective. Lastly, participants elaborated on needed changes in professional development and the overall ELL education system on their campus. Five dominant themes emerged: (a) Lack of professional support, (b) resources and strategies, (c) collaboration, (d) relevance, and (e) structure.

Lack of Professional Support. In the first section of the interview, teachers and administrators expressed a lack of adequate training in implementing sheltered instruction. The theme carried over into the discussion of professional development, subsequently leading to identifying a particular, distinct theme. In the second section of the interview, teachers and

administrators voiced a lack of professional support in professional development. Teachers described lapses in professional development relating to ELLs that, in at least one case, spanned years since the last training (Teacher D). Other teachers explained how the only relevant training received on ELL education or sheltered instruction existed through their original teacher certification courses. Administrator A corroborated the lapse of training described by teachers in stating that no professional development has come their way since joining Anytown ISD. Administrator B described professional development as simply matching ELAR TEKS with SLAR TEKS and expecting teachers to figure out the approach.

Teachers and administrators voiced concern over the training new teachers received upon entering the field. Specifically, respondents stated that new teachers do not receive any professional development. Again, the respondents' repeated perceptions of being "throw in" without adequate training in both opportunity and continuation. The participants' perceptions of professional support are sobering as professional development exists as a critical catalyst for STEM-based instruction to motivate and build interest within the most vulnerable of students (Hall & Miro, 2016). Naturally, teachers often question the correct approach when teaching STEM subjects to ELL students as teachers underestimate their abilities and overall impact (Kelly & Zhang, 2016). Generally, teachers lack experience and capital in delivering culturally relevant and differentiated instruction (Kahn et al., 2014). Often, the deficits teachers exhibit result in negative attitudes and perceptions of ELL education (Mellom et al., 2018). Effective professional development may mitigate many negative perceptions held by Anytown Middle School's teachers and administrators, especially the lack of professional support.

Resources and Strategies. Teachers at Anytown Middle School described professional development that provided numerous resources and strategies as effective, especially when

modeled. Administrators echoed teacher sentiments in the need for more resources and professional development opportunities. Resources included tangible items such as posters or manipulatives utilized within their classrooms. Teacher A described a specific item in the form of a poster with sentence stems that could prompt an ELL student to speak. Other resources included flipcharts and books with various strategies. Administrators also reflected on the power of providing teachers multiple resources and strategies. Moreover, Administrator B described a resource that helped observe and monitor teacher progress in implementing sheltered instruction.

Through thematic analysis, a subtheme emerged within resources and strategies. Teachers not only want the strategies, but they want them modeled by experienced educators. Teachers described modeling as observing a strategy performed in real-time, be it during a professional development session or while watching another teacher in class. Modeling allowed participants the opportunity to interact and troubleshoot how the strategy could work within their classroom. Ultimately, the teachers perceived the process of modeling as both effective and highly beneficial.

Providing teachers and administrators resources and strategies through professional development carries multiple benefits. STEM teachers often fight an internal battle between supporting ELLs and their language acquisition and delivery of content knowledge with ELL-specific strategies and resources mediating between the two concepts (Besterman et al., 2018). Without ELL-specific strategies, teachers often fall back to one-way, lecture-based instruction at the expense of student engagement (Maarouf, 2019). In place of ELL-specific resources and strategies, teachers rely on tactics based on misconceptions of ELL education. For instance, teachers trusting that what is good for non-ELLs is good for ELLs and depending on simple, ineffective grouping of ELLs with non-ELL peers as a form of exposure (Harper & De Jong,

2004; Hollie, 2019). The theme of resources and strategies overlapped with the theme of good teaching. Thus, teachers and administrators benefit from professional development focused on providing and modeling ELL-specific resources and strategies, especially attentive to the demands of the STEM classroom.

Collaboration. Teachers voiced a desire to work together collaboratively as part of interactive professional development. The need for collaboration encompassed STEM teachers working with other STEM teachers and ELL teachers. Teacher J suggested that collaboration extend district-wide as to be "on the same page." Teacher C indicated that collaboration with other teachers provided an opportunity to learn from more experienced educators.

The sheltered instruction framework incorporates collaboration as a foundational aspect in that teachers must share their knowledge amongst peers (Short & Echevarría, 1999). Musanti and Pence (2010) asserted that professional development "needs to be conceived as a collaborative enterprise" (p. 87). However, the authors of previous studies found feelings of isolation due to a lack of collaborative opportunities (Batt, 2008; Mellom et al., 2018). Conversely, other authors found resistance to collaboration depicted as a general avoidance of opportunities to share rather than impose on other teachers (Levine & Marcus, 2007). While no teacher stated any opposition towards collaboration, resistance exists as an inherent aspect of professional development and collaboration (Musanti & Pence, 2010). A potential focal point benefiting the creation of pathways toward collaboration and effective professional development may lie within the relevance of training.

Relevance. Furthermore, teachers and administrators both shared a concern that professional development lacks a level of relevancy. In short, teachers and administrators want to see tools that are actionable and applicable to the STEM-based classroom. Teachers described

professional development as lacking a level of relevancy. Specifically, participants associated irrelevance with presenters discussing theory rather than strategy, repeating concepts already known to participants, and receiving information through one-way or lecture-based delivery. Administrators also conveyed the perception of irrelevancy manifesting through already known concepts and theory. Additionally, teachers perceived relevant professional development as material presented by experienced personnel. Teacher H specifically targeted administrators, characterizing them as inexperienced and uninformed regarding the demands of the classroom.

Teachers and administrators of Anytown Middle School desire professional development that is interactive and relevant for their students, much in line with previous literature (Bechtel & O'Sullivan, 2006; Matherson & Windle, 2017). Additionally, past literature addressed relevancy but through the lens of student engagement. Krashen's (1985) input hypothesis situated relevance and meaning within the concept of comprehensible input. Relatedly, comprehensible input and a student's affective filter relied on associating meaning with content-related concepts. Lastly, relevancy enhanced student engagement and ultimately benefited positive student outcomes such as content mastery (Fredricks et al., 2004; Fredricks et al., 2016; Havik & Westergård, 2020; Lee, 2014). Teachers potentially find STEM content mastery and language acquisition through relevancy within comprehensible input, affective filter, and sheltered instruction. Similarly, the same concepts could provide teachers a pathway to obtaining effective professional development through relevance. In other words, approaching teacher learning with the same frameworks applied to students could enhance the professional development environment on the Anytown Middle School campus.

Structure. Lastly, teachers and administrators provided insight into their perceptions of needed change within professional development and the overall approach to ELL education and

sheltered instruction on the Anytown Middle School campus. The theme of structure emerged as dominant. Structure refers to how the campus offers professional development, support structures, data structures, communication between teachers, and campus-wide grouping of ELL students. From the overarching theme of structure, three subthemes developed: (a) More professional development, (b) more collaboration, and (c) teaming. The first two subthemes reflected earlier perceptions held by teachers and administrators. In short, teachers desired more opportunities to develop their teaching approach to ELL students, specifically within sheltered instruction. Moreover, participants wanted more opportunities to collaborate and share knowledge with other teachers on campus and throughout the district.

The last subtheme incorporated teachers' and administrators' perceptions of the campus-wide practice of teaming. Anytown Middle School groups subpopulations of students into special cohorts or teams that often share the same general education teachers and electives throughout the school day. Gifted and talented, special education, Section 504, and ELL students belong to a separate team and inform how administrators schedule teachers' class periods along with the master schedule. Through teaming, cohorts of ELL students are paired with ELAR teachers with ESL certifications. However, ELL cohorts may or may not pair with STEM teachers holding ESL certification. Moreover, traditional forms of teaming, and ones most often the focus of research, partitioned planning time for interdisciplinary teams, or teams consisting of various content areas that focused on strategies rather than content (Childress, 2019). In the 2019–2020 school year, Anytown Middle School administrators designed the master schedule to allow for PLCs consisting of interdisciplinary teams.

Teachers and administrators shared different perceptions of teaming. For example, Teacher E characterized teaming as ineffective and all but made differentiation impossible.

Teacher G discussed a “pack mentality” of ELL students and difficulty in addressing content and behavior. Teacher F described the convenience of having ELLs together in the same classroom but advocated for immersion in other classes. Teacher J expressed a need for consistency in having ELL students in the same class and common planning periods for ELL-focused discussions. Administrator A favored ELL teaming in that it afforded gap-filling opportunities through professional development. Lastly, teaming of ELLs in both student cohort and master schedule benefited the tracking and monitoring of students.

Earlier research on teaming provided mixed results as some studies showed enhanced achievement and other positive school effects. In contrast, others reported no change (Arhar et al., 1989). However, the authors of another study depicted teaming in a positive light. Clark and Clark (1997) concluded that interdisciplinary teaming “with its emphasis on collaboration has a positive influence on both teachers and students” (p. 271), giving teachers autonomy over content and instruction. New teachers found benefit in teaming through learning classroom management practices and sharing instructional strategies with colleagues (Bickmore et al., 2005). The above studies utilized a mix of teams consisting of teachers of different content areas and shared. Thus, efficacy within the teaming may not exist within the team's constituency but rather within goal-setting, support, and guidance structure as derived from the participants’ interview responses.

RQ3: STEM Teachers’ Lesson Plan Analysis

Research question 3 was designed to understand how STEM teachers addressed the ELPS in submitted lesson plans. Teachers submitted electronic lesson plans during the 2019–2020 school year to an online program called Eduphoria. Before the analysis phase, I implemented a filter that returned only STEM teachers’ lesson plans. Blank lesson plans were omitted from the

analysis. The final compilation of lesson plans from STEM teachers totaled 894, of which all underwent document analysis.

Document analysis consisted of predetermined codes correlated to the ELPS domains of Reading (R), Writing (W), Listening (L), and Speaking (S). As a function of the analysis, I attached the lesson plan's language objectives and student activities to a code representing the intended student action. Because of ambiguity, some objectives and activities did not receive a code associated with a domain from the ELPS. In such a case, the objective or activity received a code of "U" for unknown/unspecified. An overview of example objectives and activities matched with codes is provided in Table 3. Upon completing the document analysis stage, 889 language objectives and student activities received a code as summarized in Table 4.

Surprisingly, 240 of the 889 objectives and activities received a code of "U," signifying an inability to assign an ELPS domain. The vagueness of student academic expectations is concerning and presents a problem for both teachers and administrators. Minimally, lesson plans should address the content focus, how the content is learned, and how the learning is assessed by teachers (Santoyo & Zhang, 2016). Moreover, lesson plans provide teachers and administrators a starting point for evaluating and troubleshooting instruction (Sahin-Taskin, 2017). Based on the results of the document analysis, teachers relied on instructional verbs including "describe," "list," and "understand" without any context as to how the student would interact with the content. In short, what does it mean to describe or list or understand in the context of the ELPS? Ewing (2018) asserted that teachers often planned lessons generically and universally based on non-ELL students and adjusted retroactively to serve ELLs. While STEM teachers at Anytown Middle School may or may not utilize the approach, explicit and concise lesson plans may benefit students, teachers, and administrators.

When teachers listed an objective or student activity inclusive of a domain of the ELPS, results indicated a disproportionate reliance on reading and reading alone, as this accounted for 216 instances out of the 889 objectives and activities identified. Objectives and activities receiving the code of "R" occurred when students interacted with reading passages, computer-based activities that required the student to click an answer, and multiple-choice assessments. Cumulatively, Anytown STEM teachers focused on reading activities in 600 of the 889 instances, although paired with other domains of the ELPS. The finding contradicted a previous study by Gonzalez (2016) that asserted that STEM teachers of ELL-inclusive classes demonstrated an overreliance on writing and speaking activities. Cumulatively, listening and speaking occurred in 369 of the 889 identified activities.

Literature also identified the tendency for STEM educators to rely on lecture-based instruction (Gasiewski et al., 2012; Havik & Westergård, 2020; Strati et al., 2017). Teacher-centered, lecture-based instruction logically requires students to listen to the instructor at a minimum. The introduction of the ELPS domains of reading and writing appeared if students participated in note-taking and read notes from a presentation or through guided notes. In sum, objectives and activities coded as R/W/L and R/W represented teacher-centered, low-engagement, or lecture-based activities. After analyzing submitted lesson plans, 215 instances occurred in which the objectives or activities reflected the R/W/L or R/W domains of the ELPS.

In determining an overreliance on reading, writing, and listening activities, I compared activities coded with R/W/L and R/W to more dynamic objectives and activities that implemented all four ELPS or allowed peer interaction through the speaking domain. Instruction that allows peer-to-peer interaction significantly lowers students' affective filters (Hite & Evans, 2006). Moreover, sheltered instruction foundationally relies on peer-based interaction in

providing ELL students practice in all four domains of the ELPS, especially speaking (Short et al., 2011). Based on the analysis, 148 objectives or activities received a code of R/W/L/S, R/L/S, L/S, or R/S. In light of the comparison, teachers at Anytown Middle School implement low-engagement or teacher-centered instruction more than higher-engagement activities that implement peer-to-peer interaction, specifically through speaking.

Limitations, Delimitations, and Assumptions

The qualitative case study faced certain limitations. Primarily, the study relied on a sample from a single campus located in a school district in west Texas. Combined with the relatively high number of Newcomer ELL students, the factors limit generalizability and could be difficult to replicate. Moreover, as the researcher, I served a dual role and served as a former supervisor, introducing potential reactivity bias (Maxwell, 2005; Stake, 2010). Moreover, my role as an ELL administrator limits objectivity. Relatedly, the interpretive approach of the coding process remained relatively subjective. Minimizing the limitations relied on explication and triangulation utilizing member checks and confidentiality safeguards. Specifically, participants of the interview received transcripts via email postediting for grammar and clarity. Participants verified the meaning and intent of the edited transcripts. Members responded in the affirmative, minus one member who wanted to clarify the specific training they attended. Lastly, the inconsistency of expectations in lesson plan submission presented a limitation discussed in the recommendations. As a rule, each content department dictated what must appear in lesson plans and what is to be considered optional. In effect, it was understood that omission from lesson plans may not accurately reflect classroom behaviors. In other words, what teachers posted in lesson plans may not have occurred, and conversely, what actually happened as a part of instruction may not have been reflected in lesson plans.

The study also included certain delimitations. The study was designed to gain insight into the perceptions held by educators and administrators regarding sheltered instruction in the STEM classroom. Moreover, I sought insight into how teachers utilized lesson plans in addressing differentiated instruction, such as sheltered instruction of ELLs through the ELPS domains of reading, writing, listening, and speaking. The study's design combined the perceptions of STEM teachers campus-wide rather than by department or content area. Moreover, it was not an intention to gather observational data from strategies used inside the classroom as a way to investigate fidelity within lesson plans.

While following a qualitative case study methodology, I acknowledged several assumptions. Primarily, the assumption that reality is constructed by shared understandings of participants instead of the existence of one true reality (Hathaway, 1995, p. 554). Another assumption within qualitative case studies is their descriptive and inductive nature through fieldwork (Ochieng, 2009). Moreover, I served as the primary data collection instrument. Stake (2010) addressed similar assumptions, suggesting that qualitative case study research introduces subjectivity. However, the author cited the importance of subjectivity as "an essential element of understanding human activity" (p. 29).

Implications

The underpinnings of the sheltered instruction framework coincide with Krashen's (1982) theory of second language acquisition. Specifically, the hypotheses of comprehensible input and affective filter. Sheltered instruction incorporates comprehensible input hypothesis through teacher actions such as building language objectives within lesson plans and daily agendas, building upon a student's background knowledge, scaffolded questioning, and manipulatives (Daniel & Conlin, 2015; Merritt et al., 2017; Schall-Leckrone, 2018). Teacher participants of the

study described how sheltered instruction influenced their focus of instruction, in line with the comprehensible input hypothesis. For instance, teachers who focused on content and vocabulary broke down concepts into smaller parts providing relevant vocabulary with associated meaning. However, comprehensible input alone does not lead to second language acquisition or content mastery, especially in STEM. Students require relevancy and low affective filter (Hite & Evans, 2006; Krashen, 1985).

A student's high affective filter acts as a barrier against comprehensible input in both content and language acquisition (Krashen, 1985). Often, ELL students enter a classroom with high sensitivity, anxiety, and stress and rely on the teacher's skills at lowering affective filter (Allison & Rehm, 2011). Strategies such as ability grouping, accessing prior knowledge, and scaffolding instruction consistently lowers a student's affective filter (Curran, 2003; Hite & Evans, 2006; Short et al., 2011). While far from a universal approach at Anytown Middle School, some teachers commented on taking similar approaches with ELL students in their STEM classroom. STEM teachers within the study scaffolded instruction through vocabulary-based strategies and encouraged peer-to-peer interaction. Importantly, teachers within the study implemented approaches focused on building students' confidence, an effective method to lower an affective filter (Lin, 2008).

Comprehensible input hypothesis, affective filter hypothesis, and sheltered instruction link and interweave to increase student engagement (Krashen, 1985; Short et al., 2011). Student engagement incorporates three primary domains of engagement: behavioral, cognitive, and emotional (Fredricks et al., 2004). The emotional domain of student engagement encompasses the feelings, attitudes, and sense of belonging for students and often serves as a mediator for the behavioral and cognitive domains (Fredricks et al., 2004; Havik & Westergård, 2020; Kenny et

al., 2006; Lee, 2014). Logically, the emotional engagement of an ELL student shares associations with affective filter and ultimately the ability of a teacher to provide content through comprehensible input. STEM teachers relayed enjoyment through the positive relationships built with ELL students. They associated those relationships with academic and social achievement. Moreover, administrators also conveyed that the relationship-building capital of the STEM teachers existed as a strength on the Anytown Middle School campus. The close association of affective filter, comprehensible input, and sheltered instruction to student engagement suggests significant implications with high-leverage possibilities impacting student engagement and achievement on the Anytown Middle School campus.

The findings of the study also convey implications for practice. The problem of practice identified on the Anytown Middle Campus is that STEM teachers persisted with low-engagement, culturally irrelevant, lecture-based instruction in ESL inclusion classrooms despite professional development and district-wide initiatives mandating the use of a sheltered instruction approach to teaching. Addressing the problem required obtaining the perceptions of the STEM teachers on campus.

Teachers expressed an overall positive attitude toward sheltered instruction in ELL-inclusive STEM courses at Anytown Middle School, but with distinct challenges. Positivity toward the instructional approach resulted from constructive and reciprocal teacher-student relationships. Teachers found enjoyment in building cross-cultural connections and took an interest in students' cultural backgrounds. STEM teachers articulated feelings of positivity centered on achievement and success. In essence, when students succeed, teachers felt an association with that success and an essential role within the students' achievement. Importantly, teachers described achievement, not just with academic indicators, but also characterized success

in social and emotional terms. STEM teachers at Anytown Middle School conveyed a feeling of comfort with the implementation of sheltered instruction. Influences such as empathy toward ELL students, content knowledge, and service years spent teaching ELLs enhanced comfort. One administrator described their higher comfort level as a product of content knowledge and previously working with ELL students. In contrast, the other administrator felt uncomfortable with observation and addressing ELL instruction with teachers. However, the same administrator noted teachers' capacity to build positive relationships with students as a strong point within the STEM content area.

Participants of the study shared how sheltered instruction impacted their approach to ELL education. Mostly, implementation influenced the instructional focus for STEM teachers. Of those influenced instructionally, half focused on content and vocabulary. At the same time, the other half emphasized interaction with the content through a hands-on approach or stressed speaking either with the instructor or peers. Administrators also shared how sheltered instruction impacted their approach to leadership on campus. Both administrators characterized the impact as influencing instruction. However, STEM teachers and administrators deemed the effect on their overall teaching or leadership approach as minimal. The perception of minimal impact could be a result of what respondents called "just good teaching." In short, participants made little distinction between ELL-specific instruction and overall good teaching practices applicable to any student. One administrator noted a gap between what teachers perceived as good teaching in the classroom and what administrators observed.

While perceptions of the implementation of sheltered instruction remained positive, teachers and administrators shared their challenges during the interviews. Primarily, a language barrier between teachers and students made progress and behavior monitoring difficult.

Moreover, teachers felt less comfortable during instruction, especially when ELL students demonstrated lower English proficiency levels. Lastly, language barriers often resulted in ELLs only interacting with other ELL students compounding teachers' perceptions of instructional challenges.

STEM teachers and administrators at Anytown Middle School perceived a lack of training and overall support in sheltered instruction implementation. Teachers cited a lack of on-campus resources such as co-teachers trained in ELL education and adequate training or continuing support. Administrators similarly responded with concerns about the lack of district-wide support. Most importantly, teachers and administrators perceived sheltered instruction and ELL education as not a focus or priority, evidenced by support structures for special education or gifted and talented students. The perceptions of teachers and administrators of sheltered instruction implementation slanted toward the positive. However, they suggested certain areas that required campus-wide acknowledgment and change. Specifically, the perception of lack of training and professional support permeated throughout the interviews and again surfaced when participants discussed professional development.

Participants verbalized a negative reflection of professional development overall. Teachers and administrators both cited a lack of professional support. Specifically, the campus lacked opportunities for professional development, provided little resources for implementation, and provided no continuation of support. Administrators perceived a lack of training and professional support, also, but from the district level. Teachers and administrators verbalized a desire for more tangible resources like posters and sentence stems that encourages students to interact with content. Additionally, participants preferred in-class strategies modeled by experienced and successful educators relevant to their classrooms. The implications of the

findings relevant to professional development informed the recommendations for change significantly, as discussed in the next section.

Teachers and administrators appeared split on the teaming aspect of ELL education and sheltered instruction on campus. A few teachers acknowledged the pros of teaming ELLs together as a cohort as having an instructional advantage, a perception shared by administrators. Others suggested separating based on proficiency level and immersing them in other classes. The implication of this finding involves a multi-faceted approach with effects on master schedules, PLC protocols, and student schedules.

Lastly, document analysis of submitted lesson plans from STEM teachers carried several implications of practice. First, a disproportionate number of objectives and activities could not be associated with a domain from the ELPS. The objective stated what the student should learn but neglected how the student should learn it respective of the ELPS domain. This finding suggested that teachers approached lesson planning with either ambiguity or simply out of compliance. If either approach proved true, teachers entered the STEM classroom with either little idea of what strategies would be implemented or relied on in-the-moment instruction. Incongruent documentation of planned activities versus actual activities presents difficulties in troubleshooting ineffective pedagogy from both perspectives of the teacher and the administrators overseeing instruction. As an implication of practice, teachers should become more intentional with the use of language objectives. Specifically, teachers should state what the student is to learn and how the student should learn it indicated by specific domains of the ELPS. Administrators should foster the use of specific language objectives and continuously monitor their use and fidelity through lesson plan checking and observation.

Ambiguity aside, the document analysis results led to the finding that STEM teachers relied on lower-engagement, lecture-based, or otherwise teacher-centered instruction compared to more engaging activities. This finding is compliant with the problem of practice. Evidence of this finding is based on the number of activities that addressed the specific ELPS domain of speaking. The speaking domain provides opportunities for students to interact with the content through peer-to-peer interaction. Cumulatively, STEM lesson plans require attention on the Anytown Middle School campus.

Recommendations for Change on the Anytown Middle School Campus

Recommendations for change on the Anytown Middle School campus begin with professional development infused with overtones of cultural relevancy. Cultural relevancy incorporates sheltered instruction, affective filter hypothesis, and comprehensible input into a framework that provides culturally sensitive meaning to content similar to Culturally Relevant Teaching proposed by Ladson-Billings (1992). Those critical of Culturally Relevant Teaching (CRT) stated that the framework lacked specifics and relied on theory rather than practicality (Hollie, 2019). However, I argue that combing the frameworks provide STEM teachers with a concrete, specific approach to enhancing sheltered instruction on the Anytown Middle School Campus.

Professional Development

The most high-leverage opportunity for change on the Anytown Middle School campus exists within the dimension of professional development. From this perspective, teachers and administrators can effectuate change within other dimensions such as lesson planning and classroom instruction. Therefore, the recommendations for change on campus begin with

redesigning professional development opportunities on campus, restructuring student teaming, and recommending observation protocols for both teachers and administrators.

Fundamentals of Sheltered Instruction. The fundamentals of sheltered instruction guide the recommendations for campus-wide change. Foundationally, sheltered instruction incorporates the following five characteristics (Buxton & Caswell, 2020; Echevarría, Vogt, & Short, 2008; Markos & Himmel, 2016; Short et al., 2012).

1. Content and language objectives
2. Connections to cultural background
3. Activating prior knowledge
4. Authentic opportunities to practice ELPS through collaboration with peers
5. ELL-specific linguistic modifications

Collaboration. Professional development relevant to sheltered instruction should place the five primary characteristics of sheltered instruction as a collaborative focus for teacher teams. Teacher teams should consist of an interdisciplinary mix representing STEM and non-STEM teachers and ELL and non-ELL teachers, thus satisfying the participants' desire for campus-wide support. Through this collaborative effort, teacher teams should discuss examples of what each characteristic should look like in their classroom. For instance, such discussions may focus on specific methods teachers use to activate students' prior knowledge of and participation in authentic opportunities to practice ELPS. I argue that a collaborative discussion highlights best practices that include an ELL focus and reveals deficiencies within "good teaching" mentalities.

Moreover, collaborative teams allow more experienced teachers to share strategies and resources with less-experienced teachers. Staff should share a goal of producing a unified, campus-wide approach to ELL education differentiated for content areas if needed. For instance,

one recommendation requires consistent content and language objectives in both lesson planning and each content area of the classroom. However, STEM may determine the need for more hands-on activities compared to ELAR. The unified approach to ELL education on the Anytown Middle School campus serves as a guiding document for teachers. It also provides leadership with an observational tool for progress and instructional monitoring with inherent teacher buy-in.

Language Barriers. During collaborative professional development, teacher teams should be prompted to discuss known challenges within the implementation, such as the language barrier. Teachers should also review linguistic modifications for ELL students available to teachers, such as English-Spanish dictionaries and ability grouping strategies. A list of available accommodations—appropriate and pre-approved by district-level personnel and made available for discussion and adoption by the collaborative teams—benefits staff participating in the professional development.

Resources and Strategies. During the interviews, several teachers shared their desire for resources and strategies specific to ELL students. Some teachers shared examples of resources they obtained through professional development and strategy utilized within the classroom. The recommended campus-wide professional development framework potentially engages participants in creating a forum for sharing strategies seen and used. Therefore, professional development participants benefit from an intentional and partitioned time within the session for such knowledge sharing. Several participants with ELL knowledge should be tasked with supplying resources and strategies presently used or used in previous years for discussion and potential implementation within classrooms. Once delivered, content-specific departments, such as STEM-based content areas, should alter and adjust based on their unique classroom environments.

Role and Support of Leadership. During collaborative sessions, campus administration serves a facilitation role prompting discussion questions based on perceived challenges and monitoring the progress of discussions. Moreover, campus leadership may provide their expertise in campus procedures and protocols applicable to ELL-based instruction. For instance, how teachers are teamed or master schedule concerns.

Campus Structure

Recommendations for change associated with campus structure required knowledge of campus procedures and staffing challenges. For instance, Anytown Middle School, similar to many other campuses, faces challenges in creating a master schedule that allows for reasonable teacher-to-student ratios, class availability, and opportunities for students to enjoy various electives. Given the rigorous parameters, the recommendations fall short of changing the master schedule or otherwise changing any foundational aspect of the school day. Instead, the recommendations presented provide relatively minor but impactful adjustments and enhancements on what campus staff already do in the typical school day. The following recommendations impact the aspects of teaming with improved data and progress monitoring.

Teaming. The current master schedule forms PLC teams consisting of interdisciplinary groups. For instance, one specific team time consists of math, science, ELAR, and a social studies teacher, all from the same grade level. For the ELL team, the same format is followed, except for the inclusion of the Newcomer teacher. The campus follows a similar design for gifted and talented and special education teams, with a few exceptions. For example, one ELAR teacher who teaches ELL students meets with the special education team due to scheduling conflicts and teacher availability.

Moreover, campus personnel in charge of scheduling students attempt to place ELL students in their respective teams. However, campus enrollment and teacher class load significantly affect counselors' ability to adhere to teaming. Logically, ELL students may cross teams having an ELAR teacher certified in ESL and a STEM teacher on the Gifted and Talented team. In some cases, the student belongs to no team having a random mix of teachers. One recommendation is not to change the structure of the master schedule but to change the work of the teams. In a sense, the perception of "good teaching" holds true in this scenario. For example, students with lower English proficiency levels would benefit most from being on the ELL-specific team, including the Newcomer teacher. Students with higher proficiency levels should cohort into other teams. The teachers with higher proficiency level ELL students would mix their best teaching practices with ELL-specific resources obtained through the revamped professional development. Counselors tasked with student scheduling could refer to proficiency data housed in Eduphoria or obtain data from the Language Proficiency Assessment Committee (LPAC) meeting at the beginning of the year. LPACs routinely assess the proficiency of all new students based on Home Language Surveys and teacher recommendations. The extent of how the campus currently uses LPAC data for student scheduling or within PLCs is unknown, thus deserving further examination.

Data and Progress Monitoring. Related to LPAC data use, regular tracking of ELLs primarily falls on the Newcomer teacher on the Anytown Middle School campus. However, the Newcomer teacher regularly meets with the ELL team only. Logically, data gathered by the Newcomer teacher becomes knowledge of only the ELL team. One recommendation exists through an alternative communication flow of data based on the presence of ELL students within every team on campus. For example, the Newcomer teacher could serve as the "central brain" of

ELL resources and data suggested by Administrator A (Chapter 4). The work of PLCs benefits with the Newcomer teacher sharing ELL-specific data with team leaders for regular discussion through the PLC framework the campus utilizes.

Lesson Plans for STEM Teachers

A final recommendation concerns the designing and implementation of lesson plans. The online program housing lesson plans provide teachers with a district-constructed template complete with content and language objectives, activities, differentiation, and more (Appendix E). However, teachers often alter the template and exclude sections. For example, teachers may only include a general objective, activities, and a form of assessment as observed during the data analysis of lesson plan documents (Appendix F). Therefore, one recommendation for lesson plans is that all teachers on campus utilize the preexisting template provided by Eduphoria. Doing so eliminates the ambiguity discovered in the lesson plan document analysis. In addition, the recommendation requires teachers to state what is to be learned and how it is learned relative to the ELPS. Lastly, a product of the professional development framework recommended above should address the utilization of the ELPS and be reflected in lesson plans.

Recommendations for Future Research

The purpose of this qualitative case study was to explore the perceptions held by educators and administrators regarding sheltered instruction of ELL students in the STEM classroom, relevant professional development, and the use of the ELPS within lesson plans. The study, in part, utilized STEM teachers as a whole and obtained their perceptions of professional development and how the ELPS were addressed in STEM-based courses cumulatively. Future research could focus on interdepartmental intricacies of STEM teachers' and administrators' perceptions and implementation of sheltered instruction. In other words, do teachers from

different content areas in STEM hold different perceptions of sheltered instruction implementation or professional development? Future research could potentially gain insight into content-specific needs, support structures, and professional development preferences.

Similarly, future research could investigate perceptions of sheltered instruction and professional development from non-STEM courses such as English Language Art and Reading (ELAR) and social studies. Teachers of ELAR courses typically receive specialized training in sheltered instruction. Moreover, ELAR teachers regularly hold ESL certifications on the Anytown Middle School campus, thus potentially holding different perceptions and needs relative to STEM teachers. Researching sheltered instruction implementation and professional development in non-STEM courses could provide a deeper insight into sheltered instruction on a campus level.

The current body of knowledge benefits from further research in association with the lesson plan aspect of STEM education and ELLs. Specifically, researchers should investigate fidelity with posted lesson plans and classroom activities. In short, do teachers do what they say they do relative to lesson planning? Moreover, do administrators tasked with monitoring teacher performance have a reliable data source from lesson plans? Future qualitative research could sample STEM teachers within a study site and utilize a mix-methods approach, including interviews, lesson plan analysis, and observations. Researchers using the approach could gain insight into the connection between submitted lesson plans and actual classroom activities.

Lastly, the study was centered on adding to the current body of knowledge regarding sheltered instruction within the ELL-inclusive STEM course via a case study of a single campus in west Texas. Future research should focus on enhancing the generalizability of the findings to benefit professional development and instructional implementation of effective ELL-based

pedagogy. Future research should expand to other geographic locations with similar ELL population demographics. Additionally, further research into sheltered instruction implementation and professional development may benefit from attention to schools housing ELL Newcomer Academies and their effect on implementation and professional development structures.

Conclusion

The purpose of this qualitative case study was to explore the perceptions held by educators and administrators regarding sheltered instruction of ELL students in the STEM classroom, relevant professional development, and the use of the ELPS within lesson plans. Through semistructured online interviews, I concluded that teachers and administrators positively perceive sheltered instruction primarily mediated by achievement and positive relationships with ELL students. However, teacher participants described a minor impact of sheltered instruction on their standard pedagogical approach or what they described as "just good teaching." One administrator questioned the perception of "good teaching," asserting little observational evidence of ELL-focused instruction.

Teachers and administrators shared negative perceptions of implementation and professional development associated with sheltered instruction in STEM. Their negative perceptions primarily originated from a lack of training and professional support from other teachers, campus administrators, and district executives. Teachers also shared concerns with overcoming language barriers. Respondents desired more professional development that provided tangible resources, modeled strategies, and relevant guidance. Moreover, teachers and administrators communicated divided perceptions of campus-wide teaming of ELL students and personnel. The findings within the study provide campus administration with a platform for

revamping professional development, implementing new visions for lesson planning, and a framework for effective implementation of sheltered instruction in the STEM classroom of Anytown Middle School.

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Appendix A: Solicitation Emails

Invitation Email for Interview (Teacher)

Dear (Name),

I am conducting interviews as part of a research study exploring educators' perceptions of sheltered instruction of English Language Learners (ELLs) in Science, Technology, Engineering, and Mathematics (STEM) and relevant professional development. As an educator, you are in an ideal position to give valuable first-hand information from your perspective. The interview should take approximately 30 minutes. We are merely trying to capture your thoughts and perspectives as an educator of ELLs. Your responses to the questions will be kept confidential. Each interview will be assigned a code to ensure that personal identifiers are not revealed during the analysis and write up of findings. There is no compensation for participating in this study. However, your participation will be a valuable addition to my research, and findings could lead to a greater public understanding of ELL education. If you are willing to participate, please suggest a day and time that suits you, and I'll do my best to be available. If you have any questions, please do not hesitate to ask.

Thank you!

Tommy Duncan
Doctoral Candidate
Abilene Christian University

Invitation Email for Interview (Administrator)

Dear (Name),

I am conducting interviews as part of a research study exploring administrators' perceptions of sheltered instruction of English Language Learners (ELLs) in Science, Technology, Engineering, and Mathematics (STEM) and relevant professional development. As an administrator, you are in an ideal position to give valuable first-hand information from your perspective. The interview should take approximately 30 minutes. We are merely trying to capture your thoughts and perspectives as an administrator on a campus serving ELL students. Your responses to the questions will be kept confidential. Each interview will be assigned a code to ensure that personal identifiers are not revealed during the analysis and write up of findings. There is no compensation for participating in this study. However, your participation will be a valuable addition to my research, and findings could lead to a greater public understanding of ELL education. If you are willing to participate, please suggest a day and time that suits you, and I'll do my best to be available. If you have any questions, please do not hesitate to ask.

Thank you!

Tommy Duncan
Doctoral Candidate
Abilene Christian University

Appendix B: Interview Protocol

STEM Teacher Interview Questions

Sheltered Instruction

1. Describe your comfort level with educating English Language Learners (ELLs) using sheltered instruction in your content area.
2. How has sheltered instruction changed your teaching approach in STEM? If so, how?
3. As a teacher of ELLs, what are your main priorities regarding STEM instruction?
4. How do you feel about implementing sheltered instruction in your content area?
5. Has educating ELLs using sheltered instruction in your classroom been a positive or negative experience? Explain.
6. What successes have you experienced in teaching ELL sheltered instruction?
7. What challenges have you experienced in teaching ELL students through sheltered instruction?

Professional Development

1. Describe any professional development or teacher preparation that you have received regarding ELL education.
2. Do you feel that professional development or teacher preparation you have received adequately prepared you to teach ELL students? Explain.
3. What characteristics of ELL professional development or teacher preparation made it effective? Ineffective? Provide examples.
4. Overall, what changes need to occur on your campus regarding sheltered instruction professional development?
5. Overall, what changes need to occur on your campus regarding sheltered instruction?

Administrator Interview Questions

Sheltered Instruction

1. Describe your level of comfort with addressing ELL education on your campus.
2. How do you feel about the current level of instructional implementation of sheltered instruction in the content areas of science, technology, engineering, and mathematics (STEM)?
3. What successes have you observed in the ELL program regarding students receiving sheltered instruction in STEM?
4. What challenges have you experienced in the ELL program regarding students receiving sheltered instruction in STEM?
5. Has sheltered instruction changed any aspect of your leadership approach? If so, how?

Professional Development

1. Describe any professional development that you have received regarding ELL education.
2. Do you feel that you have received professional development that adequately prepares you to address ELL education on your campus? Explain
3. What characteristics of ELL professional development make it effective? Ineffective? Provide examples.
4. Overall, what changes need to occur on your campus regarding sheltered instruction professional development?
5. Overall, what changes need to occur on your campus regarding sheltered instruction?

Appendix C: District Permission to Use Submitted Lesson Plans

Gmail

Tommy Duncan <[redacted]>

Question

3 messages

Tommy Duncan <[redacted]> Thu, Jul 9, 2020 at 9:22 AM
To: [redacted]

Hello, [redacted] it's Tommy Duncan. I have a question that I thought I'd swing by you first. In 2017, I began my doctoral degree through Abilene Christian University. My dissertation focuses on English Language Learners and STEM-based education. As part of my dissertation, I intended on using submitted lesson plans from STEM teachers, specifically, the ones from SJ. The lesson plans will be used to examine differentiation and the use of lesson plans in planning for that differentiation. As you know, all identifying information is redacted as is the school and district name.

Would this be something you could grant permission for, or would this need [redacted] approval? Is there someone else that may be able to help if you cannot?

Thank you!

Tommy Duncan

[redacted] Fri, Jul 10, 2020 at 10:22 AM
To: Tommy Duncan <[redacted]>

Yes, that would be fine, so long as the teachers remain in agreement to submission. Best wishes.
[Quoted text hidden]
--
[redacted]

Tommy Duncan <[redacted]> Fri, Jul 10, 2020 at 10:23 AM
[redacted]

Thank you! Best wishes and thank you!
[Quoted text hidden]

Appendix D: IRB Approval Letter

ABILENE CHRISTIAN UNIVERSITY
Educating Students for Christian Service and Leadership Throughout the World

Office of Research and Sponsored Programs
320 Hardin Administration Building, ACU Box 29103, Abilene, Texas 79699-9103
325-674-2885

March 8, 2021

Tommy Duncan
Department of Organizational Leadership
Abilene Christian University

Dear Tommy,

On behalf of the Institutional Review Board, I am pleased to inform you that your project titled "Educator and Administrator Perceptions of Sheltered Instruction in Stem Courses",

(IRB# 21-020)is exempt from review under Federal Policy for the Protection of Human Subjects.

If at any time the details of this project change, please resubmit to the IRB so the committee can determine whether or not the exempt status is still applicable.

I wish you well with your work.

Sincerely,

Megan Roth

Megan Roth, Ph.D.
Director of Research and Sponsored Programs

Appendix E: Sample Lesson Plan Template

Lesson Topic:

# of Days for Lesson:

Warm-up/Hook:

Objectives:

Content:

Language:

Agenda/Tasks:

Modeling/Guided Practice:

Instructional Strategies:

Academic Vocabulary:

Evidence of Learning:

Formal Assessments:

Informal Assessments:

How Will I Differentiate?:

Reteach:

Enrich:

Higher Order Thinking Questions (Stems):

Accommodations (SPED, 504, ELL):

Wrap-up/Closure:

Appendix F: Teacher Lesson Plan Example

Unit 7: Functions
4 Days
What I will learn
TEKS 8.4BC & 8.5DGI
-
LT- I can identify directly proportional relationships given an equation.
-
LT- I can graph and identify graphs of directly proportional relationships.
-
LT- I can identify directly proportional relationships given a table.
-
LT- I can identify directly proportional relationships given story problems.
-
LT- I can use linear regression on a calculator to find a linear equation.
-
LT- I can make predictions using linear regression.
-
LT- I can identify functions given graphs, tables, ordered pairs, and maps.
-
LT- I can classify functions as linear or nonlinear.

Vocabulary
Should already know: rate of change, unit rate, constant of proportionality, rise, run, slope, positive negative, zero, slope, change in y, change in x, increasing, decreasing, horizontal, vertical, undefined, slope-intercept form, slope formula,
Will know: relations, functions, linear, nonlinear, mappings

Important Stuff
(subject to change)
Today's Activities: Students will take notes on functions and then practice identifying functions from ordered pairs, graphs, mappings, tables.