2023

Understanding Teachers' Perceptions of Pedagogy in Teaching Mathematics to English Language Learners

David Suh
Walden University

Walden University

College of Education

This is to certify that the doctoral study by

David Suh

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Lynne Orr, Committee Chairperson, Education Faculty
Dr. Michelle McCraney, Committee Member, Education Faculty
Dr. Crissie Jameson, University Reviewer, Education Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2023

Abstract

Understanding Teachers' Perceptions of Pedagogy in Teaching Mathematics to English Language Learners

by

David Suh

MA, National University, 2017

BA, University of California, Riverside, 2007

Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

May 2023

Abstract

The number of socially and linguistically varied students at two local high schools in a southwestern state located in the United States has greatly increased. Since the 2018-2022 school years, English language learners (ELLs) scored low on the state achievement mathematics test scores. The problem was teachers were challenged to support the mathematics achievement of Grade 9-12 ELLs. The purpose of this qualitative study was to explore the perceptions of the teachers' challenges in supporting the mathematics achievement of Grade 9-12 ELLs. The conceptual framework for this study was Vygotsky's sociocultural theory, which helped to inform the study in giving potential reasons why pedagogy and curriculum appear as a challenge for educators effectively teaching ELL mathematics students. The basic qualitative design included interviews with 12 general high school mathematics educators from two local high schools who have ELL students in their mathematics classes. The research question intended to understand the challenges of the ninth through 12th grade mathematics educators on the curriculum, instruction, and assessment of the learning of ELL students. The three major themes with 10 subthemes from the collected data included (a) lack of instructional training and support from other administrators, (b) changes needed in curriculum and resources, and (c) instructional strategies needed. A 3-day professional development series was presented as the project deliverable. The positive social change may be that educators will explore how to make a difference for ELLs in their classes and enhance equity in the classroom setting.

Understanding Teachers' Perceptions of Pedagogy in Teaching Mathematics to English Language Learners

by

David Suh

MA, National University, 2017

BS, University of California, Riverside, 2007

Project Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Walden University

May 2023

Dedication

In the loving memory of my father, Ho-Joon Suh.

Acknowledgments

I want to thank my wife, Julia. Thank you for encouraging me to tackle this program and move forward in the process. Thank you for being my strength and supporting me to accomplish the feat. I am very grateful to have a notable family and friends support group. I want to also thank my mother for supporting me to never give up in the midst of the obstacles of finishing the program.

Dr. Lynne Orr, Dr. Michelle McCraney, and Dr. Crissie Jameson were an excellent committee. Thank you so much for all the counseling, feedback, and support. It has been a privilege to work with you.

Table of Contents

List of Tables

Section 1: The Problem

In North America, school achievement is lower for English language learners (ELLs) who speak Spanish as their first language than for Caucasian students and other minorities (Swanson et al., 2020). ELLs are students who converse in another language at home and have not yet developed full English proficiency (Swanson et al., 2020). Although ELLs are one of the fastest expanding populations, they are among the lowest performers on a vast spectrum of educational results (Reyes & Hwang, 2021). ELL students generally score lower than non-ELL students in English writing, comprehension, and writing, as well as in less language-rigorous content areas, such as mathematics. African Americans 2019 mathematic SBAC score was 45.9 points below standard, and Hispanic 2019 mathematic SBAC score was 49.3 points below standard. Cross-sectional studies have presented that ELLs experience reading and mathematics challenges across various age levels (Swanson et al., 2020).

ELLs with mathematics and reading challenges are not provided with applicable services (Reyes & Hwang, 2021). Mathematical skills are needed for everyday problem solving and prospects for academic achievement. Students in the United States indicated considerable weaknesses in math compared to other academic achievement fields and industrialized nations (Reyes & Hwang, 2021). This problem is particularly compounded in students learning English as a second language, who are the most expeditiously augmenting demographics in United States public schools. However, some of the hurdles in math problem solving experienced by ELLs have been connected to oral vocabulary

and reading skills (Reyes & Hwang, 2021). Other processes beyond language and reading play a crucial aspect in comprehending mathematic performance (Swanson et al., 2022).

The Local Problem

The local problem at the two high schools located in the southwestern region of the United States was similar to the larger population of ELLs (see Reyes & Hwang, 2021). The mathematic achievement of ELLs are less than other students. Specifically for this local site, the Hispanic and African American populations of the ELLs were the primary focus. Students who are monolingual English students are achieving more than ELLs. Three local public high schools of a state in the southwestern portion of the United States were experiencing a decline in mathematics achievement for ninth through 12th grade ELLs. The problem was teachers are challenged to support the mathematics achievement of Grade 9-12 ELLs, as demonstrated by poor performance in the Smarter Balanced Assessment Consortium (SBAC) scores (see Table 1).

The scores were color-ranked on a spectrum from red to blue. Red was the lowest performance, and blue was the highest performance of the spectrum. ELLs' mathematical performance was not high as other groups. ELLs needed ways to improve their mathematics skills and comprehend what was taught in the classroom to move on to higher content in the different levels of Integrated 1, Integrated 2, Integrated 3, Trigonometry, and other advanced mathematical concepts.

Currently, Grade 9-12 ELLs in the three local high schools from a state in the southwestern portion of the United States were not as mathematically proficient compared to other student groups at the schools as detailed in the SBAC, such as

Caucasian, African America, Hispanic, socioeconomically disadvantaged, Asian, and Filipino, as shown in Table 2, according to a school dashboard of a local school district of a state located in the southwestern portion of United States As the other subgroups improved on the assessments, ELLs were not improving on their SBAC mathematics scores, according to a school dashboard of a local school district.

ELLs have mathematics learning difficulties because of the spectrum of instructional needs in mathematical class settings (Arizmendi et al., 2021). The instructional needs could include problem solving and word problems because ELLs often have difficulty with the academic language. Their self-efficacy could be low because ELLs may be overwhelmed learning mathematics in English, which was not their primary language. ELL students, on average, scored less than non-ELL scholars in mathematics (Reyes & Hwang, 2021). ELLs have inadequate exposure to comprehension plans of action to enhance problem solving capability (Orosco & Abdulrahim, 2018). The mathematics coaches mentioned that ELLs were not receiving mathematics instructional support in the mathematical class setting; there was a possibility that ELLs were having a difficult time comprehending mathematical concepts such as imaginary numbers, which allowed ELLs to not perform as well compared to other subgroups. Tables show different student groups and how different groups performed on the SBAC mathematic assessment in the given years.

I collected interview data from the three school systems of this state's southwestern portion of the United States. School Site 1's score for 2018 was 39.6 points below standard, and in 2019 the ELL math score was 50.1 points below standard. In

comparison, School Site 2's score for ELL mathematics was 148.5 points below standard in 2018 and 186.4 points below standard. School Site 3's ELL's mathematic scores were slightly above standard. Each of the ELL's mathematic scores was lower than other ethnic groups. Since there were differences amongst the three schools reviewed for this study, I also recorded the school number and participant responses to see if there were any commonalities in the instructional strategies within each school. Table 1 shows the scores for the years 2018 and 2019.

Table 1

2018-2019 SBAC Mathematics Scores- ELL Overall Scores

Sites	2019 Scores	2018 Scores
English Learners Site 1	Yellow **50.1 points below standard** Declined 9 Points	Yellow **39.6 points below standard**
English Learners Site 2	Red **186.4 points below standard** Decline 38.2 Points	Orange **148.5 points below standard**
English Learners Site 3	Green **2.2 points above standard** Maintained -1.1 Points	Blue **2.9 points above standard**

Table 2 shows the scores of the various student groups. Table 2 informs on the different student groups such as Caucasian, African American, Hispanics, socioeconomically disadvantaged, Asian, and Filipino. All the mathematic scores in the subgroups improved for the 2019 year compared to the 2018 year.

Table 2

2018-2019 SBAC Mathematics Scores- ELL Scores by Ethnicity

Student Groups	2019 Scores	2018 Scores
Caucasian	18 points below standard	18.8 points below standard
African American	45.9 points below standard	69.6 points below standard
Hispanics	49.3 points below standard	63 points below standard
Asian	92.4 points above standard	76.9 points above standard
Filipino	43.6 points above standard	5.3 points below standard
Socioeconomically Disadvantaged	32.5 points below standard	56.2 points below standard

The local school district has dashboard scores for the 2018 and 2019 years but does not have the data for 2020 and 2021 because of the COVID-19 pandemic. 2017 was the start of the implementation of the local school district dashboard, which does not have the data of the specific schools. Thus, available data from the local school district dashboard begins in 2017 and ends in 2019. Most likely, there will not be any data from 2020 or 2021. Potentially the next data collection year could be 2022 or 2023.

As reported in the SBAC test scores, the other student groups scores increased, yet ELLs mathematics test scores decreased. ELLs experienced the two-fold dilemma of learning English and academic material in today's differing classrooms. Although ELLs may appear to be able to interact in English socially, they may struggle with mathematics academic work and understanding the terminology (Xin et al., 2020). As ELLs juggle varied responsibilities, such as learning a second language, ELLs may have difficulty

comprehending mathematical ideas in the classroom setting. ELLs may communicate socially with their peers, but there are different criteria levels to understand mathematical concepts. This challenges educators to support the mathematics achievement of Grade 9-12 ELLs in the local high school (Xin et al., 2020).

Table 2 included the different student groups and how varied groups performed in the SBAC mathematic assessment. The local school district realized a deficiency in ELLs mathematics achievement from the state testing of the SBAC scores. Thus, the local school district offered training for ninth through 12th grade mathematics educators to apply the eight Common Core mathematical standards.

Mathematics training sessions were offered to educators to learn how to help ELLs succeed in mathematics. Yet, the mathematics chair at one of the high schools indicated that educators were inundated with too much information without enough time to apply the training and stated there was insufficient training to impact mathematics achievement for ninth through 12th since ELLs continued to have difficulty in understanding mathematical concepts. Therefore, as ELLs progressed into higher-level mathematics, they were challenged to comprehend the mathematics concepts, according to a mathematics instructional coach in a local school district.

Many possible factors contributed to this problem of a decrease in 2019 SBAC mathematics scores for 11th grade ELL students of nine points and 50.1 points below standard. The nine points below mean informed how the ELLs were not improving as much as other groups with the average of the SBAC mathematic scores. For this study, the gap in practice contains the unknowing of why there continue to be challenges in

teaching ELL students to learn mathematics, which contributes to the students' SBAC scores. The purpose of this qualitative study was to explore the perceptions of the teachers' challenges in supporting the mathematics achievement of Grade 9-12 ELLs. The gap is that teachers were challenged to support the mathematics achievement of 9-12 grade ELLs, as demonstrated by poor performance in the SBAC. ELLs are not improving in their mathematics and are not succeeding in the mathematics classroom setting. Still, when self-efficacy is raised for ELLs, they should also increase their academic achievement in mathematics (Sandilos et al., 2020).

Rationale

The purpose of this basic qualitative study was to explore the perceptions of the teachers' challenges in supporting the mathematics achievement of Grade 9-12 ELLs as demonstrated by the poor performance in the SBAC. The poor performances, below standard, in 2018 and 2019 recorded on the SBAC reflected the challenges of pedagogy for ELLs in the three local high schools of a state in the southwestern portion of the United States. With this study, I sought to discover the perceptions of how educators implement the pedagogy, curriculum taught, and recommendations in the three local high schools. I addressed the gap in practice where ELLs were academically achieving less than other peers because ELLs appeared challenged and had difficulty comprehending basic mathematical ideas (see Reyes & Hwang, 2021). Turkan (2016) explained that there must be an extent to which mathematics educators have an expertise base allowing modification and offering effective teaching for ELLs.

Definition of Terms

Code-switching: Code-switching connects various languages, where talkers of different languages use alternate linguistic components in their foundational language. Two or more languages may be communicated during a conversation (Akkaya & Aydın, 2019).

Collaborative Learning: Collaborative learning signifies an educational way of using groups to improve learning through working collectively. Groups of two or more students work together to work out problems, finish tasks, or learn new ideas (Pratiwi, 2020).

Differentiation of Instruction: Differentiation of instruction indicates ways of teaching the alike content to all students using an array of instructional strategies. It may call for the educator to deliver instruction at differing levels of difficulty based on the competence of each student (VanTassel-Baska et al., 2020).

English Language Learner (ELL): ELL suggests a student who comes from a non-English speaking household and who is educated to learn English as an additional language (Dussling, 2020). The specific ELL populations for this study included African Americans and Hispanics.

Flipped Classroom: Flipped classroom means blended learning where students are acquainted with the subject matter at home and practice engaging through it at school. This is the opposite of the more accepted method of launching new material at school, then assignment homework completed by the students individually at home (Algayres & Triantafyllou, 2020).

Learning Math Through Representation (LMR): LMR refers to a research-based curriculum for educating and teaching fractions and integers. The number line is used as the leading representational context (Saxe & Sussman, 2019).

Problem Based Learning (PBL): PBL mentions a teaching method in which perplexing real-world problems are used to promote student learning of ideas and standards instead of the direct delivery of information and perceptions (Mustofa & Hidayah, 2020).

Scaffolding: Scaffolding comprises helpful interchanges between the educator and the student that allows the student to do something past what the student could undertake by oneself (O'Hara et al., 2020).

Smarter Balanced Assessment Consortium (SBAC): SBAC insinuates that an assessment is administered as part of the research site's state testing program. It assesses student proficiency in the Common Core State Standards (Stoneberg, 2016).

Sociocultural Theory of Learning: Sociocultural theory of learning denotes that learning arises during social communication between individuals. Its theorists posited that learning appears first through social interaction and second through individual internalization of social actions (Arrastia-Chisholm & Tackett, 2020).

Sociolinguistic Theory: Sociolinguistic theory signifies the potent view in which shifting is seized in progress so that leaders can be recognized. Both the course of its spread and its process can be depicted (Orman & Pablé, 2016).

Universal Design for Learning (UDL): UDL indicates using many teaching methods to remove obstacles to learning and give all students equal opportunities to

achieve. It is about building adaptability to accommodate every student's strengths and needs (Vie, 2018).

Significance of the Study

Since there was a significant decline in mathematics achievement, as represented in the SBAC scores of ninth through 12th ELLs at the three local high schools, I sought information on the perceptions of grade ninth through 12th mathematics educators on the implementation of curriculum, pedagogy, and recommended practices in aiding the learning of ELLs. If mathematics educators in the three local high schools are challenged by the mathematics curriculum, it becomes more difficult for mathematics teachers to support ELLs. The results of this study could provide educators with an understanding that educators might need extra support with the curriculum and what they might need to assist the ELLs. Extra support is needed from administrators, resources, and English Language Development teachers to assist ELL students in mathematical comprehension in the mainstream mathematical classes of this state's southwestern portion of the United States. This understanding could help administrators resolve steps to support educators with mathematical resources to help ELLs grasp mathematics concepts. The findings from this study could promote social change by focusing on assisting ELLs to succeed in mathematics classes and to believe ELLs will make practical steps for contribution to society.

Next, this study has the potential to build social change by providing ELLs the same space to succeed in mathematics along with other students. This study's original contribution could help educators implement curriculum, instruction, assessment, and

recommendations for ELL students in the local high schools. This understanding may lead to school-level support for the pedagogy for mathematics teachers in the local high schools to support ELLs in mathematics and return, help ELLs' scores and learning.

Research Question

The following research question was to gather the perceptions of the ninth through 12th grade mathematics educators on the challenges in teaching and learning ELL students. There could be many challenges the mathematics educators can have while teaching ELL students, and it would be essential to see the educators' viewpoints.

RQ 1: What are the perceptions of the ninth through 12th grade mathematics educators on the challenges in supporting the mathematic achievement of Grade 9-12 ELLs?

Review of the Literature

For this literature review, I identified journal articles, college textbooks, and peer-reviewed journal articles using different databases over the 5 years from 2018-2023. I used Eric, ProQuest, SAGE, and Education Research. The following keywords used in this review were please change *teacher perceptions, teacher attitudes, teacher views, teacher beliefs, educator perceptions, educator attitudes, teacher challenges, mathematics instruction, mathematics pedagogy, English language learners sociocultural, academic achievement mathematics curriculum, teaching practices, mathematics achievement, mathematic difficulties, mathematics achievement gap,* and *secondary education.*

The purpose of this doctoral project study was to explore the perceptions of the teachers' challenges in supporting mathematics achievement of Grade 9-12 ELLs through sociocultural practices. To support the perceptions of Grade 9-12 ELLs as demonstrated by the poor performance in the SBAC, I conducted a broad review of the current literature. The literature review was organized into four sections. The first portion of the literature review discusses the conceptual framework of the sociocultural aspects of teaching ELLs. The second aspect of the literature review reviews the achievements of ELLs. In the third portion, I discuss teachers' challenges in teaching ELLs. In the final part, the curriculum for teaching ELLs mathematics was reviewed.

Conceptual Framework

The conceptual framework I used for this doctoral project study was Vygotsky's (1978) sociocultural theory. This conceptual framework was appropriate for this doctoral study because I looked to investigate the perceptions of ninth through 12^{th} grade mathematics educators on challenges in teaching and learning of ELL students. Vygotsky's sociocultural theory emphasized the foundation criteria of social interaction in the development of cognition. Vygotsky regarded that community played an intricate role in the process of understanding. Communication was essential, which was why the sociocultural theory was used as a conceptual framework for this project study.

De Araujo et al. (2018) suggested that the conceptual framework, which demonstrated the mathematics challenges of implementing pedagogy and curriculum for ELLs, required different communication practices. The conceptual framework suggested that the aspect of classroom interaction in boosting ELLs to learn and that learning can

successfully occur in social dynamics with appropriate forms of support. Peer interaction allowed ELLs an environment for delving into the language. Pair and small group work have become more common for ELLs (Tavakol et al., 2022).

The framework helped inform the study by giving potential reasons why pedagogy and curriculum does not work effectively with ELL mathematics students and suggested that a sociocultural approach could improve ELLs' mathematical achievement. The framework contributed to the research question and helped guide the interview questions concerning curriculum, pedagogy, and best practices. The conceptual framework contributed to the research questions by exploring the sociocultural practices which could help contribute to the ELL's achievement in mathematics. The sociocultural practices could help contribute to the ELL's achievement in mathematics by the correlations of how ELLs interacted and accomplished different tasks in the class. The sociocultural practices could help ELLs develop certain habits for conversing with their peers and build the foundation of the subject area (Tavakol et al., 2022).

The research question was framed through the lens of sociocultural pedagogy and language because the questions wanted to see the perceptions of the ninth through 12th grade mathematics educators on the challenges in the teaching and the learning of ELL students. The conceptual framework contributed to the research question by allowing me to delve deeply into the curriculum, instruction, and assessment of the learning of ELL students. There can be a possibility where the social interaction for the ELLs connected to the curriculum, instruction, and assessment. Also, the mathematics educators can

possibly have challenges in teaching and learning of ELLs students because the sociocultural practices were not being utilized in the classroom setting.

De Araujo et al. (2018) explained that ELLs might have a different academic communication practice than their household or previous methods. This could create challenges for educators in helping ELLs succeed in mathematics courses. Even though ELLs are developing their English skills, they can participate in mathematical tasks and engage in conversations during a mathematics lesson (de Araujo et al., 2018).

Review of the Broader Problem

The academic achievement of ELLs is explained in the high school, junior high school, elementary, and overall setting. There was an explanation from the literature review of how motivation and self-efficacy helped ELLs achieve academic achievement. Also, there was an explanation of how flexible groups and differentiation instruction helped ELLs achieve academic achievement. There was an explanation from the literature review of how cooperative learning and hands-on instruction helped ELLs achieve academic achievement. There was an explanation of how multi-sensory instruction helped students improve their academic achievement. Next, informed on the literature review of the teachers' challenges teaching ELLs. There are insights of teachers were receiving not enough training to support ELLs. Also, there was a literature review on teaching secondary ELL students and teaching ELLs mathematics. There was information that educators have multiple tasks in their profession, making it challenging to support ELL students. The literature review on teaching ELLs mathematics informed on the difficulty of helping ELLs differentiate mathematical vocabulary.

High School ELLs Academic Achievement

At both the local and state levels, there was a concern about the achievement of ELL students learning in mathematics. ELLs' active involvement in a classroom that used collaboration, conversation, text analysis, and listening helped ELLs succeed academically (Salavert & Szalkiewicz, 2020). When ELLs were intrigued by the task and enjoyed working on a specific exercise, they improved their academics (Khawaja & Howard, 2021). The difficulty was updating teaching methods that regularly incorporated a current learning spectrum to meet ELLs' learning requirements, bringing the learning development uncomplicated for ELLs to comprehend the concepts (Seo & Taherbhai, 2018). When ELLs worked on intrinsically appreciated exercises, they were more likely to see the usefulness as clarified as the relevance of the assignment, not from the aspect of others or for an external worth (Seo & Taherbhai, 2018). For ELLs, a personal significance helped them achieve academically in the classroom setting. For instance, succeeding in mathematics may be critical for a student because it may be an essential component for an ELL. The literature review on high school ELLs' academic achievement connects to the study because it informs how mathematic educators can support their ELLs in their classroom setting.

After all, it may be a crucial part of their self-worth (Ökmen & Kılıç, 2021). ELLs require motivation to provide considerable momentum to initiate learning on the content. People viewed motivation as an attempt to boost ELLs who were not even motivated to be spurred in their education (Thipatdee, 2020). The motivation was crucial to attain the progress of learning proficiency. Educators saw that the detectable motivated nature was

lively and long-term in the classroom. Academic motivation established attentiveness to learning and helped in carrying out academic achievement for ELLs (Anwar et al., 2020). Anwar et al. (2020) discussed that motivation was acknowledged as stimulation to encourage ELLs to learn and bolstered them to devote some intentions to accomplish their educational goals. ELLs' learning expectations must be positive and excellent to achieve the utmost performance because the proper expectation among ELLs created high performance. The idea of learning by merging with collaboration with students helped ELLs improve their academic achievement (Thipatdee, 2020).

Junior High School ELLs Academic Achievement

For junior high school ELLs, self-efficacy was a factor in academic achievement (Soland & Sandilos, 2021). Self-efficacy was the core of human motivation, and without confidence in one's potential to achieve a task, there was little urge to initiate it (Magableh & Abdullah, 2020). Junior high school ELLs' improvement in math and reading over a spectrum were connected with the expansion in self-efficacy as ELLs moved along with their education (Soland & Sandilos, 2021).

Junior high school ELLs who believed in their learning potential may employ approaches that allowed them to be more productive across the academic matter (Soland & Sandilos, 2021). Empathetic educators strengthened self-efficacy in math for junior high school ELLs, which shared a positive connection with math test results. The flexible grouping in which students were grouped based on appeal, readiness, and occasionally based on learning descriptions helped junior high school ELLs to receive support in their classes from the literature review. Because junior high school ELLs learned in various

ways, educators should diversify their approaches to teaching to use more styles that can connect more junior high ELLs (Magableh & Abdullah, 2020). If junior high school ELLs become frustrated because the subject matter was too arduous, it could lead junior high school ELLs to disengage. However, it will be unfavorable if their teaching was below the junior high ELLs' standard or below their readiness.

Differentiated instructions allowed junior high school ELLs to work at their rate (Liman Kaban, 2021). Educators can accentuate junior high school ELLs' interests by enabling junior high school ELLs to partake in an independent study to learn what they are attentive to (Magableh & Abdullah, 2020). Students come to classrooms from various environments, cultures, inclinations, and requirements. Educators can differentiate instruction by utilizing an assortment of intelligence and being accustomed to what methods their junior high school ELLs might enjoy (Liman Kaban, 2021).

As the educator used differentiated instruction, the strategy would allow junior high school ELLs to collaborate with other students and improve their academics (Magableh & Abdullah, 2020). Another way that helped junior high school ELLs achieve academic achievement was through active learning (Suh et al., 2020). As educators used visuals in active learning, it was supportive for junior high school ELLs to elevate cultural awareness and intercultural communicative proficiency through class dialogue and activities that allowed them to gather a wealth of knowledge (Magableh & Abdullah, 2020). The literature review on junior high school ELLs' academic achievement connects to the study because there are insights into junior high school ELLs' academic

achievement, which could help mathematics educators have a different understanding on how to support their ELLs.

Elementary ELLs Academic Achievement

The elementary teachers realized that students' academic achievement improved when ELLs collectively processed the subject matter in groups (Asad et al., 2021). This gave ELLs a chance to work in small groups and learn to problem solve concepts, organize their thoughts, use the correct academic language, and edit their assignments in conditions of the practicalities of the subject area (Nair & Sanai, 2018). The elementary ELLs' writing skills concerns were eased as it was student-centered and activated the ELLs to write collectively.

As teaching and understanding development was focused on elementary ELLs, ELLs could progress in their academic achievement (Irby et al., 2018). The cooperative involvement kindled ELLs' desire and concentration towards the lessons, which forwards the academic work (Owens & Wells, 2021). Another aspect that helped elementary school ELLs were hands-on activities. The hands-on instruction made scientific comprehension more obtainable and helped them understand by lessening the language requirements for productive participation (Irby et al., 2018). When the content-area terminology and concepts are shown using visuals and hands-on tasks, ELLs can use their senses to comprehend the subject matter (Zubiri-Esnaola et al., 2020).

Using concrete objects in the school setting allowed cognitive relations with academic language spurs dialogue, and enhances background understanding (Irby et al., 2018). The hands-on instructions benefited the elementary school ELLs to comprehend

the subject matter and learn in the classroom setting. When the curriculum was purposeful and the education connected to the elementary ELLs cultural upbringing, elementary ELLs achievement was ameliorated (Estrada et al., 2020). As educators know about the experiences of their elementary ELLs, this allowed educators to make relevant connections between the curriculum content and ELLs' cultural backgrounds (Owens & Wells, 2021). Elementary ELLs' academic achievement connects back to the study because there are insights that inform primary education, which could compare to secondary education to support ELLs in the educational setting.

Another critical aspect of elementary ELLs' academic achievement was that the educators' beliefs have a paramount significance in their classroom methods to help ELLs succeed in the classroom setting (Clark, 2020). The development of positive academic standards was vital for preparing educators to support elementary ELLs (Polat et al., 2019). If the educators do not have the confidence to support ELLs, they may place the burden on ELLs' academic achievement on English as a second language (ESL) educators (Clark, 2020). If educators viewed elementary ELLs' presence in their class as an advantage, educators may design and practice instructional practices that have favorable effects on the ELLs academic achievement. Educators who supported multiculturalism are more successful in advancing the academic success of elementary ELLs. Educators in many nations with immensely varied populations entered classrooms with somewhat restricted tiers of readiness about the intentions of cultural and linguistic variances for ELLs learning. As educators have the mindset to advance multiculturalism, they will help elementary ELLs succeed in the classroom (Polat et al., 2019).

Overall Academic Achievement for ELLs

When ELLs do not use their primary language, it led to more intellectual and verbal requirements for ELLs, which may factor in reading challenges and potential placement into lower-tier classes (Alshahrani, 2019). Programs that assisted ELLs in elevating literacy in their native tongue be more productive than an English-only pathway (Gonzales & Tejero Hughes, 2021). ELLs who have a ground laying comprehension of abilities in the native language can carry over those skills while studying English. Native language teaching might be favorable for ELLs who entered academies with less established vocabulary and an abstract understanding of their native language. ELLs learned lessons from their native tongue, improving their academic achievement. Research has shown that educational pathways that boosted ELLs' native language literacy are more impactful than English-only methods. Being bilingual and bi-literate aided in higher degrees of achievement in English and could help ELLs in the future (Gonzales & Tejero Hughes, 2021). Among the multitudes of languages spoken around the globe, English has become the primary world language of the 21st century (Torff & Murphy, 2021). Two critical elements of learning English are vocabulary and spelling (Zhang, 2021).

The more substantial ELLs' vocabularies were, the more extensive material they would use that would help them, allowing them to converse and comprehend others much better (Alshahrani, 2019). Spelling was essential for ELLs to gain further academic understanding. Acquisitions of this ability were arduous, particularly for ELLs. English can be difficult because multiple words sound identical when pronounced but are spelled

contrastingly and, thus, have differing meanings (Lou, 2020). Because the English language was elaborate to master, the excellent pathway for ELLs to gain proper understanding was to incorporate a relation between spelling and reading comprehension (Alshahrani, 2019).

ELLs learned best through direct, multi-sensory, visual, and hearing teaching (Yu & Cheng, 2020). ELLs have academic achievement when spelling and vocabulary strategies are used in the compositions. Direct vocabulary instruction emerged to assist ELLs in increasing their fluency and academic language (Lou, 2020). ELLs comprehended 10 to 12 target academic words each week, and they worked on spelling. The practice was repeated until the ELLs acquired the spelling of each term, build the ELLs confidence, and increased their reading comprehension skills. The ameliorated vocabulary advanced the ELLs reading comprehension (Alshahrani, 2019). The literature review on overall academic achievement for ELLs connects to the study because the insights inform on what are the crucial needs to support ELLs in the classroom setting.

Teachers' Challenges Teaching ELLs

Teachers of ELLs have faced problems executing an instructional plan of action designed to improve their competence of ELLs (Duong & Nguyen, 2021). The issues were that teachers were getting little training to help ELLs, difficult to support ELLs in large class sizes in the mainstream classes, teachers have difficulties engaging ELLs, managing the time in the classroom setting, and emphasizing the academic language in mathematics class for ELLs (Vattøy & Gamlem, 2020).

Each of these situations' presented barriers or challenges for the educators teaching ELLs. Many classroom educators received little or no training in providing the types of support that ELLs needed to concurrently learn academic matters and skills to progress proficiency in the English language. Educator preparation programs are required to augment educators' views on their self-efficacy in educating ELLs (Shi et al., 2020). When educators do not receive the training, they ignore students' mixed backgrounds, apply teaching methods for ELLs, and depended on firm classroom protocols that made it challenging to support ELLs (Shi et al., 2020). Educators first acted on their reasoning and later analyzed how well their reflections served them in directing their teaching. When they do not have adequate training to help ELLs, it was difficult for educators to have a thought process to empower ELLs (Shi et al., 2020).

Secondary school class sizes were usually large, and it was difficult for educators to help ELLs be engaged in group work. Educators fretted about off tangent discussions and disciplines, which prevented educators from engaging with the ELLs (Duong & Nguyen, 2021). Educators believed that a small class size possibly gave ELLs more chances to drill verbalize skills than larger ones which were conjectured to cause unmanageable and unwelcome chatter. For middle and high schools, educators have limited time and time constraints that make it challenging to help ELLs.

Another challenge teachers faced was having enough time allocated to assist ELLs properly. Teachers have multiple learning targets to educate their ELLs in mainstream classes. ELLs have some difficulty understanding the concepts in a class taught in English. ELLs needed extra time to comprehend the ideas, and there are times

when educators do not have enough time to assist their ELLs correctly (Sriwichai, 2020). In a classroom setting, educators may utilize collaboration methods where ELLs conversed with other students on the topics taught in class. There were times when ELLs needed additional support in these collaboration settings, and educators did not have enough time allocated to properly assist ELLs while helping other students (Rao & Chen, 2020).

The final challenge encountered by educators was teaching ELL learners related to teaching the academic language during another academic subject, such as mathematics. ELLs have been disadvantaged by their difficulty to converse efficiently in English, mainly in finishing a core subject task. It notably allowed the ELLs to have the daunting task of thriving in a mathematics test. ELLs needed to develop both intricate content skills and language competence simultaneously to be effective in the classroom. Educators felt swamped by helping the ELLs comprehend the substantial number of academic words. There are times when ELLs do not learn the jargon, making it arduous for educators to support the ELLs in connecting their ideas (Yoon, 2021).

The repeated use of worksheets to support ELLs exercising the same sentence structures and recalling academic language words out of context may helped ELLs understand the concepts in class in the short term. Still, it was difficult for ELLs to comprehend the big ideas in the classroom setting. Educators have trouble helping ELLs understand the academic language and engage in the classroom (Lazarević, 2022). ELLs have difficulty in comprehensibility due to the lack of reading (Rahimi, 2021). Educators have a challenge teaching ELLs to comprehend the academic language because the ELLs

are not reading in English as much (Toba et al., 2019). It led ELLs not to engage in learning activities in various outlets. ELLs felt incapable in the classroom setting based on how ELLs felt with other mainstream students. As ELLs are not reading in English as much as mainstream students, educators have difficulty helping ELLs understand the vocabulary and connect with other students (Yoon, 2021).

Teaching secondary ELL students showed that teachers continue to struggle (S. Yu et al., 2020). ELL students in secondary schools were likelier to be taught in the mainstream classroom (Yoon, 2021). This caused great distractions, noise, and disruptions (Akbana & Yavuz, 2021). The last subsection on teachers' challenges in teaching ELLs related to teaching mathematics. There becomes a debate on who was responsible for teaching English, the English teacher, the ELL instructor, or all academic departments (Knaak et al., 2021). Another struggle appeared in deciding whether to teach the mathematical language or only teaching the formula (Abedi et al., 2020). The teachers' challenges teaching ELLs literature review connects to the study because the insights inform the educators' challenges and relate to what ELLs mathematic educators may face in their classroom setting.

Teaching Secondary ELL Students

Secondary educators have various aspects of teacher difficulty when supporting their ELLs. Secondary students seemed to be substantially active and needed a lot of monitoring from educators, leading to many disruptions or noise in the classroom. Educators have difficulty handling the noise, making it hard to support the ELLs in the mainstream classroom (Duong & Nguyen, 2021). Some educators believed an increased

workload, no backing from the education system, and insufficient training to help ELLs. The lack of curricular directions made it difficult for educators to support ELLs (Lazarević, 2022). Some educators regarded the subject matter as their primary duty; that was their primary job, and helping ELLs ameliorate their English was an additional task. Some educators believed it was the English educators' responsibility to help ELLs improve their English. As some educators put English development to other educators, this mindset made some educators have a difficult task supporting ELLs (Lazarević, 2022). Teaching secondary ELL students literature review connects to the study because the insights inform the difficulties educators face in their classes and could relate to what the mainstream mathematics educators tackle to support their ELLs.

Teaching ELLs Mathematics

Mathematics was usually thought of as solving mathematical problems without utilizing academic language. For all learners, however, mathematics demanded additional academic language learning for learners to become competent in mathematics discourse. For instance, mathematical terms such as sum, plus, and increase could be used to make a single idea, which will be understood in math problems. Educators have a challenge in helping ELLs differentiate mathematical terminologies (Arizmendi et al., 2021). ELLs must learn the vocabulary and the complicated sentence processing of word problems. It placed additional challenges on the number of facts that ELLs must understand in their second language to solve a mathematic concept (Soland & Sandilos, 2020).

As educators have multiple facets to help ELLs, educators have difficulty conveying mathematical ideas to ELLs (Arizmendi et al., 2021). ELLs excelled when

language heavy math problems were lowered in word amount, and their peers in a mainstream class also excelled. Educators have difficulty balancing mathematical language and math problems to help ELLs (Arizmendi et al., 2021). Arizmendi et al. (2021) conducted a study that consisted of 3,766 participants who were ELLs in a language-focused mathematics support study group. Two of the six groups of students had ELLs who were recognized as at risk.

Students with low math capabilities were considered at risk (Arizmendi et al., 2021). The ELLs that had a language focus on mathematics interventions were more effective than the ELLs who did not have a language focus. The ELLs who had pre-teaching essential academic language, mathematical language modeling, and chances for practice ameliorated their mathematic skills. Also, the visuals and explicit instruction while using the ELLs native language support helped the ELLs to succeed in the classroom (Arizmendi et al., 2021). Teaching ELLs mathematics literature review connects to the study because there are insights into educators' difficulties when supporting ELLs in the classroom setting. The literature review may correlate with mainstream mathematic educators' challenges in their classes.

Code Switching Pedagogy

Another effective pedagogy for teaching ELLs was code switching, which included language and communication tools. Code switching contributed to ELLs with a pedagogic benefit and helped students understand the content more. Code switching helped ELLs to develop solid vocabulary in both languages, which was one of the foundations of bolstering multilingualism (French, 2019). ELLs were shocked as they

had never heard of polygons before, and only after the educators utilized code-switching did ELLs begin to grasp the concept (Maluleke, 2019). Code switching enhanced ELLs' insufficient vocabulary when handling new material. Code switching allowed to help support ELL's comprehension of the mathematics word problems more clearly. If there was no aid, the students were uninvolved in class and copied whatever the educator wrote on the whiteboard without understanding how to implement the information presented (Maluleke, 2019). Teachers engaged in code switching when they recognized that learners found it difficult to comprehend the subject matter presented in English (Tai & Wei, 2021). Code switching was a sociocognitive purpose of supporting learners to understand their native language and can be utilized to serve the same purpose as in English (Mohammed et al., 2020).

Educators were encouraged to allow ELLs to code switch willingly to promote participation in the class. ELLs used code switching to show the educator that they comprehend the lesson of the subject matter, and ELLs can explain to the educators utilize code-switching when they are stuck on a problem (Maluleke, 2019). Code switching served as a method to help linguistic and cultural diversity in multilingual communities. Code switching was a sociolinguistic plan of action that can support both educators and students improve their English vocabulary and understanding complex mathematical terms comprehensibly (French, 2019).

Code switching was a strengthening strategy that supported teachers in cultivating a solid relationship with ELLs. It allowed educators more chances to converse with the ELLs and develop the ELLs' enthusiasm for mathematics. Code switching will enable

learners to bond with the educator while simultaneously allowing them to comprehend mathematics (French, 2019). Code switching developed active engagement between educators and students who view their educators as guides.

Flipped classroom and code switching are two dynamic pedagogies that supported ELLs to succeed in the subject matter. Utilizing the flipped classroom allowed the ELLs to receive quick feedback and learn how to improve their mathematics. Also, the videos gave them the support to review the critical concepts for the class. The code switching pedagogy helped the students comprehend the mathematics word problems, strengthening their native language and English. It allowed ELLs to participate and get involved in the class setting. These two pedagogies were instrumental in helping ELLs to comprehend the content area.

Regardless of the finite language ability in one of the codes, the non-fluent bilingual ELLs could create grammatically sound switches. The code switched pronouncements made by educators and students were primarily grammatical, and utterances were steady (Tai & Wei, 2021). The code switching helped ELLs connect with their native language and understand the subject area (Bravo-Sotelo, 2020). Times were using pure English when there were mathematics inquiries. Some of the mathematical expressions were already comprehended by students, and it would be more arduous to translate the different mathematical expressions (Sharma, 2018). Using pure English through conversation with ELLs presents restraints, and speaking in the pure native language can be unnecessary because mathematics terminologies essential to understanding mathematics ideas are usually English (Tai & Wei, 2021). Unless

mathematics educators and students are acquainted with the equivalent language words of mathematics terminologies, using non English through mathematics discussions can be arduous (Bravo-Sotelo, 2020). Code switching for lesson delivery was supportive for ELLs because code switching eases students' cognitive strain of comprehending both language and subject matter at once (Edgerton & Desimone, 2018). Code switching was necessary because mathematics terminologies and expressions in English are vital components in explaining and discussing subject matter knowledge. So it was comprehensible when equations were articulated in English (Bravo-Sotelo, 2020). The code switching literature review connects to the study because there are insights into instructional strategies to support ELLs in the classroom setting.

Language Objectives

Subject content teachers are primarily professionals in their work, such as mathematics, but they might have little awareness of language as a medium for learning and teaching (Mäkipää et al., 2021). Language objectives are construed as statements emphasizing written and oral language that students needed to accomplish the activities connected with the content objectives of the lesson (Hansen-Thomas et al., 2019). Language objectives laid out the definite language attributes learners used to read, talk, hear, and write within a lesson to work out their learning goals (Hansen-Thomas et al., 2019). Educators prioritized the objectives in detail in both content and language and displayed the objectives in clear interpretations focusing on the lessons (Mäkipää et al., 2021). As the language objectives have content and language details, teachers have

refined them to support students in connecting language with the content (Gleason et al., 2018).

Cardimona (2018) explained ELLs faced the difficult task of learning mathematics in a different language in a mainstream class. Educators used academic language support and problem-solving skills for the ELLs, but students have difficulty comprehending English. Turkan (2016) explained that there must be mathematics educators with an expertise base who can modify effective teaching for ELLs. Turkan (2016) questioned the most valuable pedagogical and language practices to teach mathematics to ELLs and inquired about what professional developments will help mathematics teachers support ELLs. Language objectives literature review connects to the study because the insights informed instructional strategies that support ELLs in the classroom setting.

Curriculum for Teaching Mathematics to ELLs

The curriculum for teaching mathematics to ELLs was emphasized because of the social-cultural element of communication and language practices. Different curriculums could support ELLs to succeed in the content area. Learning Mathematics Through Representation, Universal Design for Learning, Problem Based Enhance Language Learning, Problem Based Learning, Mathematics Instruction to Task, and Intelligent Tutor-Assisted Mathematics Intervention Programs are different curriculums that helped ELLs blossom in the content area. In these different curriculums, educators are engaging ELLs to build their skills to comprehend mathematical concepts. The curriculums will emphasize collaboration for ELLs to succeed in the subject areas.

Learning Mathematics Through Representation

Because of the collaborative nature of representation, it was included as a communication practice. Students engaged with activities and discourse connected to mathematics when they utilized Learning Mathematics Through Representation (LMR). LMR develops and reflects upon units. Students used insights from launching discussions during the collaboration as they solved problems leveled in difficulty. In the concluding discussion, the educator encouraged scholars to converse concepts and model the class to clarify disagreements. LMR lessons engaged students with visual and tangible representation using number lines and rods to depict the distance (Saxe & Sussman, 2019). Students' actions and observations of their actions may be specifically helpful for ELLs' mathematical growth. ELLs who engaged in LMR will show progress in mathematics, and there was a rise in mathematical success while ELLs engaged in the LMR classroom.

There was a system involved in the lessons for the LMR curriculum. Lessons started with two or three nonroutine warmups that began the lesson's subject matter. LMR allowed for a formative assessment for students with various conceptual understandings and provided a focal point for the opening discussion (Saxe & Sussman, 2019). There was a post-intervention achievement gap for ELLs involved in LMR classrooms. Also, the LMR curriculum allowed students to problem-solve. Educators utilized manipulatives and visuals while teaching the content (Saxe & Sussman, 2019). The design aspects of LMR have five levels of recurring lesson system, allowed students to participate in different factors of discussion and problem-solving. LMR classrooms

supported the standards in which there was an expectation that students would bring their conjectures and reasoning into the discourse. Also, students listened to their peers' perspectives in the discussion and partner work. ELLs who were involved in LMR improved on integers and fractions. They did not need the number line to help enhance integers and fractions. Learning mathematics through representation literature review connects to the study because the insights inform instructional strategies that help ELLs succeed in the classroom.

Universal Design for Learning

The universal design for learning (UDL) was included because of the social aspect. UDL helped ELLs in mathematics. UDL helped with incorporating skill building skills. Students could problem solve in written and verbal discourse to obtain content information. Students worked in groups that had to describe essential parts of the task. They had to find various points of entry to connect knowledge to academic work, and UDL gave different modes of tests (Staats & Laster, 2018). Educators utilized more facilitation modes compared to direct instruction. Teachers used questioning strategies to help ELLs to comprehend mathematical concepts. Universal design for learning literature review connects to the study because the insights inform instructional strategies to support ELLs in the classroom setting.

Language Learning and Problem Based Learning

Problem based learning helped ELLs collaborate and solve problems in the social-cultural aspect. Problem Based Enhance Language Learning (PBELL) and Problem Based Learning (PBL) curriculum helped ELLs improve in the content area. PBL

allowed ELLs to work on their problem solving skills. The progress of PBL enabled educators to help learners comprehend the content area and connect to many possibilities in their lives. PBL allowed students to work on mastery of content standards and persevere in relevant problems (Berenji, 2021). Students collaborated to understand conflict and work towards finding a solution. PBL helped ELLs to build on their academic language. The combination of PBELL and PBL utilized ELL strategies while deliberately improving language use and progress. PBL allowed educators to enforce new standards and effectively work with all students. PBELL and PBL enabled students to participate. There was the observation of increased student participation and engagement in the lessons. Students were self-directing when they were stuck in a problem. They were able to find a solution to the content when there were times when they were struggling (Guest, 2021). When students are given the skills to prepare for academic discussion, the pace of participation developed.

LMR, UDL, PBELL, and PBL curricula showed that collaboration with their peers significantly impacted ELLs' success in the content area. Educators were teaching the curriculum more as facilitators compared to giving direct instruction. As students were working on cooperative activities in the curriculum, ELLs could utilize the academic language in the class setting. The physical representation made a huge factor for students to succeed in the content area in the curriculum. The verbal with the physical representation helped ELLs utilize different modalities in the curriculum. Language learning and problem based learning connect to the study because the insights inform the curriculum that can help ELLs in the classroom.

Making Mathematics Instruction to Tasks

Making mathematic instructions for the task was emphasized because of the collaborative nature of this pedagogy. Taking mathematics instructions to tasks helped students to improve their mathematics. The educators of ELLs have a continual problem with managing equitable student approaches to figure out contextualized problems when there are language barriers (Chu, 2019). To overcome the obstacles, there are different tasks in mathematics classes. Students will break down tasks into groups and collaborate. They will verbally explain what they examined. A split instructional design allowed intriguing tasks that call for students to communicate with one another about mathematical concepts. Mathematical communication enabled the ELLs to understand mathematical ideas more thoroughly (Chu, 2019). The informational gap task allowed students to listen to a description of a mathematical concept because they were not given complete information. ELLs would ask questions to clarify the meaning and enforced students to utilize language to communicate mathematical ideas during the task (Aldana & Martinez, 2018). The task process challenged students to build explanations and then explain the mathematical reasoning of others. ELLs could concur or challenge the differing mathematical perspective. This method was a format of the task to engage ELLs in their mathematics (Monarrez & Tchoshanov, 2020). Making mathematics instruction to tasks connects to the study because the insights inform pedagogy that can help ELLs succeed in the classroom setting.

An Intelligent Tutor-Assisted Mathematics Intervention Program

The sentence supported this pedagogy because of the social aspect. The computer-assisted mathematical program-solving system helped ELLs collaborate with their other students and solve problems, which helped in the social part. A computer-assisted mathematical program-solving system helped ELLs to problem solve. The graphical representation strategy assisted in problem-solving, and the four-step problem-solving procedure allowed ELLs to reflect on the mathematical concepts they were solving. Students understood the problem and constructed a plan to solve the problem. ELLs carried out the plan and refined their thinking process for solving a mathematical problem (Hübner et al., 2020). The program allowed ELLs to work on their problem-solving skills. The interactive games enabled students to be engaged, and the system provided feedback on what ELLs must improve. The program gave indirect suggestions to facilitate students' problem-solving of mathematical concepts (Monarrez & Tchoshanov, 2020). The program engaged ELLs in developing mathematical thoughts, and the reasoning behind the mathematics was made clear to students. Modeling real problem situations into a mathematical model allowed students to work on their arithmetic. Students could draw visuals in the program, which allowed ELLs to comprehend mathematical concepts more thoroughly. The program gave multiple options to understand the mathematical problem (Lavery et al., 2019). The program showed the possibility of promoting problem-solving skills for ELLs. The concrete model-based problem-solving instruction allowed students to tackle mathematical concepts with problem-solving skills (Hübner et al., 2020). An intelligent tutor assisted mathematics

intervention program literature review connects to the study because the insights inform pedagogy that can help ELLs in the classroom setting.

Teaching Practices for ELLs

Various teaching practices helped ELLs to succeed in the content area. The different teaching practices for ELLs from the literature review would be storytelling, learning vocabulary, task modification, class communities, and learner-centered. These teaching practices have components that allowed the ELLs to comprehend the content level and succeed in the course work. Some situations could be where the students are to participate more in the class setting. This can be where the students problem solved and worked collaboratively with their peers. The educator could support students to ease their language skills while utilizing academic language in the course work. The teaching practices helped students be confident speakers while educators used the skill sets.

Storytelling Helps English Language Learners

Storytelling accentuated student-centered description, and storytelling was a focus that has been utilized in international science education backgrounds. While the exercise of video making needed clear-cut teaching early on, video making have produced good outcomes for students. When building videos, students are encouraged to go through self reflecting and cultivate thoughtful and independent learning (Chubko et al., 2019). The video-making allowed students to control the exercise. They can work on creativity in relating project matters to their interests and past knowledge to build their determination—the introductory stages of the course helped build team building and attempted to assist students' comprehension. The different perspectives are essential for

gaining a better grasp of the content. Additionally, the analysis of the lesson validates that technology does not need to be the fundamental focal point of the lesson to be adequate. Technology can develop the contexts for students' cooperation and insight construction (Chubko et al., 2019). Students could bring their feedback confidently while participating in digital storytelling. Digital storytelling helped raise ELL's attention in areas for development in their language content knowledge and learning ability. Storytelling helps English language learners' literature review connects to the study because the insights inform teaching practices that can help ELLs succeed in the classroom.

Teaching and Learning Vocabulary for English Language Learners

Vocabulary was regarded to be the keystone of language courses. Vocabulary acquisition remained a very active aspect of research with essential indications to advise practice (Sa'D & Rajabi, 2018). ELLs having successful vocabulary gained have been correlated with successful reading skills and becoming more conversational, confident, and proficient. The repetition of choral or ELLs following the educators' explanations and asking students to present their examples helped ELLs improve their vocabulary. This technique was used in most observed classes (Sa'D & Rajabi, 2018).

Differentiated instruction, storytelling, and vocabulary utilization helped ELLs succeed in the classroom setting. Educators could use these teaching practices so that ELLs could understand the content area. ELLs have difficulty communicating with their peers and educators in a traditional classroom setting, but digital storytelling helped ELLs participate in the class. Differentiated instruction was pivotal for ELLs to collaborate with their peers and build their language skill sets. The teaching and learning vocabulary

teaching practice encouraged students to develop their vocabulary acquisition and communication in the class by utilizing choral teaching practices. When students can explain their examples, it helped them build their vocabulary. These three teaching practices were crucial for ELLs to thrive in class.

The direct instruction of mathematical terminologies through educating daily word problems ameliorated ELLs' verbal mathematics vocabulary notably, and ELLs' mathematics comprehension somewhat improved. The regularity of using mathematics terminologies in ELLs' oral discourse was increased vastly by the direct teaching of mathematics vocabulary (Valley, 2019). Word problems were an excellent approach to repeating vocabulary words in an enjoyable process. The outcomes of the frequency tally displayed that the word problems were efficient for vocabulary and a practical approach to teaching new vocabulary to ELLs (Mwale & Mwakapenda, 2018). Students who obtained constructed criticism seemed to learn more, and slowing down the process when explaining the academic language helped students comprehend the terminologies. Teaching and learning vocabulary for English language learner literature review connects to the study because the insights inform the teaching practices that can help ELLs succeed in the classroom.

Task Modifications for English Language Learners

The Task Modification was being discussed because it allowed ELLs to communicate in learning mathematics. Educators are urged to carry out high level cognitive demand assignments and sustain high expectations when teaching ELLs. The suggestion entailed providing only low cognitive demand tasks, which may lower ELLs'

opportunity to acquire information (I, 2019). Providing a plan of action for high quality mathematics instruction lined up with linguistic support was essential. Task modifications of graphic organizers supported ELLs in envisioning ideas and comparing conversations between an educator and student through role playing support ELLs to understand mathematics (Seetee et al., 2021). The task modifications periodically entangled, simplifying sentences and increasing visuals. The task modifications of multiple solution pathways granted ELLs to utilize their abstract reasoning while comprehending mathematics ideas (Di Domenico et al., 2018). The task modifications related to ELLs' lives help ELLs contextualize the mathematical concepts. When task modifications are connected to ELLs' lives, there will not be a reduction of cognitive demands in either language or mathematics (I, 2019). When there are real life examples, educators could support ELLs in inquiring how they solved the mathematics problems, and ELLs could understand there are different approaches to solving mathematical problems. The task modification of asking why-questions to the ELLs' responses allowed ELLs to reflect on their learning in the mathematics courses. Task modifications for English language learners connect to the study because the insights inform the teaching practices that may help ELLs succeed in the classroom.

Classroom Communities for English Language Learners

The classroom communities for ELL pedagogy were included because it allowed ELLs to work on their communication skills with their peers and in a sociocultural outlook. ELLs bond with other language learners allowed a safe space for people to practice their new language and learn academic information without the concern of

competition or shame from English speakers. English speakers could provide entry to deeper subject matter learning than communicating with others limited to converse in English (Johnson et al., 2020). Typical classroom educator student interactions are thought to generally build a positive environment where students' peer relationships could excel. The emotional backing, characterized by a sincere, supportive climate, educator understanding of student needs, and regard for the child's viewpoint, has been most consistently connected to ELLs social skills and classroom peer environment (Kim Glatt Yochai, 2019). The emotionally supportive educator-student dialogue provided students with a beneficial model of the types of relational skills prevalent in forming relationships, a secure foundation, and a helpful context in which ELLs can safely examine and take risks in their peer involvement (Lotan et al., 2019). The higher levels of emotional care for ELLs were connected to less rigidity in the social order of the classroom. The general helpful teacher-student interaction quality will relate to the higher percentage of friendships in the classroom and helped ELLs to succeed in the classroom (Johnson et al., 2020). Classroom communication for English language learners literature review connects to the study because the insights inform the teaching practices that may help ELLs succeed in the classroom.

Learner Centered for English Language Learners

The learner centered was included in the literature review because the ELLs utilized their social and cultural background to collaborate with their peers. Learner centered education was believed to have various learning gains, and educators' mindsets and practices portrayed a vital role in furthering its results. As educators aimed to

improve ELLs' English language development, ELLs generally encountered language shortcomings and shallow content familiarity. The difficulties are reflected in grammatical errors, vocabulary deficiency, and a restricted range of thoughts (Imane Badjadi, 2020).

An educator needed to integrate learner centered teaching practices to advocate for students to expand their knowledge regarding both language and content. There was considerable significance to be given to the social components of ELLs. Cooperative and collaborative methods are essential for ELLs. Learner centered education has a foundation for progressing communication skills and increasing personal growth (Kusumaningrum, 2018), using cooperative and collaborative strategies, while learner centered education furthered development in many aspects. ELLs could comprehend and utilized the content to life scenarios, develop confidence, and learn to utilize interpersonal skills efficiently.

The collaborative conservation allowed ELLs to assist in discussing and progressing as thinkers. Students have the chance to benefit from the educator's existence, and students received responses from varied sources (Bremner, 2021). The learner centered verbal interaction helped circuiting development with ELLs problem-solving in groups. ELLs could acquire new terminologies and grammar with the cooperation of their peers. Learner centered encouraged ELLs to engage in active learning through directed discovery to expand ELLs' resources rather than relying solely on the educator. The guided discovery allowed the ELLs to be challenged and work on the content area while receiving support from the educator (Qasem, 2020). Learner

centered for English language learner literature review connects to the study because the insights inform teaching practices that may help ELLs succeed in the classroom setting.

Sociocultural Aspects of Teaching Mathematics to ELLs

The aspects that will be emphasized in the sociocultural literature review will be the sociolinguistic theories of language, collaborative pedagogical practices, the dimension of language in mathematics, and constructing sociocultural awareness. The sociolinguistic approaches to language focused on how the sociocultural aspect will bring different outlooks on how educators and students utilize language. The emphasis of the collaboration with peers and educators will be on the sociolinguistic theories of language. The collaborative pedagogical practices will focus on the cooperative sociocultural nature and language improvement in the content areas. Dimension of language in mathematics focused on mathematics language while in sociocultural outlook. Constructing sociocultural awareness focused on how prior knowledge impacts sociocultural awareness.

Sociolinguistic Theories of Language

Learning mathematics while studying English entailed that ELLs understood to engage in academic conversation methods that may contrast with home or society communication practices. Sociocultural viewpoints were shown, concentrating on educators' guiding emergent bilingual students' mathematical conversation utilizing technology. From the sociocultural outlook, this learning difficulty was not simply mental but included a range of learning to engage in appreciated sociocultural practices and societies (Mpalami, 2022). Developed sociocultural perspectives on language

motions should contribute to expanded access to linguistic intricacies and grade level possibilities in teaching and learning methods. In utilizing a sociocultural lens, the socio-cultural lens emphasized how educators and students used language, varied semiotic resources, and symbolic tools to study mathematics and mathematical discourse methods in a context where students are learning (Lachance et al., 2019).

The predominance of sociocultural perspectives among the writers bolstered the demand to account for regional social contexts and discourses in the progress of educator education courses. Equal access to academic vocabulary, verbal academic discourse, and grammar may improve ELLs' sociocultural and linguistic necessities for academic improvement (Mpalami, 2022). The applicability was the concurrent sociocultural expansion of students' metalinguistic learning and linguistics along with educators' progress goals beyond fixed vocabulary lessons with academic dialogue and content language. Educators saw themselves as essential human resources to advance student learners' development. The educator gave value to their own set up of new knowledge through collaboration and transformative methods while engaged with content educators. The sociolinguistic theories of language literature review connect to the study because the insights inform the conceptual framework aspect of the study.

Collaborative Pedagogical Practices

Collaborative pedagogical methods are significant. Collaborative pedagogical approaches featured educators' development and learner power based on shared efforts. These beliefs would feature that educators have solid and considerable abilities connected to identifying the importance of equality in education and the intricacies and sociocultural

nature of cooperative methods for language improvement with their learners (Lachance et al., 2019). The study showed results that most educators remained to accentuate vocabulary instruction as the main route to academic language instruction, making space for a new articulation of broad socio-cultural, pedagogical concepts and further outlooks of the range of their instructional methods (Schneider & Arnot, 2018). The sociocultural paradigms allowed us to comprehend learning as a social form through communication with colleagues and professionals and are socially situated in diverse contents with ideologies and standards for communication (Jaffee, 2021). A sociocultural angle pointed out the crucial role of student interaction with one another (Gordon, 2019).

The sociolinguistic theories of language and collaborative pedagogical practices explained that collaboration between students and educators was essential (Gordon, 2019). The sociolinguistic theories of language explained how sociocultural outlooks on language improving on teaching methods (Suh et al., 2020). The collaborative pedagogical focused on how cooperative ways of a sociocultural nature could help language support for the students. These two aspects are essential factors that emphasized the sociocultural aspects of teaching and learning. The collaborative pedagogical practices literature review connects to the study because the insights inform the conceptual framework aspect of the study.

Sociocultural Dimensions of Language in Mathematics

ELLs who learned mathematics in English may have academic communication practices that vary from home or community communication practices. From the sociocultural viewpoint, this learning challenge was not simply cerebral but included a

range of learning to engage in valued sociocultural systems (de Araujo et al., 2018). From a sociocultural foundation, the mathematical process was not detachable from semiotic tools and language utilized to do mathematics. Researchers embracing sociocultural positions argued that ELLs have chances to talk, learn, and engage in the mathematics classroom (Chowa & Masa, 2019). Research fixated on ELLs' use of their primary languages and analysis connected to illustrating ELLs' cultural supplies in mathematics draw on sociocultural ideas. The sociocultural aspects can be shown with attention to educators' aiding ELLs' mathematical communication through technology, modeling, and providing chances for interaction and utilizing vibrant mathematical terminologies with students (Hoff, 2019). The predominance of sociocultural outlook was the need for local social contexts and dialogues in the growth of educator education programs. Educators brought approaches that often restricted their abilities to recognize and leverage ELLs' various mathematical knowledge foundations (de Araujo et al., 2018). The sociocultural dimension of language in mathematics connects to the study because the insights inform the conceptual framework aspect of the study.

Constructing Sociocultural Awareness

Educators are recommended to be aware of ELLs' sociocultural upbringing and ELLs' linguistic necessities. Sociocultural outlooks viewed human learning as an active social activity in physical and social situations. The sociocultural perspective considered that human understanding was built through learning through social tasks (Bautista Pérez, 2018). Social awareness included both skill and will to collaborate with others, involving motivation, empathy, and the capability to deal with social causes. ELLs expanded the

concept of culture when students showcased their oral presentations connected to cultural awareness (Mellom et al., 2018). The growth of the sociocultural ability of ELLs was largely impacted by their prior knowledge. ELLs brought their ideas, values, and background to the classroom during the varied activities. Educators were pivotal in creating learning environments that promoted the students' sociocultural awareness and frequently analyzed and reflected on the results of tasks in the classroom (Tavakol et al., 2022). ELLs acknowledged that sociocultural activities offered them a special chance because they had to face obstacles that led them to create and expand their linguistic abilities and raise sociocultural awareness. Educators are pivotal to immersing in a sociocultural outlook and connecting the classroom worldwide and locally (Bautista Pérez, 2018). Constructing sociocultural awareness literature review connects to the study because the insights inform the conceptual framework aspects of the study.

Implications

The purpose of this basic qualitative study was to explore the perceptions of the teachers' challenges in supporting the mathematics achievement of 9-12 grade ELLs. The implications of this doctoral project study included finding ways to help educators support ELLs in mathematics achievement in the classroom and assessments. Educators can have a variety of difficulties in supporting ELLs in mathematics. Based on the data collection and analysis, the project deliverable was a three-day professional development series. This three-day professional development was designed to enhance teachers’ knowledge and support ELL mathematics achievement. As teachers brought their insights into challenges to support mathematics achievement for ELLs, this professional

development (PD) was designed to assist mathematics teachers in the local high schools. Based on the four project deliverables, the three day professional development project was the selected projected deliverable. Educators can have the opportunity to have active learning while participating in the three day professional development so they can support ELLs in their mathematic classes. There was a possibility educators may need extra support to help ELLs, and conducting PD may give teachers an avenue to improve providing academic support for ELLs. The results of this study could guide school leaders to help and organize PDs that are on the specific needs that mathematics educators need as they explain the difficulties of supporting mathematics achievement for ELLs. It could also help other high schools in the district to support mathematics educators to support ELLs in mathematics.

Summary

The population of ELLs is continually growing. Roughly ten percent of children in United States public schools are ELLs (E. Schneider, 2019). ELLs in the United States are historically lower accomplishing students than proficient English students (Kim Glatt Yochai, 2019). As ELLs lacked mathematics competence, ELLs will need attention and support to succeed in their mathematics courses. Educators were challenged to support the mathematics achievement of ninth through 12^{th} grade ELLs, as shown by the poor performance in the SBAC. The sociocultural theory was the conceptual framework for this study. There must be mathematics educators with a knowledge foundation who can modify effective instruction for ELLs (Turkan & de Jong, 2018).

The focus of section 1 was the local problem and rationale of the project study. There were definitions of terms that were incorporated and explained the study's significance. There was one research question and an extensive review of the literature. Section 1 started with the conceptual framework and looked at the bigger picture of the overall achievement of ELLs at different grade levels. The literature review looked at the teachers' challenges in teaching ELLs to teach ELLs mathematics and looked into the sociocultural aspect of teaching mathematics to ELLs.

In Section 2, I informed the basic qualitative research design, selection of participants, and steps for data collection and analysis. There was a justification for the research and selection criteria for participants. I informed the procedure access to participants and established a research-participant working relationship. Also, I informed on the data collection and justification of participants. For the data analysis, I reported the accuracy and credibility of the findings. There was a procedure for addressing discrepant cases and a procedure for addressing discrepant cases. The results will be shown and examined, connected to the local problem and the larger body of research.

Section 2: The Methodology

Research Design and Approach

In this study, I explored the perceptions of the teachers' challenges in supporting the mathematics achievement of Grade 9-12 ELLs in the local school setting. Qualitative data was collected to gain more of an understanding of why high school educators are struggling to use the mathematics curriculum with ELLs in the ninth through 12th grade school setting. I investigated the perceptions of the ninth through 12th grade mathematics educators in teaching, learning, and curriculum of mathematical achievements of ELLs. This study showed evidence of the need for instructional methodologies of mathematics educators focused on the ELL population. The study members informed how to use specific strategies targeting ELLs.

A basic qualitative design was used because it allowed for the expansion of the understanding of individuals who participated in the study. Qualitative research was specially arranged to present researchers with data more connected to human events. The qualitative research pathway produces detailed information on the experiences and analyzes the significance of participants' actions (Stahl & King, 2020). I discovered participants' focal experiences and understood how the meanings are created using a basic qualitative approach to interviewing (see Frankel et al., 2021). I used a qualitative method because the method was exploratory in nature and allowed the researcher to see different perspectives. The fundamental advantage of qualitative research are emerging causal rationales (Maxwell, 2021). I used the qualitative method to see the causation from the interviews of the basic qualitative design.

Justification for Research

Quantitative research was considered because it can be useful to collect data by conducting different surveys; however, this research methodology was not connected with the research question, as quantitative research emphasizes connections between various variables. Quantitative research methodologies analyzed information in numbers and possible statistical data (Yükselir, 2020) which would not have answered my research question. Quantitative research was unsuitable for this study because quantitative research analyzed data utilizing numbers.

Quantitative methods would not provide a thorough understanding of the perceptions of ninth through 12th grade educators in ELLs' teaching, learning, and curriculum of mathematical achievements. This study took place in a natural setting and allowed participants to express their outlooks and beliefs on the mathematics curriculum for ELLs. The qualitative data consisted of data gathered from interviews, allowing an in-depth study of how educators utilized the mathematics curriculum to support ELLs. Quantitative research was the most practical for accurately calculating different variables, using experimental or statistical controls to decide their outcomes on other variables, and making conclusions from a probability representative of a population (Maxwell, 2021). In the basic qualitative design, there will not be experimental or statistical controls needed for quantitative research. Therefore, quantitative research would not work.

Participants

The purpose of this basic qualitative study was to explore the perceptions of the teachers' challenges in supporting the mathematics achievement of Grade 9-12 ELLs.

The three local schools from a single state in the southwestern portion of the United States were selected for this doctoral project study due to the number of ELL students enrolled. At the three local high schools, general education educators are responsible for educating ELL students with the same criteria as non ELL students. The ELLs are taught in mainstream classrooms. The participants chosen for this doctoral project study included general mathematics high school teachers who teach in the local high schools.

Selection Criteria for Participants

I selected the study site schools because their ELLs mathematics SBAC scores went down in the local school district. In addition, I selected three schools to increase the participant ratio to eligible mathematic educators. The ratio of ELLs was roughly 30% of the total participants for the social science research.

Procedure Access to Participants

Before collecting any data, I acquired Institutional Review Board (IRB) approval from Walden University and permission from the study sites. The associate superintendent of curriculum, instruction, innovation, and support permitted me to conduct the research study. Once approval was granted, I communicated with the principals about conducting a doctoral study at the three local high schools. Once the site approvals were received, the principal provided me with a list of possible participants. I emailed each participant individually to introduce myself and to clarify the purpose of the doctoral project study. Because of COVID-19, I met with each potential participant virtually. While recruiting participants, I attempted to obtain four participants for each

integrated mathematics class. There were 52 mathematics educators in the three local high schools

To complete all interviews efficiently, I provided a variety of time slots during the day that participants could choose from to schedule their interviews at their availability. Once all participants agreed to participate in the interview, each participant signed the consent form before the interviewer collected any information. During each interview, I reminded interviewees that participation was voluntary and that they did not have to participate if they felt uncomfortable proceeding with the interview. Once data had been collected, participants had the chance to review the analysis to check for accuracy.

Establishing a Researcher-Participant Working Relationship

Previously, I was a high school mathematics teacher in one of the local high schools used as a study site. Currently, I am a social studies educator at one of the local high schools. I worked with high school mathematics teachers in the past, but they were not currently my direct teammates or coworkers. I currently do not communicate with the mathematics teachers in the three local high schools, which reduced biases related to the research. Also, I did not hold supervisory roles; I am currently a social science educator.

Developing a relationship with participants was vital in this doctoral project study because participants supplied essential information about the research questions the interviewer created. I met with all potential participants individually to build a strong relationship with participants. As soon as the authorization had been approved, I introduced myself, explained the reason for the study, and how the information obtained could enhance the education field. I emphasized that participants remained anonymous

throughout this doctoral study. Privacy was vital to safeguard participants' identities so there would be no complications. No real names were used throughout this doctoral project study to protect the confidentiality of each participant. The participants were referred to as Participant 1, Participant 2, Participant 3, etcetera. I transcribed the interviews, organized the data, coded the data, identified what was of interest in the data, and looked for codes and themes of a common reappearing arrangement across the information. I was the only person who knew the participants' names and responses, as the transcripts were confidential. All ethical standards were followed, including protection of rights, confidentiality, protection from harm, and the consent form.

Data Collection

One primary source of data collection was the interviews for this doctoral project study to answer the following research question:

RQ1: What are the perceptions of the ninth through 12th grade mathematics educators on the challenges in supporting the mathematic achievement of Grade 9-12 ELLs?

The primary data source used during the doctoral project study was teachers' interviews. Data were collected after the school sites and Walden's IRB approval had been granted (IRB Approval #09-09-22-0751441).

An approved recruiting email was sent to all 70 potential participants from the three research school sites. The principal from the three local high schools provided the names and email addresses of the full time mathematic instructors from the three local

schools. The email served as a recruiting letter and a consent form. The educators determined their participation and were offered a $20 Starbucks gift card.

The primary data source in the doctoral study was the interviews, which allowed for collecting meaningful and rich data. A virtual interview through the meeting platform Zoom was conducted with 12 general mathematics educators. The first 12 volunteers were all from two out of the three schools invited. The data collected during the observation allowed an investigation into the perceptions of the ninth through 12th grade mathematic educators on the challenges in supporting the mathematic achievement of Grade 9-12 ELLs.

Mathematics teachers were asked to provide essential information about their perceptions of supporting the mathematics achievement of Grade 9-12 ELLs as demonstrated by poor performance in the SBAC scores. I interviewed 12 mathematics education teachers with varying cultures, age levels, and educational backgrounds. By conducting semistructured interviews, I was able to gather relevant and solid data that answered my research question. The selected number of participants allowed this doctoral project study to be directed promptly, which benefited the researcher in collecting enough information to respond to the research question refined for the doctoral project study (see Frankel et al., 2021).

The only data collection source applied to this study was the interviews. The interview protocol was researcher developed. The interview protocols were developed by reviewing the research question and conceptual framework. I created an interview protocol with semistructured questions, which I used as a guide to interviewing each

participant to gain a deeper understanding. Semistructured questions allowed a focused and consistent presence with all participants throughout the data collection process. I collected the data using a digital voice recorder to record the interview. The interviews were conducted through the Zoom meeting platform. When participants provided limited responses, I would ask probing questions such as this: What do you mean by that example, or can you give me some concrete examples? Interviews lasted roughly 45 minutes. Once I collected the data, I transcribed the recording word for word into an MS Word document. I also emailed a summary transcript to each participant for member checking and to have validity for the interview.

Justification of Participants

Educators are challenged to support the mathematics achievement of Grade 9-12 ELLs, as demonstrated by poor performance in the SBAC. There is a justification for seeing why there continue to be challenged in teaching ELL students to learn mathematics. To have an in-depth understanding of the perceptions of the ninth through 12^{th} grade educators in the teaching, learning, and curriculum of mathematical achievements of ELLs, my goal was to have different mathematics educators from the mathematical classes to provide sufficient data to discover distinct trends. Furthermore, fewer participants during interviews in this doctoral project study offered a chance to conduct one-on-one interviews. An interviewer can dedicate ample time to fewer participants compared to having an extensive number of participants while still getting sufficient information for the study (Slettebø, 2021). When an interviewer has more than

12 participants, it is more challenging to recruit participants and analyze data (De Klerk & De Klerk, 2018).

I selected mathematics high school educators because I wanted to investigate the perceptions of the ninth through 12th grade educators in the teaching, learning, and test scores of the mathematical achievements of ELLs. The focus was on mathematics, so I chose the mathematics educators in the local high schools. I selected a diverse group of educators who may provide reliable information about the perceptions of the ninth through 12th grade educators in teaching, learning, and curriculum of mathematical achievements of ELLs.

Data Analysis

Qualitative data analysis should be fixated on what participants inform, how they explain it, and the angle of the conversation as they report their experiences and thoughts (Zahir et al., 2022). The data for this study were collected during a 3 week period. There were interviews for 12 mathematics teachers working with ELLs in a regular education mathematics setting at three local high schools in this state's southwestern United States. The data collected for this doctoral study was recorded, transcribed, analyzed, and coded for themes based on the sociocultural framework. When gathering data during interviews, audio recording helped validate that the analysis was correct as the data were collected, transcribing participants' recordings from interviews' exact words into a document that was transcribed. The recordings were documented within 24 hours of conducting the interview. A study's description comprises answering the who, what, when, and where inquiries. I handled the data analysis, so I would thoroughly understand the facts that

were written. I conducted the data analysis, so I deeply understood the information I collected. For educator interviews, the interviewer used the interview with the educators to discover their perceptions and experiences.

The initial step in the data analysis was to read each interview's transcripts multiple times. After reading each transcript, the next analysis of manually coding individual participants' scripts was completed. One system was to highlight important phrases. The codes were different colors to categorize the information. I created another code to address a new topic if additional codes appeared. The six different codes were curriculum, instruction, assessment, complaints, recommendation, and miscellaneous. I began sorting codes into viable themes, and themes were identified from the coding process. Data were handled and arranged into small parts during the coding process to handle the coding steps easily.

These are the further details of the coding process (Williams & Moser, 2019). I analyzed the data through codes and themes. The first cycle of transcription review included highlighting essential phrases or sentences. I included highlighting the phrases in various colors according to codes based on the research question (Williams & Moser, 2019). There were total of six different codes based upon the research question. The second cycle created different categories curriculum, instruction and assessment to include the strengths, challenges and suggestions giving a total of 12 codes. The third cycle included grouping the codes into themes (Williams & Moser, 2019). I attentively explored the data to categorize common themes. The possible patterns, topics, and views were chunked together to offer common themes (Howard-Grenville et al., 2021).

I created an Excel spreadsheet and compartmentalized the codes for the 12 participants. The columns in the Excel spreadsheet had the six codes, while the rows had the highlighted information of the participants. Deciding a code for themes from the data can be more art than science. There may be an array of codes that could effectively lock up the themes (Williams & Moser, 2019). By analyzing the 12 codes in the Excel Sheet, I created themes. During the process, I arranged the data by determining themes, patterns, and associations. The data was analyzed by reading and examining the data, creating codes, and for possible themes that applied to the research problem, purpose, framework, and research question. The 13 codes were broken down to 3 primary themes with 10 subthemes. The three primary themes and 10 subthemes included:

1. Training and Support
    a. Needing additional training
    b. Needing additional support
2. Changes needed in Curriculum & Resources
    a. Adjustments needed in Curriculum
    b. Textbook and videos need improvement
    c. Include additional languages in textbooks
3. Instructional Strategies Recommendations
    a. Strategies for word problems
    b. Strategies for multiple step processes
    c. Strategies for student collaboration & check for understanding
    d. Strategies for building a foundation of vocabulary

e. Strategies for providing visuals for mathematics representation

Ensuring the Accuracy and Credibility of the Findings

Research accuracy and credibility are crucial components of a well-grounded qualitative study (Liao & Hitchcock, 2018). Transparency permits other researchers to evaluate methods and comprehend how a researcher reached their findings (Buckley et al., 2022). This study contains comprehensive reports of how the study was conducted to assure transparency. To provide credibility, the interviewer analyzed the data collected as precisely as possible by ensuring that the interviewer depicted participants' understandings, ideas, and thoughts. No new categories or codes were identified with the analysis of new interviews. Once reaching the eighth interview, no new information was shared with the participants. Thus, data saturation was achieved by the eighth interview. The last four participants shared similar answers to the previous eight participants.

For 12 potential interviewers, one receives the same information that someone already explained. As I moved forward with the interviews with the eighth participant, there was more of a pattern with the replies from the participants. Data saturation is the point in the research process where enough data has been gathered to draw necessary determinations, and any other data collection will not create value-added understanding. For qualitative data, it is between eight to 12 interviews. The data was collected, analyzed, and accurately depicted participants' understandings, ideas, and thoughts. Established sufficiency of data collection instruments to answer the research question. Conclusions were backed up with validation of the interviews.

There was trustworthiness in the qualitative research because there was dependability as I continually reread the transcripts to comprehend what the data explained. My interpretation did not frequently change over time. There was trustworthiness in the qualitative research because there was authenticity when I utilized raw quotes during the interviews, and there were excerpts of the raw quotes in the project study. By doing that, there was authenticity. There was an audit trail where I kept all the transcripts and summary transcripts. I kept all the coding and files to have the trustworthiness of data analysis. The audit trail brought practical contributions in terms of advancing guidelines and transparency for the study. As I used an audit trail, provided a transparent account of the steps taken throughout the research project, backed by a thorough accumulation of relevant documentation (Carcary, 2020)

Because validity was essential in a research project study, member checking was utilized in this doctoral project study. Member checking is a process where participants are given a copy of interview transcripts to confirm and correct findings, permitting participant validation (Buckley et al., 2022). Member checking took place after interviews were completed. The interviewer utilized member checking by providing participants with a summary of their replies. During this process, participants could input or remove anything they felt did not correctly portray their statements. The participants had the opportunity to provide feedback on their responses. At this juncture, the participants can give constructive feedback on the themes and codes from their interview. With transparency, all participants agreed with the themes and codes from their specific interviews. There were no corrections needed after participants received the transcripts.

Member checking allowed the interviewer as a researcher to establish credibility, accuracy, and integrity. Member checking provided this doctoral project study was valid because participants would approve the analysis of their responses, which would give them an understanding of the findings (Motulsky, 2021). The assistance for tracking data would be the catalog assistance, and I reflected on the data given through the in-depth interviews with the mathematics educators. There were no corrections needed after participants received the transcripts.

Procedure for Addressing Discrepant Cases

Discrepant cases are cases that do not suit specific arrangements or current insight into the data, which can affect the validity (Ravitch & Carl, 2018). Researchers must look for these particular cases and address them as needed. I searched for and pinpointed any discrepant cases as the data was assessed. One discrepancy included a participant explaining that the local school district schools textbook was helpful while others explained the textbook was not beneficial. By using various sources to examine data continually, the researcher would surely be able to discrepant cases. If discrepant cases emerged in the data, the researcher would utilize those conditions to examine why the discrepancies have occurred, starting with a reevaluation and examination of the interview questions. The interviewer recorded the findings justly and conversed with the contradicting proof in the research findings. By intensively inquiring about the discrepant cases, the analysis and understanding of the data are fortified (Merriam, 2008). I considered all discrepant cases. Some of the interview questions may not be answered in the research questions. The discrepant cases were utilized in the final project study. These

discrepant cases could aid stakeholders such as district administrators, schools, and educators with decision-making processes to support ELLs.

Data Analysis Results

Three local high schools in a southwestern state located in the United States informed teachers were challenged to support the mathematics achievement of 9-12 grade ELLs. The purpose of this study was to explore the perceptions of the teacher's challenges in supporting the mathematics achievement of 9-12 grade ELLs. This study helped me comprehend the challenges of the local high school mathematics teachers working with ELLs in their classrooms. To collect data for this study, one-on-one interviews were conducted with twelve high school mathematics teachers in grades 9-12. Twelve educators were individually asked to participate in the study and told they would be emailed if an interview was needed. After eight interviews, saturation was reached. No new information was gathered after the eighth interview.

I received approval from Walden University's IRB (IRB #09-09-22-0751441). I emailed the principals at the three local high schools of this state's southwestern portion of the United States to receive the emails of the mathematics teachers at the three local high schools of this state's southwestern portion of the United States. Next, the email invitation was sent to the mathematic educators at the three local high schools of this state's southwestern portion of the United States. Twelve prospective research participants commented, "I Consent" to participate in the study. The interview consisted of 12 open-ended questions, permitting the participants to share experiences and outlooks on the challenges in supporting the mathematic achievement of 9-12 grade ELLs. Before

starting the interview, the participants were asked to sign the consent form. I permitted the participants time to read over the consent form and ask any questions. Once the consent form was signed, the interview started. As the interviews were being recorded, I was taking notes. Each interview was conducted within 45 minutes. An interview schedule was sent after achieving the desired number of 12 research participants needed. The 12 mathematic participants were interviewed through the video conferencing platform, Zoom.

The interview transcriptions were analyzed and reorganized for accuracy. I transcribed each audio recording after each individual interview to match with the live transcript to verify that the responses were correct. This process needed multiple reviews of the audio recording to fix the words from the live transcript. The following process was member checking; each participant received their transcripts to review, examine, and confirm the accuracy of the information. Summary transcripts were emailed and shared with the participants. Participants were permitted to read over the transcripts and make any changes. All participants confirmed that their information was accurate. The audio recording and transcripts were stored separately and secured by a password.

Content thematic analysis was utilized to evaluate the data. I manually coded the information using Microsoft Excel to record recognized patterns and develop groups of codes, making themes. I found three major themes with ten subthemes. The first major theme evolved was the need for additional training and support. The first major theme had two subthemes are divided up the need for training and the need for additional support. The second major theme included the need for additional changes to the

curriculum and resources. There were three subthemes under this primary theme. One subtheme was a need for adjustments in the curriculum. The next subtheme was the need for improvement of videos and the textbooks. The third subtheme was the need for additional languages in the textbook. The third primary theme suggested the need for instructional strategy recommendations. There were five subthemes within this theme. One subtheme recommendation was to include strategies for teaching word problems. The next subtheme suggested instructional strategies for teaching multiple step processes. While the following was the next subtheme, offering strategies for teaching student collaboration and checking for understanding. The fourth subtheme was building a foundation of vocabulary as an instructional strategy. The final subtheme was instructional strategies for providing visuals for mathematical representation.

Table 3 presents the research question with the created themes. The themes were generated from codes recorded in table 4. Table 4 states the direct quotes from the research participants to create codes and develop themes.

Table 3

Research Question and Themes

Research Question	Themes
What are the perceptions of the ninth through12th grade mathematics educators on the challenges in supporting mathematic achievement of 9-12 grade ELLs?	1. Training and Support a. Needing additional training b. Needing additional support from the administration
	2.Changes needed in Curriculum & Resources a. Adjustments needed in Curriculum b. Textbook and videos need improvement c. Include additional languages in textbooks
	3.Instructional Strategies Recommendations a. Strategies for word problems b. Strategies for multiple step processes c. Strategies for student collaboration & check for understanding d. Strategies for building a foundation of vocabulary e. Strategies for providing visuals for mathematics representation

Table 4

Themes, Codes, and Quotations

Themes	Codes	Quotations
1A). Lacking training to support ELLs.	Miscellaneous	"Funnily enough there was no training, the school did nothing"
1B). Needing additional support and training	Recommendation	"I honestly think some training with ELLs would go a long way so it does not have to be significant training but maybe just providing some strategies or list of strategies of ways to support our students especially on the assessments."
2A). The curriculum is not helping the ELLs enough.	Complaints	"I guess you can say going through the textbook on their own so right now current curriculum at the school does not have a lot of variety of ways to assist in students that don't have English as their main language."
3A). Language barriers and difficulty on the word problems.	Assessment	"Word problems tend to be largest difficult thing to get the students to understand."
3B). Difficulty on multiple step problems.	Assessment	"Like I said things that are computational can sometimes can also cause some problems because they are not sure what the steps are and what they are doing for the computational portion."
3C). Student collaboration and checking for understanding.	Instruction	"I have kids work in pairs so they can share their answers and if I do have an ELL, I try to sit them near another student who kind of speaks the language as well, they can help them out at times."
3E). Visuals in mathematical representation.	Instruction	"When we start the lesson whenever possible I do draw any visuals any time of representations on what is going on and that tends to help as well."
2B). Textbook and videos.	Curriculum	"I think in the class in IM2, Integrated Math 2, it is so English intense that I think that our books and our curriculum tend to overlook the fact that we need to find the ways and entry points for English Language Learners above and beyond what is being presented them in the book."

Content thematic analysis was utilized to evaluate the data. The content thematic analysis included six steps for analyzing the data. The first step is to become familiar with the data; step two is to generate initial codes; step three is to search for themes; step four is to review themes; step five is to define themes; and step six is writing the results.

There was trustworthiness in the qualitative research because there was dependability as I continually reread the transcripts to comprehend what the data explained. My interpretation did not frequently change over time. There was trustworthiness in the qualitative research because there was authenticity when I utilized raw quotes during the interviews, and there were excerpts of the raw quotes in the project study. By doing that, there was authenticity.

Narrative Report

The research problem for this study was that the teachers were challenged to support the mathematics achievement of 9-12 grade ELLs, as demonstrated by poor performance in the SBAC. A basic qualitative study was selected to gather and study the experiences of the educators at the three local high schools of the challenges to support the mathematic achievement of 9-12 grade ELLs. Purposeful sampling selected 12 participants, semi-structured interviews were utilized to gather the data, and content thematic analysis was utilized to evaluate the data. This narrative report informs the story of the 12 participants using three major themes with 10 subthemes, (1) training and support, (a) additional training needed, (b) additional support needed; (2) changes needed in curriculum and resources, (a) adjustments needed in curriculum, (b) textbook and videos need improvement, (c) include additional languages in textbook besides Spanish,

(3) recommended instructional strategies, (a) strategies for word problems, (b) strategies for multiple step processes, (c) strategies for student collaboration and check for understanding, (d) strategies for building a foundation of vocabulary, (e) strategies for providing visuals for mathematics representation. RQ1 is answered in the context of themes 1-3 unveiling the perceptions of the ninth through 12th grade mathematics educators on the challenges in supporting the mathematic achievement of ninth through 12th grade ELLs. In this section, I reported the findings of the study, During the coding process. I recognized three major themes, with 10 subthemes with 12 codes. Each theme was connected to the research question. The findings of the research question were summarized, with each participant numbered according to the sequence of the interview.

Research Question 1

I asked mathematics educators their perceptions on the challenges in supporting the mathematic achievement of ninth through 12th grade ELLs through the interview questions connected to research question one. These questions related to the conceptual framework for this study, sociocultural aspects of teaching for ELLs. Mathematics educators described their challenges in supporting the mathematic achievement of ninth through 12th grade ELLs. Three major themes with 10 subthemes were developed from these interview questions to answer the research question. Each theme emphasized teachers' various experiences with the challenges in mathematic achievement of ninth through 12th grade ELLs.

Theme 1 –Additional Training and Support Needed

Subtheme 1A- Needing additional training.

The first theme was training and support participants believed there was a need for additional training and support for ELLs. A subtheme was there was a need for additional training to support ELLs in their mathematics classes. The data results disclosed the majority of the participants did not believe there was not a lot of training to support ELLs in mathematics. Most participants did not receive specific training to help ELL in mathematics. Participant 5 informed how the participant did not receive the training, "I haven't had training in things like that in the past. I think it will help me provide more meaningful lessons for them like something that they can get more benefit from." Participant 12 informed how the participant had ELL training while being in the teaching credential but not lately,

> I don't ever remember going to training where they help us support English Learners; there are [many] trainings that I have attended even when getting my teaching credentials. They do say 'well you got to think of your English Learners', but they never gave me specific techniques of things to do other than 'here is the textbook' (Participant 12).

Participant 9 informed that a refresher course and any support for ELLs could be helpful. "I think… any training at this point will be helpful, even just training on various instructional strategies whether it can be graphic organizers or just different [instructional] strategies that would help those [ELL] students make connections easier" (Participant 9).

The participants believed there was a lack of training to support ELLs in their mathematics classroom and needed the extra to support to help their ELLs to succeed in their mathematics classroom.

Subtheme 1B- Needing additional support.

The subtheme of theme 1 was needing additional support to teach ELLs in their mathematics courses. There were challenges in supporting the mathematical achievement of ninth through 12th grade ELLs. Participant 9 stated that, "I think… any training at this point will be helpful even just training on various whether it can be graphic organizers or just different [instructional] strategies." Because the educators were not receiving any training, having any type of training would have been helpful. The majority of the participants agreed that any type of training would be beneficial. Participant 8 commented that "I think being refreshed on some of the current ELL strategies in a math class can certainly be helpful, a PD or something like that, it never hurts." A participant believed having additional support and training hands-on would help the participant. Participant 10 suggested that "I think it is better for us [educators] to see those things [instructional strategies] in action by observing different classes from teachers or someone coming into my classroom and actually doing the work I supposed to be… [executing] because I learn by watching and looking at someone actually… [presenting] the work." The subtheme for theme 1 emphasized that there was a need for additional support training to help ELLs from the different participants.

Theme 2 – Changes Needed In Curriculum and Resources

Subtheme 2A- Adjustments need in curriculum.

For the second theme there was changes needed in curriculum and resources the first subtheme for theme 2 was curriculum was not helping the ELLs enough. There were challenges in supporting mathematical achievement of ninth through 12th grade ELLs because participants were complaining the textbook was not helpful for the ELLs. Participant 4 informed that "the textbook, no it does not [help]. Zero. The whole thing, nothing helps… [for] my ELLs." Participant 8 confirmed that "I think that our [mathematics] curriculum is not really supporting our ELLs." Some educators were informing the textbook did not help ELLs to connect to their primary language. Participant 11 suggested that "well, everything is in English for one… [part] we don't provide any opportunities for the [ELL] students to be assessed in their primary language." The subtheme for theme 2-emphasized that the curriculum is not helping ELLs from the various participants.

Subtheme 2B- Textbook and videos need improvement.

Another subtheme for the second theme was textbooks, and videos need improvement. A wide variety of responses regarding the textbook and videos need improvement. Some had a negative opinion of the curriculum and resources. Participant 12 commented that, "I don't think… [curriculum] provide any support to English Learners in my opinion." Other participants responded that the curriculum textbook was great and clearly helped the needs of Spanish ELLs, but no other [primary] languages. Participant 8 suggested that,

> I think… Integrated Math 2, it is so English intense that… our books and our curriculum tend to overlook the fact that we need to find the ways and entry

> points for English Language Learners above and beyond what is being presented them in the [text]book (Participant 8).

The subtheme for theme 2 emphasized different responses on textbook and videos from the different participants.

Subtheme 2C- Include additional languages in textbook.

Another subtheme for theme 2 was the need to include additional languages in the textbook. Multiple participants explained there was a need to include additional languages in the textbook to support ELLs. Participant 1 commented, "in general, the textbook does not provide translation for all [primary] languages or at least common languages other than Spanish." Participant 11 explains that “other than what the teacher does, there is nothing, there is far as I know there is nothing that is specifically [there] to help English Language Learners.” Participant 5 explains that “the textbook as well that are available in Spanish that is the only language [supported].” The participants were informed that the mathematical textbook had only translations for Spanish and that there was a need for other languages native to the ELLs. The subtheme for theme 2 emphasized the need to include additional languages in the textbook.

Theme 3 – Instructional Strategies Recommendations

Subtheme 3A- Strategies for word problems.

Theme 3 was the need for instructional strategy recommendations. A subtheme for theme 3 was strategies for mathematical word problems. These included language barriers and difficulty with word problems. There were multiple participants explaining ELLs were having difficulty with the word problems. Participant 2 informed that “word

problems tend to be largest difficult… [aspect] to get the [ELL] students to understand." Participants were explaining the wording can make it difficult for ELLs. Participant 6 commented that "I would say… it is going to be word problems are typically going to give… [ELLs] a lot of issues so if there is a lot of wording of a problem, if there are a lot of [language] context in the word problems even if it is really easy [mathematical] problem." The majority of the educators confirmed there was a language barrier. Participant 4 commented that "I most[ly] think it is language barrier and the fact that a lot of… [aspects] is in instruction, and it comes down to math, numbers make sense but sometimes the… [language]." Participant suggested that "If they don't have the language then it would be hard for… [ELLs] to do well." The subtheme for theme 3 emphasized on ELLs had language barriers and difficulty on the word problems from the different participants.

Subtheme 3B- Strategies for multiple step process.

Another subtheme for instructional strategies recommendations was strategies for multiple step processes. ELLs was having difficulty on multiple step problems. ELLs were having difficulty on multiple step problems on the assessments. Some of the participants were informing the ELLs were having difficulty on the minor steps. Participant 5 stated that,

> We go into… specific [mathematic] properties one specific one would be additive inverse property now all that means that adding a positive and negative to get zero. So, something like that… [ELLS] may not be understanding why those small building blocks… [particularly] with IM1 those small building blocks that

> you need throughout the entire math curriculum going on once they get missed it gets increasingly difficult to catch up to understand more complex calculations (Participant 5).

As the mathematic problems require multiple steps, the ELL students are struggling. Participant 6 commented that, "I also noticed problems with where there are multiple steps so if they have to do the rational root theorem that might give… [ELLs] trouble because there are so many [mathematical] steps to it, and I think they might have trouble… memorizing how to do that [mathematical] problem." The subtheme for theme 3 focused on that ELLs has difficulty on multiple step problems from the various participants.

Subtheme 3C- Strategies for student collaboration & check for understanding.

Another subtheme for theme 3 was student collaboration and checking for understanding. Multiple teachers were explaining that collaboration was a key component to help ELLs succeed in class. Participant 3 stated that,

> I try to let [ELL] students to sit next to other students that speak the same language as they do that [it] is… important piece to it, [ELLs] can turn to the person next to them and ask them for clarifications on what I was just teaching or what the [mathematical] task is I just ask[ed] [students] to do (Participant 3).

Some educators would use Think Pair Share to have the ELLs collaborate with their peers. Participant 8 reviewed that "So I use I have Think Pair Share students who… [converse] with each other to try to put in their own words what we are learning what the

issue with the [mathematical] problem is and so on." Also, participant 10 suggested that, "I do a lot of pair shares [activity]. I put them with someone that can actually help them or speak their language and also in a small group of a group of four will be there working together and a lot of times for them to collaborate with the small group[s] or pair shares [activity]." The subtheme for theme 3 emphasized on student collaboration and check for understanding from the varied participants.

Subtheme 3D- Strategies for building a foundation of scaffolding.

Another subtheme for theme 3 was building a foundation of vocabulary. Participants discussed the curriculum and the importance of building a foundation and focusing on vocabulary. Participant 2 explained that "I think that the curriculum that we currently have for IM2 does a really good… [part] of focusing on vocabulary because out all three classes in my opinion vocabulary is most heavy in math 2." Participant 5 mentioned the importance of building a foundation of knowledge, and informed "I think in the class in IM2, Integrated Math 2, It is so English intense that I think that our books and our curriculum tend to overlook the fact that we need to find the ways and entry points for English Language Learners above and beyond what is being presented them in the book." The subtheme for theme 3 focused on building a foundation and vocabulary to support ELLs from the various participants.

Subtheme 3E- Strategies for providing visuals for mathematical representation.

Another subtheme for theme 3 was providing-visuals for mathematical representation. A lot of educators explained that visuals and mathematical representation

was essential for the ELLs to understand the mathematical concepts in class. Participant 5 commented that, “When we start the [mathematical] lesson whenever possible, I do draw any visuals any time of [mathematical] representations on what is going on, and that ends to help… [ELLs].” Some educators explained they utilize technology to show visuals in mathematical representation. Participant 10 commented that, “So for a lot of things that I do is I provide visuals using PowerPoint or… [interactive whiteboard] what we have now, so even like going over the questions the word problems I provided… [visuals] and try to engage their interest.” Some educators use the visuals in mathematical representation to make connections. Participant 9 stated that, “So I do a lot of visuals, so I do so them, for example in IM2 we cover complete the square so I show them the algebraic method as well as the visual method where they are complete the… [manipulatives] so they can try to bride those connections.” The subtheme-for theme 3 focused on visuals in mathematical representation was important for mathematical educators from the various participants.

Review of the Findings

The previous section informed the significant themes with backing details from the collected data from each research participant. In this section, the reviews of findings conveyed the literature conceptual framework, the accuracy of the data report, and deliverables. The data analysis disclosed three major themes with ten subthemes.

1. Training and Support
    a. Needing additional training
    b. Needing additional support

2. Changes needed in Curriculum & Resources
    a. Adjustments needed in Curriculum
    b. Textbook and videos need improvement
    c. Include additional languages in textbooks
3. Instructional Strategies Recommendations
    a. Strategies for word problems
    b. Strategies for multiple step processes
    c. Strategies for student collaboration & check for understanding
    d. Strategies for building a foundation of vocabulary
    e. Strategies for providing visuals for mathematics representation

The data reported the participants' experiences helping ELLs in their mathematics classrooms. The participants shared their difficulty in supporting ELLs in their mathematics classes with lack and non-suitable training and lack of resources provided by the local schools. Despite the recorded challenges, participants were willing to find ways to help ELLs in their mathematics classes. Most participants desired to find ways to support their ELLs in their mathematics classes but needed help.

Findings Related to the Conceptual Framework

The conceptual framework for this project study was Vygotsky's sociocultural theory. The sociocultural theory views human learning as an active social activity situated in social and physical conditions and allocated across individuals, activities, and tools (Bautista Pérez, 2018). The research and interview questions were directed by sociocultural theory. The data analysis of the participants indicated that ELLs needed

their sociocultural aspect where ELLs could have a dialogue with other students. The theme of instruction strategies recommendation ensured that student collaboration was essential and it connected to sociocultural theory. The strategy for word problems was essential for ELLs to communicate with their peers and educator actively. Strategies for building a foundation for vocabulary were pivotal for ELLs to communicate with the other students. When there are multiple-step mathematic problems and ELLs have difficulty with those concepts, utilizing the sociocultural theory of collaborating with peers makes a difference. Although the local school district provided overall training, the participants' responses informed that it did not prepare the mathematic educators enough to help ELLs in their mathematics classes. The data indicated ELLs were more inclined to learn and comprehend when there was a sociocultural aspect in their learning. Many participants were not supporting direct instruction because it lacked the sociocultural element with ELLs, students, and educators.

Findings Related to the Literature

The results of this basic qualitative study were backed in the literature review in section 1. The findings from the data analysis disclosed the educators' challenges in supporting the mathematic achievement of ninth to 12 grade ELLs. The participants' experiences emphasized how mathematics educators took their own experiences on the difficulty of helping ELLs in their mathematics classrooms. Educators had issues where they had little training to support ELLs, challenging to assist ELLs in a large class setting in mainstream classes, and educators had difficulties engaging ELLs (Vattøy & Gamlem,

2020). The participants informed because the class setting had more than 30 students in a high school setting, it was difficult for them to help ELLs in a mainstream class.

The participants informed the educators had many mathematical learning targets to deal with, which made the participants have difficulty supporting the ELLs. Educators have various learning targets to educate their ELLs in mainstream classes. ELLs have some problems comprehending mathematical concepts in a class taught in English (Sriwichai, 2020). The participants informed that ELLs had difficulty conversing effectively in English. Participants would report that they desired the ELLs to speak even though it may not be understandable. There are moments when ELLs do not learn the idea, making it difficult for teachers to support the ELLs in connecting their thoughts (Yoon, 2021).

Project Deliverable

The three major themes and 10 subthemes justified the need for professional development as a project deliverable for this study. The challenges of mathematic educators to support ELLs in mathematics classes and the need for support are the main factors to address in the 3-day professional development series. The responses convey mathematics educators' challenges in supporting ELLs. Reviewing and acquiring new knowledge and instructional skills to help ELLs in their classroom would be a meaningful learning experience. A 3-day professional development prepares for the needs of the mathematical educators and provides instructional strategies, assessment, and practical experience.

Summary

In this section, I have described the research methodology utilized for this project study. The data collection process included semi-structured interviews and purposeful sampling. The content thematic analysis was utilized to analyze the data. Member checking was used to check the accuracy of the collected data. The data analysis disclosed nine significant themes that addressed the research question—the review of findings correlated to the conceptual framework and literature review. The section provides a literature review of the project genre and the project's description, evaluation, and implication.

Section 3: The Project

The purpose of this qualitative study was to explore the perceptions of the teachers' challenges in supporting the mathematics achievement of Grade 9-12 ELLs. Semistructured interviews and purposeful sampling were used to gather the data to collect the outlooks of 12 educators at the local high schools in a state located in the southwestern portion of the United States. Content thematic analysis was used to analyze the data. The results from the data analysis was determined which deliverable I would create from the genres of projects for the project study. The four genres of projects included a program evaluation, curriculum plan, professional development/training curriculum and materials, and a white or position paper. Thus, the findings favored professional development to address the teachers' challenges in supporting the mathematics achievement of Grade 9-12 ELLs. A 3-day professional development training objective was to provide instructional strategies for ELLs in mathematics, curriculum support, and hands-on experience delivering instruction effectively in a classroom. The aim of this study can help identify strategies and obstacles to teaching ELLs in a mathematics class.

Rationale

The research problem for this study was that teachers were challenged to support the mathematics achievement of Grade 9-12 ELLs. The study finding suggested the need for professional development for mathematic educators to be trained to help support of Grade 9-12 ELLs to raise their mathematics achievement scores. The project for this study includes a 3-day professional development based on the findings and themes in

Section 2. The professional development project genre was chosen because many participants explained they needed extra support to support ELLs in their mathematics classes. The 3-day professional development series will address the problem related to challenges teaching ELLs mathematics and provide ways to address the problems. For instance, the codes pertaining to theme two showed that educators at the study sites desired additional support and training to help their ELLs in their mathematics classes. These codes were integrated into professional development, with suggestions on documenting crucial findings that can compel classroom instruction for ELLs in a mathematics classroom. Professional development is an organized process that bolsters how professionals gain and hold onto skills, understanding, and attitudes (Pattison et al., 2022). Professional development assists in ameliorating teachers' use of different practices at the school level (Freeman et al., 2018). This 3-day professional development training may carry out the objectives of this project study by establishing to provide educators with resourceful skills, information, and pedagogy to improve and support educators to support the mathematics achievement of Grade 9-12 ELLs. The professional development will lead to comprehending different teaching strategies to help support ELLs in their mathematics classrooms. Educators can implement the teaching strategies and pedagogies in their lessons and build assessments they can take back to their classrooms.

Review of the Literature

The second literature review was a thorough search and analysis of the literature to support professional development for educators. This literature review guided and

pinpointed the best practices to plan beneficial professional development training for educators. The sociocultural theory was selected as a guide to comprehend the learners for this professional development. The findings from the study disclosed the need for comprehensive professional development to address the needs and challenges of the mathematics educators at the three local schools of a state in the southwestern portion of the United States. The data sources for this literature review were Educational Resources, Educational Resource Center (ERIC), and Google Scholar. The following keywords were used to conduct the literature review: *professional development, training for professional development, strategies for professional development, mathematics achievement, collaborative strategies, differentiated instruction, secondary education, scaffolding, sociocultural, instructional practices, English language learner,* and *assessments.*

The literature review is broken into multiple sections. The first discusses how professional development works and its importance. Then, I present literature on the implementation of professional development with a section on timing and how to implement training. Next, advice on linguistic scaffolding and visual scaffolding to support ELLs is presented. Another portion of the literature review provides information on structured collaborative learning, which helps ELLs to succeed in class. Finally, I discuss differentiated instructions for ELLs. The literature review helps to tell how differentiated instruction offers educators teaching strategies to support ELLs.

Why Professional Development Works

When educators are asked to instruct differently but do not know how to start or even explain what the instruction may look like, teachers are generally unable to adjust

(Rahman Talukder et al., 2021). Educators draw substantially on the ideas of teaching and learning that they have practiced and frequently continue to depend on lessons and activities that have functioned in the past, particularly in aspects in which they are uneasy (Richardson, 2022). Quality education can be reached by educators who possess an excellent scope of learning and teaching methods and are bolstered by a favorable learning environment. Research suggests that educators are the most critical driver of student learning (Rahman Talukder et al., 2021). Educational heads consider professional development for educators as the prime way to encourage school changes. One reason professional development works is the collaborative nature of educators working together. The teaching profession has a context where the isolated practice remains in the majority.

Collaboration is one of the most beneficial ways to include all educators in sharing obstacles and finding resolutions together (Brennan & King, 2022). Collaboration is potentially most productive when educators are being enabled to collaborate and not imposed. Professional development allows people to collaborate with others and find a solution (Brennan & King, 2022). When educators experience an analysis-based professional development emphasizing the application rather than the content, they are more likely to apply what they learned in their classrooms; educators are more inclined to be engaged in professional development (TeKippe et al., 2020).

Discourse plays a vital aspect in professional development. As the teachers collaborate and have discourse, educators will have more professional learning, progress their professional learning, and enhance their teaching practices (Onrubia et al., 2022).

Professional development allows educators to move beyond the minimal accounts of their practices and emphasize critically analyzing different teaching practices. As educators examine other teaching practices, the dialogue becomes richer with their peers. Educators can build on teaching practices in professional development (Onrubia et al., 2022). Positive effects in teaching practices have been developed with professional development that was occupation rooted. Professional development allows educators to apply new methods promptly through collaboration with other educators and adults. The professional development will enable them to collaborate and converse on their best practices and compare theory with what teaching practices are used in their classroom (Smith & Robinson, 2020).

Professional development works because the training allows educators to have content knowledge benefits where the educators may not know a specific skill in their classrooms (Piasta et al., 2020). Educators who use what they learned in professional development can apply the higher standard of classroom instructional practices. Professional development allows educators to have deep and evaluative self-reflection, allowing educator learning. The educators are reflecting while they are in professional development. Reflection is an impactful aid in bringing considerable change beyond the regularity where the educators can apply what they learned in professional development to support their students (Jhagroo et al., 2021).

When To Implement Professional Development

Professional developments are a continual process. Administrators desire to support educators' professional development and help them build space to apply what

educators have learned (Smith & Robinson, 2020). Professional development allows educators and students to have fresh experiences by exchanging views and findings (Karacabey, 2020).

Educators who were briefed on the professional development content by their administrators prior to its offering were more inclined to support the development (Smith & Robinson, 2020). One-day mass training has been perceived to be the least practical approach for providing professional development that comprises changes in teaching practice (Karacabey, 2020). These 1-day professional developments are usually unsuccessful because they lack discourse and do not consider nor tailor to the educators' needs. The professional developments have to go beyond a day to lead to collaboration and dialogue with educators (Hubbard et al., 2020). Professional development allows educators to learn new skills to incorporate into their class routines, and the 3-day gives enough time to process the thoughts on what they have learned. The 3-day session can spur educators to continue their lifelong learning process that is practical to their professional career and build professional development. (Karacabey, 2020).

How To Implement Professional Development

Professional development can be built in when the administrators have class visits and provide feedback to their educators. To improve and help the professional development of educators and the teaching process, administrators can review educators' performance in the classroom and give constructive feedback for the educator's professional development (Karacabey, 2020). The administrators can see a trend in the educators' needs and have an action plan for professional development for the educators.

Administrators can encourage educators to visit other classes and gather data on the trends that the educators inform the leaders (Deniz & Erdener, 2020). The instructional supervision from the administrators shows that the leader has an action plan to help educators grow in their field and guide them as instructional leaders. Educators need more assistance in terms of professional development in the early years of their careers, but all educators should have a growth mindset (Deniz & Erdener, 2020). Professional development will help all teachers improve their craft as educators (Karacabey, 2020). The administrators can collaborate with the instructional coaches on campus. There the administrators can receive feedback from the instructional coaches on the needs of their educators and plan professional development for the educators (Jimerson & Quebec Fuentes, 2021).

Professional development can also be developed by having surveys on the educators' needs. Depending on the responses from the educators, leaders can see what professional development is needed for their teachers. These anonymous surveys would allow the educators to bring their honest opinions and help administrators lead the educators in the right direction for professional development (Waters & Hensley, 2020). The teacher's attitudes and perceptions might alter what professional development would be used to support the educators. If the educators disapprove of a topic, the leadership will likely not start professional development. On the other hand, if the educators are supportive of a topic that interests them, the administration will engage them in that specific professional development (Rose & Sughrue, 2021). Professional development is depended on as a means of educational growth; with an enormous connected investment

of finances and time, administrators have to make the right decision on allocating the proper professional development for the educators (McChesney & Aldridge, 2021)

Scaffolding to Support ELLs

Scaffolding is essential to help support ELLs. Scaffolding will allow ELLs' independent usage of academic language (Xin et al., 2020). O'Hara et al. (2020) informed that educators adequately help and guide academic language development by presenting linguistic scaffolding suitable for ELLs' language stage. Linguistic scaffolding pertains to language understandable to ELL students when engaging ELLs in studying new and intricated content knowledge (O'Hara et al., 2020).

Linguistic scaffolding may use simplified vocabulary or a fixed amount of verbal prompting with continual support of a target group of words to help ELLs comprehend the content knowledge (Xin et al., 2020). Linguistic scaffolding allows practical and responsive assistance for ELLs' language output performance, which demands educators to use language that is understandable to students when providing them with a new and more complex idea, including the usage of a slower rate of speech, uncomplicated vocabulary, or cycling speech with the consistent support of a target set of terms (Lei et al., 2020).

Visual scaffolding includes graphic organizers, images, and words that mediate learning past verbal and text-based literacy (Lei et al., 2020). Visual scaffolding serves the aim of helping ELLs access content knowledge and providing visual scaffolding, serving as a graphic organizer in specific, to assist ELLs' representation of word problems in the model problem for problem-solving. The visual scaffolding allows the

ELLs to break down the mathematical problem and solve the assignment (Xin et al., 2020). Visual scaffolding involves the usage of photographs or drawings to tie English words, sentences, and phrases to visual images and support ELLs in learning the target content. This pathway makes complex concepts seem more understandable to ELLs and makes the language more notable while providing comprehensible input on the target subject matter (Lei et al., 2020).

Collaborative Learning for ELLs

Group collaboration with attention focused on the process of making comprehension of math problems is helpful and not just for arriving at the correct justifications. Structured collaborative language-rich activities help to concurrently advance mathematic matter understanding and English language development by pressing ELLs to explain how they approached the answers to mathematic questions and inquiring clarifying questions of other students (Bahr et al., 2018). ELLs can pose questions to get the required information to solve a problem. ELLs may be in collaborative groups and determine what details they need and what assumptions they must create.

The collaborative groups could discourse their reflections on the mathematical problem and find solutions while collaborating with their peers (Suh et al., 2020). Grouping ELLs differently by mathematics skills helps circumvent vast disparities in clusters struggling with mathematical problems. This approach operates best when ELLs already understand the mathematical problem given (Eichhorn et al., 2019). ELLs saw collaborative work as a chance to view others' progress, involve them in group

discussions, and improve their English learning. Some ELLs explained that collaborative learning allows them to learn from others, which was very helpful. ELLs could learn new vocabulary through discussions with their peers (Arifeen & Billah, 2018). ELLs need academic opportunities emphasizing oral language proficiency to ameliorate literacy acquisition, and collaborative learning allows them to work on their oral language proficiency (Eichhorn et al., 2019).

Differentiated Instruction for ELLs

Differentiated instruction gives a valid approach to teaching required state standards and optimizing each ELL's growth by meeting the ELLs' at their current standing, as opposed to conventional instruction, which instructs to the middle as a one-size-fits-all process. Differentiated instruction emphasizes the specifications of learning. Direction instruction presents educators with teaching strategies that reflect students' varied needs when preparing and delivering instruction which helps the ELLs to succeed in the classroom (Emerson et al., 2018). Creating prime learning conditions is difficult for even experienced educators. Educators can meet these demands is to providing differentiated instruction that will elevate productive problem-solving among diverse students. Differentiated instruction helps ELLs to raise their language proficiency, incorporate problem-solving strategies, and actively engage in the classroom (Cardimona, 2018). Educators connect learner characteristics to instruction and assessment so that every student has a pathway to the curriculum. In differentiated instruction, student change groups connect on their abilities, and all students are actively involved in the

classroom activities, allowing the ELLs to succeed in the classroom (Magableh & Abdullah, 2020).

All students in the same spectrum should go through the same content, but educators should adjust the elaborateness degree by utilizing varied instructional pathways to teach the content. The concept is that all students should learn the same ideas in various ways. Educators can either diversify the content by differentiating the difficulty or having the same content to determine the classroom activities that help ELLs and all learners (Cardimona, 2018).

Project Description

The data analysis conveyed the educators desired to help ELLs in their mathematics classes; however, they needed additional professional development training. A 3-day professional development training in response to the outcomes was formed as the project deliverable. The purpose of the professional development was to present educators with the skills, knowledge, and pedagogy to support ELLs in their mathematics classrooms adequately. The study results indicated that educators would obtain valuable insight from professional development training emphasizing learner-centered pedagogy, curriculum, and resources to optimize student learning and mathematical achievement in mathematical classes.

Needed Resources

The professional development needs the support of the associate superintendent of curriculum, instruction, innovation, and support and the local school district principals of this state's southwestern portion of the United States. The associate superintendent of

curriculum, instruction, innovation, and support needs to approve the 3-day professional development for educators and inform the principals at the local school districts. The associate superintendent of curriculum, instruction, innovation, and support needs to open the dates at the district facility for the 3-day professional development. Principals must inform the mathematic educators about the 3-day professional development and have enough substitute teachers to take care of the educator's classes.

Existing Support

The mathematic instructional coaches are the existing support at the schools in the local school district of this state's southwestern portion of the United States. They can assist mathematics classes and English language development teachers who help ELLs in their classrooms. There is a large district hall to have space for the 3-day professional development. The principals converse with the mathematics department chairs and leaders on what topics to emphasize in the Professional Learning Communities for the educators at the local high schools in the local district of this state's southwestern portion of the United States.

Potential Barriers

The potential barriers that may hamper professional development progress are indifferent educators, the training facility, and the need for substitute teachers. Indifferent educators may not desire to learn new methodologies and pedagogy to help ELLs succeed in mathematics classes because they may have a fixed mindset over a growth mindset. There is a possibility the principal could have forced them to come to this 3-day professional development without inclining them to participate. To resolve this matter, all

educators can share the pedagogy and challenges of helping ELLs in mathematics classes. From here, I will acknowledge their difficulties and motivate them to learn new skills and knowledge to support the ELLs in their mathematics classes. The next barrier is reserving a training venue (district facility) to accommodate a sizable number of educators and creating several sessions to accommodate the number of participating educators. Another barrier will be having enough substitute teachers to take care of the mathematics educators' classes while the mathematics educators participate in the 3-day professional development. Pre-planning to have enough substitute teachers booked for the 3-day professional development period will be crucial. There will be a need for other subject level teachers to period substitute from their preparation class if there are not enough teachers so that all the mathematics teachers' classes will be covered.

Roles and Responsibilities

My role as a coordinator is to collaborate with the administrators, instructional coaches, and English Language Development educators to design the professional development customized to the needs and the central areas found in the data analysis to develop better educators for supporting ELLs in their mathematics classes. I am responsible for arranging and supplying all resources and materials needed for the professional development training. I am securing and scheduling the training dates established on administrators' recommended dates and times to conduct professional development at the local school district facility of this state's southwestern portion of the United States.

Implementation and Timetable

The circulation of the summary findings and 3-day professional development is sent to the associate superintendent of curriculum, instruction, innovation, and support and director of secondary curriculum and instruction. Once documents are reviewed, I will arrange a meeting with the associate superintendent of curriculum, instruction, innovation, and support and invite all principals to present the research findings. Each principal will be allowed to share their understanding of the findings. I will also feature the need for professional development revealed and backed by the data analysis addressing particular areas with the associate superintendent of curriculum, instruction, innovation, and support approval to train mathematic educators.

Professional development will be incorporated during the school year. Professional development may allow mathematical educators to improve the support for ELLs in mathematical classrooms. The timetable for professional development is 3-day. Below is the schedule as follows (see Table 5). Described below is the timetable for each day. A 3-day professional development series day will begin at 8:00 am and end at 3:45 pm. Lunch will be provided by the expense of the school district. Each day will begin with an introduction of the day. The day's objective is shared, introduced, and discussed. The primary morning session will begin by introducing the strategy and discussed as a think-pair-share format. After a one-hour lunch period, the afternoon has 3-4 learning activities and concluded with the day's evaluation.

Table 5

3-Day Professional Development Timetable

DAY 1: Scaffolding Strategy		
Objective: Mathematic educators will learn how to utilize scaffolding strategies to help ELLs in mathematical classes.		
8:00-8:30 am	Sign-in/Breakfast/Pick up resources	
8:30-9:00 am	Welcome faculty, provide a brief overview of professional development and introduce the trainers	
9:00-9:30 am	Present challenges and needs to help ELLs in mathematics classes.	
9:30-9:45 am	15-minute break	
9:45 am-12:30 pm	Introduction to scaffolding strategy Implement scaffolding strategy Open Discussion (Think – Pair – Share)	
12:30-1:30 pm	Lunch Break	Lunch provided
1:30-3:30 pm	Activity 1: Creating a Scaffolding	

	strategy on a mathematical topic. Activity 2: Discuss what scaffolding strategy other educators have created. Activity 3: Creating a Scaffolding strategy with other educators. Groups of 4. Activity 4: Present the scaffolding strategy to the audience.
3:30-3:45 pm	End of day 1 Wrap-up and Assessment
Day 2: Collaborative Learning Strategy	
Objective: Mathematic educators will learn how to utilize collaborative learning strategies to support ELLs in mathematics classes.	
8:00-8:30 am	Welcome faculty to Day 2 Introduction and Overview
8:30-10:30 am	Review of the Scaffolding strategies Discussions with other educators. (Think – Pair – Share)

10:30-10:45 am	15-minute break	
10:45 am-12:00 pm	Activity 1: Introduction to Collaborative Learning Strategies Activity 2: Implement Collaborative learning strategies Activity 3: Open Discussion (Think – Pair – Share)	
12:00-1:00 pm	Lunch Break	Lunch Provided
1:00-3:30 pm	Activity 1: Creating a Collaborative Learning strategy on a mathematical topic. Activity 2: Discuss what Collaborative Learning strategy other educators have created. Activity 3: Creating a Collaborative Learning strategy with other educators. Groups of 4. Activity 4: Present the Collaborative	

	Learning to the audience.
3:30-3:45 pm	End of day 2 Wrap-up and assessment
Day 3: Differentiated Instruction Strategy & Assessments	
Objective: Mathematic educators will learn to utilize differentiated instruction strategies and create assessments to help ELLs in mathematical classes.	
8:00-8:30 am	Welcome faculty to day 3 Introduction and Overview
8:30-10:00 am	Review of Collaborative Learning Strategy Introduce differentiated instruction to help ELLs. Implementation of how to utilize differentiated instruction and build assessments.
10:00-10:15 am	15-minute break
10:15 am-12:00 pm	Activity 1: Create differentiated instruction plans for a mathematical topic. Activity 2: Discuss with different partners on

	what differentiated instructions other educators have created. Activity 3: Create a differentiated instruction plan with other educators—Group of 4.	
12:00-1:00 pm	Lunch Break	Lunch Provided
1:00-3:00 pm	Activity 4: Create an assessment correlated with differentiated instruction with other educators—Group of 4. Activity 5: Present the differentiated instruction assessments to the audience.	
3:00-3:30 pm	End of day three and professional development Wrap-up and assessment	

Project Evaluation Plan

The program evaluation's objective included effectively helping mathematic educators teach adequate teaching strategies for each professional development day. Broken down into three days, and the first day is designated for the educators to learn scaffolding strategies. The second day focuses on collaborative learning strategies. The final day is on differentiated learning and creating assessments. After each day, the objectives will be measured through a summative evaluation.

A survey will be distributed at the end of each day of the professional development—the survey will be comprised of measurable statements to evaluate the professional development and speaker. There will be an open-ended question at the end of the survey for any suggestions and concerns from mathematics educators for the upcoming day and future professional development. Summative assessment is a process of making a finding according to criteria and notions (Fergus et al., 2021). The summative assessment objective is mainly to identify the executions of the systems. Its primary aim is to obtain a measurement of attainment to be used in making actions (Ismail et al., 2022). The summative assessment evaluates each person's comprehension of the subject matter and validates the professional development objectives and goals. All surveys are anonymous to guarantee confidentiality and collected for data purposes to plan future professional development.

The key stakeholders for this project study are faculty staff, administrators, and the directors in the local school district of this state's southwestern portion of the United States. Administrators and directors must listen to the difficulties and needs of ELLs

support in mathematics. It informs the disjuncture between mathematics educators and ELLs and mathematic educators and administrators/directors. The local district of this state's southwestern portion of the United States must provide the training, resources, and support for mathematics educators to maximize ELLs learning and achievement in mathematics classes.

Project Implications

The data analysis disclosed the need for purposeful professional development that customizes to the targeted domain of needs and assists mathematics educators in helping ELLs in their mathematics classrooms. The local school district of this state's southwestern portion of the United States gained from the project to fulfill ELLs mathematics objectives and instructional outcomes at the local schools. Mathematics educators' voices about what works for them to support ELLs in their mathematics classes are essential for students because mathematics educators should be qualified to teach ELLs in mathematics classrooms.

The findings from this study may foster positive social change by providing educators and administrators with a greater awareness of the determinants and peculiar teaching strategies that can improve best practices to prepare mathematics educators to support their ELLs in the classroom. This project is pivotal to the local stakeholders. The local stakeholders gain from the project by obtaining information about mathematics educators' difficulties in supporting ELLs, practical planning, and evidence to validate budget planning to assist and augment the quality of teaching for mathematics educators.

Section 4: Reflections and Conclusions

Project Strengths and Limitations

The 3-day professional development project was designed to handle the needs and challenges of educators to support them to help ELLs in their mathematics classes. This professional development is intended to help school leaders, educators, and curriculum managers raise their skills and knowledge in ELL pedagogy to close the achievement gap between ELLs and non-ELLs. By emphasizing the professional needs of general education mathematics teachers who work with culturally diverse students, ELLs' student achievement can rise. Through professional development, general mathematics educators can learn to plan progressively suitable lesson plans and learning activities that target ELLs' content knowledge and linguistic needs. The data collected during this doctoral project study disclosed that general mathematics teachers did not have strong background knowledge of ELLs; thus, they lacked an understanding of beneficial instructional strategies and confidence in working with linguistically and culturally diverse students. A strength of this project is that educators can learn the needed skills and knowledge to adequately work with ELLs by attending this professional development. Professional development can help because it becomes a resource for mathematics educators to strengthen their teaching strategies to support the ELLs in their classes. There were limitations to professional development. The first limitation was that insufficient participation from the attending educators could adversely influence the overall performance and results of the professional development and program evaluation outcomes. The second limitation was the opposing stances of educators that declined to

learn new understanding and abilities because of the increased obligations. The third limitation was the short duration of the professional development sessions, given the research on professional development showing the benefits of follow-up beyond initial sessions. Thus, additional professional development sessions and meetings with the educators to discuss what is and is not working should be added to the 3-day professional development series.

Recommendations for Alternative Approaches

A different professional development approach was forming a 12-week curriculum course. The curriculum pathway designed was with the same material from the professional development with assessments. It is favorable to mathematics educators because of its fluidity and accommodations for self-directed educators. It decreases the unease of learning on time to take in all the insights in a restricted time frame in professional development. There are times when mathematic educators must go to multiple meetings and are overwhelmed with different tasks during the school year. The curriculum course could offer the same material from the professional development, yet with an extended time. Still, mathematic educators will have a longer time to learn from the curriculum course. The curriculum course could emphasize scaffolding strategies, collaborative learning strategies, and differentiated instructions. Mathematics educators must pass all assessments with a minimum of 70% to a 100% maximum score. Once mathematics educators adequately complete the course, it gives them more confidence to help ELLs in their mathematics courses. A passing score on assessments would be the best approach to determine the effectiveness of improving ELLs' outcomes. The

assessments will help keep mathematics educators accountable for the learning offered through the curriculum. Also, it could streamline which mathematic educators need more support to help ELLs with more robust performance on the assessment.

Another alternative is to provide professional development during professional learning communities or faculty meetings. Educators meet with the administration teams twice a month, after school, for faculty meetings and twice a month, during planning, for professional learning communities, at the study sites. Part of the professional learning community and faculty meeting time could be used to carry out professional development.

Scholarship, Project Development and Evaluation, and Leadership and Change

Every pathway starts easy or arduous for the challenger but with the same objective at the end. From my perspective, the journey from prospectus to the proposal of the doctoral journey was acceptable but challenging from the proposal to the IRB approval. I struggled to create an organized and immaculate proposal with multiple rounds of invalidations and resubmissions before approval. The project study was a demanding learning process to make the project using the methodology. As an educator, I have matured into a scholar because of the doctoral experience Walden University has presented. As a researcher, the doctoral process has developed my research skills and scholarly writing. This undertaking was a long-life learning experience for me because of my validity as a scholar and researcher. It allows me to use my areas of knowledge in curriculum, instruction, and assessment.

Reflection on the Importance of the Work

Once I completed my data analysis and found the deliverable as a project, I progressed quickly. This was my experience because of the length of time in developing the proposal to improve the finished proposal, which gave me self-assurance in my research to complete the final study. The spark of research interest augmented after collecting and analyzing the data. It directed me to make a positive change to the research problem in my field of study. The crucial factor I learned from this process is providing the body of literature, knowledge in the field of study, and further social change.

Implications, Applications, and Directions for Future Research

The possible positive social change for educators and leaders is understanding the challenges that impact mathematics educators to help support ELLs in mainstream mathematics courses. This project has positive social change implications for educators when incorporating different teaching strategies and assessments. This is to assist ELLs in mathematics achievement in the classrooms. The purpose of this basic qualitative was to explore the perceptions of the teachers' challenges in supporting the mathematics achievement of 9-12 grade ELLs. While the 12 research participants did not represent all the different aspects of challenges that mathematics educators deal with to support mathematics educators, the research participants still gave valid information for the research. The data saturation helped to comprehend the needs of the participants. There was trustworthiness in the qualitative research because there was dependability and authenticity from continually rereading the transcripts to understand what the data explained and using raw quotes in the project study.

Three aspects of the collected data support the validity of the information. One was the credibility of the participants; each of the participants had experience and was currently teaching ELL's in high school mathematics courses. There is evidence of valid information from the participants because the participants work in the educational field with ELLs in their mainstream classrooms. Two was the consistency in the responses. The participants gave valid information needed to support ELLs in their classroom. ELLs face the astounding task of learning and demonstrating mathematics content insight in a new language while mathematic educators are teaching ELLs in their classrooms. Three, there was agreement amongst the participants, which aligned with previous literature. Cardimona (2018) suggested that ELLs need extra support to succeed in the mathematics classroom setting.

This project study was created based on the sociocultural theory described in the first literature review and the data results. While completing the professional development, educators will practice skills that can be taken back to the classroom and utilized with their ELLs. In addition, educators will learn to create plans to help ELLs master skills that have not been mastered or new skills ELLs are ready to progress to a new mathematical standard.

A recommendation for future research would be to enlarge the sample population criteria. A larger sample size for a qualitative study will allow having more feedback from various mathematic educators. A mixed-method study would serve to collect considerable and abundant data to address the research problems in future research. The quantitative component would allow more data on mathematic assessments and compare

and contrast the quantitative data with the qualitative data. Future research could emphasize implementing effective professional learning communities, a type of professional development. Once these teaching strategies are used in the classroom, deeper comprehension of the PLCs at the schools could be evaluated. Effective PLCs could correlate to positive school improvement of ELLs mathematics achievement data.

Conclusion

The research problem in this study was teachers were challenged to support the mathematics achievement of ninth through 12th grade ELLs. A basic qualitative study was utilized to collect and examine the experiences of mathematics educators at three local high schools on the challenges to support ELLs in their mathematics courses. The findings from the data analysis discovered the challenges and needs of mathematics educators to support ELLs in their mathematics courses through professional development. The number of ELLs continues to grow nationwide; thus, mathematics educators must be prepared to work with ELL students. Through a qualitative case study research design, I gained a deep awareness of how general mathematics teachers felt working with ELLs by interviewing them. The results of this doctoral study specified that educators did not feel confident about working with ELLs; thus, a PD program was formed to raise educators' skills and knowledge. Professional development will highly assist mathematics educators and the local district at large. The voice of mathematics educators was valuable because they were in continuous, direct communication with ELLs, and better served the ELLs by supporting and providing the resources in the classroom. The project can impact positive social change for educators and leaders to

redesign curriculum, instruction, and assessment aligning to the practicality needed to prepare better ELLs to maximize learning and mold society in the future.

The number of ELL students continues to rise nationwide; most likely, general mathematics educators will have to educate them. Thus, mathematics educators and school leaders must know ELL instructional strategies to work with culturally and linguistically diverse students. If educators have the essential knowledge and skills to educate ELLs successfully, student achievement will rise among ELLs. Through a systematic PD, mathematics educators can learn beneficial instructional strategies to meet the academic needs of their ELLs.

References

Abedi, J., Zhang, Y., Rowe, S. E., & Lee, H. (2020). Examining effectiveness and validity of accommodations for English language learners in Mathematics: An evidence-based computer accommodation decision system. *Educational Measurement: Issues and Practice*, *39*(4), 41–52. https://doi.org/10.1111/emip.12328

Akbana, Y. E., & Yavuz, A. (2021). English as a foreign language learners' and their teacher's feedback on form focused instruction. *Eğitimde Kuram ve Uygulama*, *17*(1), 84–97. https://doi.org/10.17244/eku.935475

Akkaya, A., & Aydın, G. (2019). Code switching beliefs of learners of Turkish as a foreign language: A scale development study. *Educational Policy Analysis and Strategic Research*, *14*(4), 90–101. https://doi.org/10.29329/epasr.2019.220.5

Aldana, U. S., & Martinez, D. C. (2018). The development of a community of practice for educators working with newcomer, Spanish-speaking students. *Theory Into Practice*, *57*(2), 137–146. https://doi.org/10.1080/00405841.2018.1425813

Algayres, M., & Triantafyllou, E. (2020). Learning analytics in flipped classrooms: A scoping review. *Electronic Journal of E-Learning*, *18*(5), 397–409. https://doi.org/10.34190/JEL.18.5.003

Alshahrani, H. A. (2019). Strategies to improve English vocabulary and spelling in the classroom For ELL, ESL, EO and LD students. *International Journal of Modern Education Studies*, *3*(2), 65. https://doi.org/10.51383/ijonmes.2019.41

Anwar, K., Asari, S., Husniah, R., & Asmara, C. H. (2020). Students' perceptions of

collaborative team teaching and student achievement motivation. *International Journal of Instruction*, *14*(1), 325–344. https://doi.org/10.29333/IJI.2021.14119A

Arifeen, M. S., & Billah, M. M. (2018). Building collaborative academic writing through blogs: Students' perceptions. *Language in India*, *18*(12), 29–37.

Arizmendi, G. D., Li, J. T., Van Horn, M. L., Petcu, S. D., & Swanson, H. L. (2021). Language-focused interventions on math performance for English learners: A selective meta-analysis of the literature. *Learning Disabilities Research and Practice*, *36*(1), 56–75. https://doi.org/10.1111/ldrp.12239

Arrastia-Chisholm, M. C., & Tackett, S. (2020). Apps for behavior management, communication, and learning: Using sociocultural theory to understand mobile technology in PK-12 settings. *Peabody Journal of Education*, *95*(2), 148–159. https://doi.org/10.1080/0161956X.2020.1745614

Asad, M. M., Khan Soomro, R. B., Shamsy, A., & Churi, P. (2021). Students' satisfaction towards E-assessment for academic achievement in ESL at public schools and colleges. *Education Research International*, *2021*. https://doi.org/10.1155/2021/4576750

Bahr, D. L., Monroe, E. E., & Mantilla, J. (2018). Developing a framework of outcomes for mathematics teacher learning: Three mathematics educators engage in collaborative self-study. *Teacher Education Quarterly (Claremont, Calif.)*, *45*(2), 113.

Bautista Pérez, N. Y. (2018). Constructing sociocultural awareness from the EFL classroom. *GiST Education and Learning Research Journal*, *15*(15), 149–172.

https://doi.org/10.26817/16925777.394

Berenji, S. (2021). Enhancing metacognitive scaffolding and comprehension ability through problem-based learning in an EFL context. *Education Research International*, *2021*. https://doi.org/10.1155/2021/6766793

Bravo-Sotelo, K. P. (2020). Exploring the Tagalog-English code-switching types used for mathematics classroom instruction. *The International Academic Forum Journal of Education: Language Learning in Education, 8*(1), 41–59. https://doaj.org/article/8927edc34f51490d8eb590f5f87d31a1

Bremner, N. (2021). What is learner-centered education? a quantitative study of English language teachers' perspectives. *Tesl-Ej*, *25*(2), 1–29. https://tesl-ej.org/pdf/ej98/a9.pdf

Brennan, A., & King, F. (2022). Teachers' experiences of transformative professional learning to narrow the values practice gap related to inclusive practice. *Cambridge Journal of Education*, *52*(2), 175–193. https://doi.org/10.1080/0305764X.2021.1965092

Buckley, J., Adams, L., Aribilola, I., Arshad, I., Azeem, M., Bracken, L., Breheny, C., Buckley, C., Chimello, I., Fagan, A., Fitzpatrick, D. P., Garza Herrera, D., Gomes, G. D., Grassick, S., Halligan, E., Hirway, A., Hyland, T., Imtiaz, M. B., Khan, M. B., … Zhang, L. (2022). An assessment of the transparency of contemporary technology education research employing interview-based methodologies. *International Journal of Technology and Design Education*, *32*(4), 1963–1982. https://doi.org/10.1007/s10798-021-09695-1

Carcary, M. (2020). The research audit trail: Methodological guidance for application in practice. *Electronic Journal of Business Research Methods*, *18*(2), 166–177. https://doi.org/10.34190/JBRM.18.2.008

Cardimona, K. (2018). Differentiating mathematics instruction for secondary-level English language learners in the mainstream classroom. *TESOL Journal*, *9*(1), 17–57. https://doi.org/10.1002/tesj.303

Chowa, G. A. N., & Masa, R. D. (2019). Asset ownership and academic achievement among youth in Ghana: Examining associations based on asset type and academic subject. *Educational Forum*, *83*(2), 181–198. https://doi.org/10.1080/00131725.2019.1570578

Chu, H. (2019). Taking mathematics instruction to task : Applying second language acquisition approaches to analyze and amplify learning opportunities for English learners. *NYS TESOL Journal, 6(2)*, 16–30.

Chubko, N., Morris, J. E., McKinnon, D. H., Slater, E. V., & Lummis, G. W. (2019). Engaging adolescent kyrgyzstani EFL students in digital storytelling projects about astronomy. *Issues in Educational Research*, *29*(4), 1107–1130.

Clark, S. K. (2020). Examining the development of teacher self-efficacy beliefs to teach reading and to attend to issues of diversity in elementary schools. *Teacher Development*, *24*(2), 127–142. https://doi.org/10.1080/13664530.2020.1725102

de Araujo, Z., Roberts, S. A., Willey, C., & Zahner, W. (2018). English learners in K–12 mathematics education: A review of the literature. *Review of Educational Research*, *88*(6), 879–919. https://doi.org/10.3102/0034654318798093

De Klerk, M., & De Klerk, W. (2018). Exploring educators' experiences regarding empathy within inclusive classrooms. *International Journal of Special Education*, *33*(3), 657–674.

Deniz, Ü., & Erdener, M. A. (2020). Levels of school administrators exhibiting instructional supervision behaviors: Teachers' perspectives. *Research in Educational Administration and Leadership*, *5*(4), 1038–1081. https://doi.org/10.30828/real/2020.4.3

Di Domenico, P. M., Elish-Piper, L., Manderino, M., & L'Allier, S. K. (2018). Coaching to support disciplinary literacy instruction: Navigating complexity and challenges for sustained teacher change. *Literacy Research and Instruction*, *57*(2), 81–99. https://doi.org/10.1080/19388071.2017.1365977

Duong, T. M., & Nguyen, H. T. T. (2021). Implementing task-based language teaching in Vietnamese secondary schools: What hinders EFL teachers? *TESL-EJ*, *25*(2), 1–16.

Dussling, T. (2020). English language learners' and native English-speakers' spelling growth after supplemental early reading instruction. *International Journal of Education and Literacy Studies*, *41(4)*, 241-263. https://doi.org/10.7575/aiac.ijels.v.8n.1p.1

Edgerton, A. K., & Desimone, L. M. (2018). Teacher implementation of college- and career-readiness standards: Links among policy, instruction, challenges, and resources. *AERA Open*, *4*. https://doi.org/10.1177/2332858418806863

Eichhorn, M. S., Lowry, A. E., & Burke, K. (2019). Increasing engagement of English learners through universal design for learning. *Journal of Educational Research and*

Practice, *9*(1), 1–10. https://doi.org/10.5590/jerap.2019.09.1.01

Emerson, J. M., Junor Clarke, P., & Moldavan, A. (2018). Bridging pedagogy and practice: From coursework to field experiences in a teacher preparation program. *Georgia Educational Researcher*, *14*(2). https://doi.org/10.20429/ger.2018.140203

Estrada, P., Wang, H., & Farkas, T. (2020). Elementary English learner classroom composition and academic achievement: The role of classroom-level segregation, number of English proficiency levels, and opportunity to learn. *American Educational Research Journal*, *57*(4), 1791–1836. https://doi.org/10.3102/0002831219887137

Fergus, S., Hirani, E., Parkar, N., & Kirton, S. B. (2021). Strategic engagement: Exploring student buy-in across a formative and summative assessment. *AISHE-J: The All Ireland Journal of Teaching & Learning in Higher Education*. *13(1), 1-24.*

Frankel, K. K., Deanna Brooks, M., & Learned, J. E. (2021). A meta-synthesis of qualitative research on reading intervention classes in secondary schools. *Teachers College Record: The Voice of Scholarship in Education*, *123*(8), 31–58. https://doi.org/10.1177/01614681211048624

Freeman, J., Kowitt, J., Simonsen, B., Wei, Y., Dooley, K., Gordon, L., & Maddock, E. (2018). A high school replication of targeted professional development for classroom management. *Remedial and Special Education*, *39*(3), 144–157. https://doi.org/10.1177/0741932517719547

French, M. (2019). Multilingual pedagogies in practice. *TESOL in Context*, *28*(1), 21. https://doi.org/10.21153/tesol2019vol28no1art869

Gleason, J., Berg, M., & Huang, J. (Ginny). (2018). Patterns of oral choice and evaluation across secondary content areas. *Language and Education*, *32*(2), 93–111. https://doi.org/10.1080/09500782.2017.1391279

Gonzales, W., & Tejero Hughes, M. (2021). Leveraging a Spanish literacy intervention to support outcomes of English learners. *Reading Psychology*, *42*(4), 411–434. https://doi.org/10.1080/02702711.2021.1888352

Gordon, C. (2019). Trusting students' voices in critical English education. *Journal of Language and Literacy Education*, *15*(1), 1–33.

Guest, M. (2021). Developing discussion and tutorial leadership skills in EFL students. *English Teaching Forum, 59*(3), 31-35.

Hansen-Thomas, H., Langman, J., & Farias Sokoloski, T. (2019). The role of language objectives: Strengthening math and science teachers' language awareness with emergent bilinguals in secondary classrooms. *Latin American Journal of Content & Language Integrated Learning*, *11*(2), 193–214. https://doi.org/10.5294/laclil.2018.11.2.2

Hoff, H. E. (2019). Fostering the "Intercultural Reader"? An empirical study of socio-cultural approaches to EFL Literature. *Scandinavian Journal of Educational Research*, *63*(3), 443–464. https://doi.org/10.1080/00313831.2017.1402366

Howard-Grenville, J., Nelson, A., Vough, H., & Zilber, T. B. (2021). From the editors: Achieving fit and avoiding misfit in qualitative research. *Academy of Management Journal*, *64*(5), 1313–1323. https://doi.org/10.5465/AMJ.2021.4005

Hubbard, J., Fowler, M., & Freeman, L. (2020). PreK–5 teacher views of professional

development integrating Common Core language arts with science and social studies. *Journal of Educational Research and Practice*, *10*(1), 1–25. https://doi.org/10.5590/jerap.2020.10.1.01

Hübner, N., Wagner, W., Hochweber, J., Neumann, M., & Nagengast, B. (2020). Comparing apples and oranges: Curricular intensification reforms can change the meaning of students' grades! *Journal of Educational Psychology*, *112*(1), 204–220. https://doi.org/10.1037/edu0000351

I, J.-Y. (2019). Preservice teachers' mathematics task modification for emergent bilinguals. *School Science and Mathematics*, *119*(3), 127–141. https://doi.org/10.1111/ssm.12325

Imane Badjadi, N. E. (2020). *International Academic Forum Journal of Education: Language Learning in Education*, *8*(1), 41–59.

Irby, B. J., Guerrero, C., Lara-Alecio, R., Sutton-Jones, K. L., Tong, F., & Abdelrahman, N. (2018). Implementation of research-based ESL strategies with lower grade middle school ELLs in the science classroom: Findings from an experimental study. *Tesl-Ej*, *22*(1), 1–26.

Ismail, S. M., Rahul, D. R., Patra, I., & Rezvani, E. (2022). Formative vs. summative assessment: impacts on academic motivation, attitude toward learning, test anxiety, and self-regulation skill. *Language Testing in Asia*, *12*(1). https://doi.org/10.1186/s40468-022-00191-4

Jaffee, A. T. (2021). "I want them to feel safe and to feel loved": Collaborating to teach social studies for middle level emergent bilingual students. *RMLE Online*, *44*(1), 1–

16. https://doi.org/10.1080/19404476.2020.1859904

Jhagroo, J., Bansilal, S., & Stringer, P. (2021). Teacher learning insights from two practice-based inquiries in South Africa and New Zealand. *New Zealand Journal of Educational Studies*, *56*(1), 65–81. https://doi.org/10.1007/s40841-020-00184-y

Jimerson, J. B., & Quebec Fuentes, S. (2021). Approaches to instructional leadership: organizational influences in contexts of (mis)match. *Journal of School Leadership*, *31*(4), 343–367. https://doi.org/10.1177/1052684620980359

Johnson, H. E., Molloy Elreda, L., Kibler, A. K., & Futch Ehrlich, V. A. (2020). Creating classroom communities in linguistically diverse settings: Teacher-directed, classroom-level factor effects on peer dynamics. *Journal of Early Adolescence*, *40*(8), 1087–1120. https://doi.org/10.1177/0272431619891238

Karacabey, M. F. (2020). Perceptions of school administrators on their contributions to teacher professional development Okul Yöneticilerinin Öğretmen Mesleki Gelişimine Katkılarına İlişkin Algıları. *Journal of Theoretical Education Science*, *13*(January), 78–90 : http://dx.doi.org/10.30831/akukeg.541053

Khawaja, N. G., & Howard, G. (2021). Understanding Samir: Educational difficulties of a high school student from refugee background. *Educational and Developmental Psychologist*, *38*(1), 110–120. https://doi.org/10.1080/20590776.2021.1899747

Kim Glatt Yochai, B. (2019). Identifying the consequences of actions and options and dimension of teachers' ethical sensitivity at various school levels: Implications on English learner student achievements. *Journal for Leadership and Instruction*, 25–31.

Knaak, T., Grünke, M., & Barwasser, A. (2021). Enhancing vocabulary recognition in English foreign language learners with and without learning disabilities: Effects of a multi component storytelling intervention approach. *Learning Disabilities*, *19*(1), 69–85.

Lachance, J. R., Honigsfeld, A., & Harrell, G. (2019). Equal educational opportunity for English learners: ESL teachers' conceptualizations on the importance of academic language. *TESOL Journal*, *10*(2), 1–17. https://doi.org/10.1002/tesj.415

Lavery, M. R., Nutta, J., & Youngblood, A. (2019). Analyzing student learning gains to evaluate differentiated teacher preparation for fostering English learners' achievement in linguistically diverse classrooms. *Journal of Teacher Education*, *70*(4), 372–387. https://doi.org/10.1177/0022487117751400

Lazarević, N. (2022). CLIL teachers' reflections and attitudes: Surviving at the deep end. *International Journal of Bilingual Education and Bilingualism*, *25*(2), 571–584.

Lei, Q., Xin, Y. P., Morita-Mullaney, T., & Tzur, R. (2020). Instructional scaffolds in mathematics instruction for English learners with learning disabilities: An exploratory case study. *Learning Disabilities*, *18*(1), 123–144.

Liao, H., & Hitchcock, J. (2018). Reported credibility techniques in higher education evaluation studies that use qualitative methods: A research synthesis. *Evaluation and Program Planning*, *68*, 157–165. https://doi.org/10.1016/j.evalprogplan.2018.03.005

Liman Kaban, A. (2021). EFL students' personalized reading experiences and its influence on engagement and online presences. *Shanlax International Journal of*

Education, *9*(4), 196–209. https://doi.org/10.34293/education.v9i4.4113

Lotan, R. A., Burns, D., Darling-Hammond, L. (2019). The instructional leadership corps: Entrusting professional learning in the hands of the profession. *In Learning Policy Institute*. Learning Policy Institute.

Lou, Y. (2020). Teaching disciplinary literacy to adolescent English language learners: Vocabulary development and reading within the disciplines. *TESL Canada Journal*, *37*(1), 63–75. https://doi.org/10.18806/tesl.v37i1.1329

Magableh, I. S. I., & Abdullah, A. (2020). On the effectiveness of differentiated instruction in the enhancement of Jordanian students' overall achievement. *International Journal of Instruction*, *13*(2), 533–548. https://doi.org/10.29333/iji.2020.13237a

Mäkipää, T., Kallio, M., & Hotulainen, R. (2021). Finnish general upper secondary students' metacognitive awareness in foreign language learning. *Reflective Practice*, *22*(4), 446–458. https://doi.org/10.1080/14623943.2021.1913720

Maluleke, M. J. (2019). Using code-switching as an empowerment strategy in teaching mathematics to learners with limited proficiency in English in South African schools. *South African Journal of Education*, *39*(3), 1–9. https://doi.org/10.15700/saje.v39n3a1528

Maxwell, J. A. (2021). The importance of qualitative research for investigating causation. *Qualitative Psychology*, *8*(3), 378–388. https://doi.org/10.1037/qup0000219

McChesney, K., & Aldridge, J. M. (2021). What gets in the way? A new conceptual model for the trajectory from teacher professional development to impact.

Professional Development in Education, *47*(5), 834–852. https://doi.org/10.1080/19415257.2019.1667412

Mellom, P. J., Straubhaar, R., Balderas, C., Ariail, M., & Portes, P. R. (2018). "They come with nothing:" How professional development in a culturally responsive pedagogy shapes teacher attitudes towards Latino/a English language learners. *Teaching and Teacher Education*, *71*, 98–107. https://doi.org/10.1016/j.tate.2017.12.013

Merriam, S. (2008). *Adult Learning Theory for the Twenty-First Century*. *119*, 93–98. https://doi.org/10.1002/ace

Michael Williams, & Tami Moser. (2019). The art of coding and thematic exploration in qualitative research. *International Management Review*, *15*(1), 45–72.

Mohammed, S. M., Amponsah, K. D., Ampadu, E., & Kumassah, E. K. (2020). Extent of implementation of inquiry-based science teaching and learning in Ghanaian junior high schools. *Eurasia Journal of Mathematics, Science and Technology Education*, *16*(12), 1–15. https://doi.org/10.29333/ejmste/9373

Monarrez, A., & Tchoshanov, M. (2020). Unpacking teacher challenges in understanding and implementing cognitively demanding tasks in secondary school mathematics classrooms. *International Journal of Mathematical Education in Science and Technology*. https://doi.org/10.1080/0020739X.2020.1857860

Motulsky, S. L. (2021). Is member checking the gold standard of quality in qualitative research? *Qualitative Psychology*, *8*(3), 389–406. https://doi.org/10.1037/qup0000215

Mpalami, N. (2022). Complexities of translating mathematics tasks from English to learners' home languages. *Pythagoras*, *43*(1), 1–6. https://doi.org/10.4102/PYTHAGORAS.V43I1.560

Mustofa, R. F., & Hidayah, Y. R. (2020). The effect of problem-based learning on lateral thinking skills. *International Journal of Instruction*, *13*(1), 463–474. https://doi.org/10.29333/iji.2020.13130a

Mwale, L., & Mwakapenda, W. (2018). "Eighteen hands high": A narrative reading of Animal Farm from a mathematical perspective. *Pythagoras*, *39*(1), 1–11. https://doi.org/10.4102/pythagoras.v39i1.403

Nair, S. M., & Sanai, M. (2018). Effects of utilizing the stad method (cooperative learning approach) in enhancing students' descriptive writing skills. *International Journal of Education and Practice*, *6*(4), 239–252. https://doi.org/10.18488/journal.61.2018.64.239.252

O'Hara, S., Bookmyer, J., Pritchard, R., & Martin, R. (2020). Mentoring secondary novice teachers to develop academic language of English language learners. *Journal of Educational Research and Practice*, *10*(1), 26–40. https://doi.org/10.5590/jerap.2020.10.1.02

Ökmen, B., & Kılıç, A. (2021). The effect of layered flipped learning model on academic success. *Participatory Educational Research*, *8*(3), 300–322. https://doi.org/10.17275/per.21.67.8.3

Onrubia, J., Roca, B., & Minguela, M. (2022). Assisting teacher collaborative discourse in professional development: An analysis of a facilitator's discourse strategies.

Teaching and Teacher Education, *113*. https://doi.org/10.1016/j.tate.2022.103667

Orman, J., & Pablé, A. (2016). Polylanguaging, integrational linguistics and contemporary sociolinguistic theory: A commentary on Ritzau. *International Journal of Bilingual Education and Bilingualism*, *19*(5), 592–602. https://doi.org/10.1080/13670050.2015.1024606

Orosco, M. J., & Abdulrahim, N. A. (2018). Examining comprehension strategy instruction with English learners' problem solving: Study findings and educator preparation implications. *Teacher Education and Special Education*, *41*(3), 215–228. https://doi.org/10.1177/0888406418770787

Owens, C. W., & Wells, S. P. (2021). Elementary content teacher perceptions regarding their ELL instructional practices. *Journal of Educational Research and Practice*, *11*(1), 139–152. https://doi.org/10.5590/jerap.2020.11.1.10

Pattison, K., Costigan, H., Keller, C., & Sekhar, D. (2022). Investigating the effectiveness of an adapted professional development model in the adoption of school wellness initiatives. *Health Education Journal*, *81*(4), 492–501. https://doi.org/10.1177/00178969221085160

Piasta, S. B., Soto Ramirez, P., Farley, K. S., Justice, L. M., & Park, S. (2020). Exploring the nature of associations between educators' knowledge and their emergent literacy classroom practices. *Reading and Writing*, *33*(6), 1399–1422. https://doi.org/10.1007/s11145-019-10013-4

Polat, N., Mahalingappa, L., Hughes, E., & Karayigit, C. (2019). Change in preservice teacher beliefs about inclusion, responsibility, and culturally responsive pedagogy

for English learners. *International Multilingual Research Journal*, *13*(4), 222–238. https://doi.org/10.1080/19313152.2019.1597607

Pratiwi, V. U. (2020). Improving students' writing skills through collaborative learning: A case study of senior high school veteran 1 of Sukoharjo. *Theory and Practice in Language Studies*, *10*(5), 527. https://doi.org/10.17507/tpls.1005.06

Qasem, F. A. (2020). The effective role of learners' self-assessment tasks in enhancing learning English as a second language. *Arab World English Journal*, *11*(3), 502-514. https://doi.org/10.24093/awej/vol11no3.33

Rahimi, M. (2021). A comparative study of the impact of focused vs. comprehensive corrective feedback and revision on ESL learners' writing accuracy and quality. *Language Teaching Research*, *25*(5), 687–710. https://doi.org/10.1177/1362168819879182

Rahman Talukder, M. M., Green, C., & Mamun-ur-Rashid, M. (2021). Primary science teaching in Bangladesh: A critical analysis of the role of the DPEd program to improve the quality of learning in science teaching. *Heliyon*, *7*(2). https://doi.org/10.1016/j.heliyon.2021.e06050

Rao, Z., & Chen, H. (2020). Teachers' perceptions of difficulties in team teaching between local- and native-English-speaking teachers in EFL teaching. *Journal of Multilingual and Multicultural Development*, *41*(4), 333–347. https://doi.org/10.1080/01434632.2019.1620753

Ravitch, S., & Carl, N. M. (2018). Reflections from the field: Critical partnership and participation in India. *Penn GSE Perspectives on Urban Education*, *15*(1), 1–11.

Reyes, M., & Hwang, N. Y. (2021). Middle school language classification effects on high school achievement and behavioral outcomes. *Educational Policy*, *35*(4), 590–620. https://doi.org/10.1177/0895904818823747

Richardson, C. (2022). Supporting collaborative creativity in education with the i5 framework. *Educational Action Research*, *30*(2), 297–312. https://doi.org/10.1080/09650792.2020.1810731

Rose, A. L., & Sughrue, J. A. (2021). Professional development needs of novice alternatively certified teachers in Florida: teachers' perspectives. *Teacher Development*, *25*(4), 449–464. https://doi.org/10.1080/13664530.2021.1947887

Sa'D, S. H. T., & Rajabi, F. (2018). Teaching and learning vocabulary: What English language learners perceive to be effective and ineffective strategies. *Center for Educational Policy Studies Journal*, *8*(1), 139–163. https://doi.org/10.26529/cepsj.492

Salavert, R., & Szalkiewicz, D. (2020). The seal of biliteracy, graduates with global competence, is on the rise. *NECTFL Review*, *85*, 29–49.

Sandilos, L. E., Baroody, A. E., Rimm-Kaufman, S. E., & Merritt, E. G. (2020). English learners' achievement in mathematics and science: Examining the role of self-efficacy. *Journal of School Psychology*, *79*(March), 1–15. https://doi.org/10.1016/j.jsp.2020.02.002

Saxe, G. B., & Sussman, J. (2019). Mathematics learning in language inclusive classrooms: Supporting the achievement of English learners and their English proficient peers. *Educational Researcher*, *48*(7), 452–465.

https://doi.org/10.3102/0013189X19869953

Schneider, C., & Arnot, M. (2018). An exploration of school communication approaches for newly arrived EAL students: Applying three dimensions of organisational communication theory. *Cambridge Journal of Education*, *48*(2), 245–262. https://doi.org/10.1080/0305764X.2017.1329399

Schneider, E. (2019). Impact of an English language learner course on preservice teachers. *SRATE Journal*, *28*(1), 43–51.

Seetee, N., Chi, C., Dhir, A., & Chen, S. (2021). Validation of the science, mathematics, and English task value scales based on longitudinal data. *International Journal of Science and Mathematics Education*, *19*(3), 443–460. https://doi.org/10.1007/s10763-020-10081-x

Seo, D., & Taherbhai, H. (2018). What makes asian English language learners tick? *Asia-Pacific Education Researcher*, *27*(4), 291–302. https://doi.org/10.1007/s40299-018-0386-1

Sharma, S. (2018). Bridging language barriers in statistics for year-12 Pasifika students: A collaborative study. *Waikato Journal of Education*, *23*(1), 107–120. https://doi.org/10.15663/wje.v23il

Shi, Y., Zaier, A., & Maina, F. (2020). Sheltered instruction observation protocol model: An effective way of promoting teacher candidates' self-efficacy in teaching English language learners. *International Journal of Diversity in Education*, *21*(2), 1–17. https://doi.org/10.18848/2327-0020/CGP/v21i02/1-17

Slettebø, T. (2021). Participant validation: Exploring a contested tool in qualitative

research. *Qualitative Social Work*, *20*(5), 1223–1238. https://doi.org/10.1177/1473325020968189

Smith, O. L., & Robinson, R. (2020). Teacher perceptions and implementation of a content-area literacy professional development program. *Journal of Educational Research and Practice*, *10*(1), 55–69. https://doi.org/10.5590/jerap.2020.10.1.04

Soland, J., & Sandilos, L. E. (2020). English language learners, self-efficacy, and the achievement gap: Understanding the relationship between academic and social-emotional growth. *Journal of Education for Students Placed at Risk*, *26*(1), 1–25. https://doi.org/10.1080/10824669.2020.1787171

Soland, J., & Sandilos, L. E. (2021). English language learners, self-efficacy, and the achievement gap: Understanding the relationship between academic and social-emotional growth. *Journal of Education for Students Placed at Risk*, *26*(1), 20-44. https://doi.org/10.1080/10824669.2020.1787171

Sriwichai, C. (2020). Students' readiness and problems in learning English through blended learning environment. *Asian Journal of Education and Training*, *6*(1), 23–34. https://doi.org/10.20448/journal.522.2020.61.23.34

Staats, S., & Laster, L. A. (2018). Extending universal design for learning through concurrent enrollment: Algebra teachers' perspectives. *Education Sciences*, *8*(4), 1–19. https://doi.org/10.3390/educsci8040154

Stahl, N., & King, J. (2020). Expanding approaches for research: Understanding and using trustworthiness in qualitative research. *Journal of Developmental Education*, *44*(1), 26–28.

Stoneberg, B. (2016). Idaho percentile results for the 2015 and 2016 ISAT (SBAC) English language arts and mathematics tests in grades 3-8 and 10. *Online Submission*.

Suh, E., Hoffman, L., Hughes, M., & Zollman, A. (2020). The twelve-foot basketball player task: STEM circles score points and win academic goals with emergent multilingual students. *Middle School Journal*, *51*(3), 11–18. https://doi.org/10.1080/00940771.2020.1735872

Swanson, H. L., Arizmendi, G. D., Li, J., Swanson, H. L., Del, M., Guevara, A., Luevano, L., Massa, J., Riskie, C., Curtis, T., Yan, C., Flores, K., Zambrano, S., Cruz, K., Brown, H., Flores, K., Lopez, V., Garcia, S., Brooks, M., … Hall-cuaron, B. (2022). Supplemental material for what mediates the relationship between growth in math problem-solving and working memory in English language learners? *Journal of Educational Psychology*, *114*(7), 1608–1632. https://doi.org/10.1037/edu0000718.supp

Swanson, H. L., Kong, J., Petcu, S. D., & Asencio Pimentel, M. F. (2020). Can difficulties in language acquisition and specific learning disabilities be separated among English learners? *Exceptional Children*, *86*(3), 293–309. https://doi.org/10.1177/0014402919893931

Tai, K. W. H., & Wei, L. (2021). Co-Learning in Hong Kong English medium instruction mathematics secondary classrooms: A translanguaging perspective. *Language and Education*, *35*(3), 241–267. https://doi.org/10.1080/09500782.2020.1837860

Tavakol, M., Tavakoli, M., & Ketabi, S. (2022). The impact of linguistic background on

the nature of classroom dyadic interactions: evidence from L2 and L3 learners of English as a foreign language. *International Multilingual Research Journal*, *16*(1), 1–26. https://doi.org/10.1080/19313152.2021.1929761

TeKippe, S., Bechtel, M., Krogh Faga, K., & Rod Szabo, M. (2020). The 3CM approach: A pedagogy based in theory and experience to move beyond the "what" into the "how" toward a pathway of lifelong learning and teaching. *The International Journal of Pedagogy and Curriculum*, *27*(1), 39–52. https://doi.org/10.18848/2327-7963/cgp/v27i01/39-52

Thipatdee, G. (2020). The development of English competency-based curriculum integrated with local community for high school students. *Journal of Education and Learning*, *10*(1), 39. https://doi.org/10.5539/jel.v10n1p39

Toba, R., Noor, W. N., & Sanu, L. O. (2019). The current issues of Indonesian EFL students' writing skills: Ability, problem, and reason in writing comparison and contrast essay. *Dinamika Ilmu*, *19*(1), 57–73. https://doi.org/10.21093/di.v19i1.1506

Torff, B., & Murphy, A. F. (2021). Placement of former English language learners in middle schools: General education or dual language? *International Journal of Bilingual Education and Bilingualism*, *24*(4), 569–576. https://doi.org/10.1080/13670050.2018.1494697

Turkan, S., & de Jong, E. (2018). An exploration of preservice teachers' reasoning about teaching mathematics to English language learners. *Teacher Education Quarterly*, *45*(2), 37–60.

Valley, V. (2019). The impact of math vocabulary on conceptual understanding for ELLs.

Networks: An Online Journal for Teacher Research, *21*(2), 1–20. https://doi.org/10.4148/2470-6353.1278

VanTassel-Baska, J., Hubbard, G. F., & Robbins, J. I. (2020). Differentiation of instruction for gifted learners: Collated evaluative studies of teacher classroom Practices. *Roeper Review*, *42*(3), 153–164. https://doi.org/10.1080/02783193.2020.1765919

Vattøy, K. D., & Gamlem, S. M. (2020). Teacher–student interactions and feedback in English as a foreign language classrooms. *Cambridge Journal of Education*, *50*(3), 371–389. https://doi.org/10.1080/0305764X.2019.1707512

Vie, S. (2018). Effective social media use in online writing classes through Universal Design for Learning (UDL) principles. *Computers and Composition*, *49*, 61–70. https://doi.org/10.1016/j.compcom.2018.05.005

Waters, S., & Hensley, M. (2020). Measuring rural P-12 teachers' attitudes, perceptions, and utilizations of social media. *Research in Social Sciences and Technology*, *5*(3), 25–54. https://doi.org/10.46303/ressat.05.03.2

Xin, Y. P., Kim, S. J., Lei, Q., Wei, S., Liu, B., Wang, W., Kastberg, S., Chen, Y., Yang, X., Ma, X., & Richardson, S. E. (2020). The effect of computer-assisted conceptual model-based intervention program on mathematics problem-solving performance of at-risk English learners*. *Reading and Writing Quarterly*, *36*(2), 104–123. https://doi.org/10.1080/10573569.2019.1702909

Yoon, B. (2021). English language learners' language and literacy development: A brief synopsis of major theoretical orientations for middle school teachers. *Middle School*

Journal, *52*(1), 23–29. https://doi.org/10.1080/00940771.2020.1840270

Yu, F. Y., & Cheng, W. W. (2020). Effects of academic achievement and group composition on quality of student-generated questions and use patterns of online procedural prompts. *ICCE 2020 - 28th International Conference on Computers in Education, Proceedings*, *1*, 573–581.

Yu, S., Xu, H., Jiang, L., & Chan, I. K. I. (2020). Understanding Macau novice secondary teachers' beliefs and practices of EFL writing instruction: A complexity theory perspective. *Journal of Second Language Writing*, *48*(July 2019), 100728. https://doi.org/10.1016/j.jslw.2020.100728

Yükselir, C. (2020). A quantitive study of Turkish EFL learners' perceptions about critical thinking dispositions. *Internation Online Journal of Education and Teaching* *7*(1), 127–139.

Zahir, M. Z., Miles, A., Hand, L., & Ward, E. C. (2022). Opportunities to enhance children's communication development at school in underserved communities. *Language, Speech, and Hearing Services in Schools*, *53*(1), 104–121. https://doi.org/10.1044/2021_LSHSS-20-00148

Zhang, Y. (2021). Preparing teachers to work with English learners: A multimodal vocabulary mini-lesson project. *TESOL Journal*, *12*(2), 1–22. https://doi.org/10.1002/tesj.569

Zubiri-Esnaola, H., Vidu, A., Rios-Gonzalez, O., & Morla-Folch, T. (2020). Inclusivity, participation and collaboration: Learning in interactive groups. *Educational Research*, *62*(2), 162–180. https://doi.org/10.1080/00131881.2020.1755605

Appendix A: The Project

The appendix presents a rundown of the 3-day professional development project. The research data analysis backed the selection of the project deliverable. The research problem addressed in this study was teachers are challenged to support the mathematics achievement of ninth through 12th grade ELLs. The purpose of this qualitative study is to explore the perceptions of the teachers' challenges in supporting the mathematics achievement of ninth through 12th grade ELLs. The professional development was designed for high school mathematics educators to acquire the knowledge and skills to help ELLs in their mathematics classes.

The professional development was categorized into a 3-day training. The implementation date of the project was recommended during an approved date by local school district leaders. The intentions of the professional development are as follows:

1) Mathematics educators will learn how to utilize scaffolding strategies to help ELLs in mathematical classes.
2) Mathematics educators will learn how to utilize collaborative learning strategies to support ELLs in mathematics classes
3) Mathematics educators will learn to utilize differentiated instruction strategies and create assessments to help ELLs in mathematical classes.

Target Audience

The targeted audience for the professional development is mathematic educators in the local school district. The professional development intends to optimize three days of beneficial and productive training, feature group activities, discussions, and hands-on activities.

Materials and Equipment

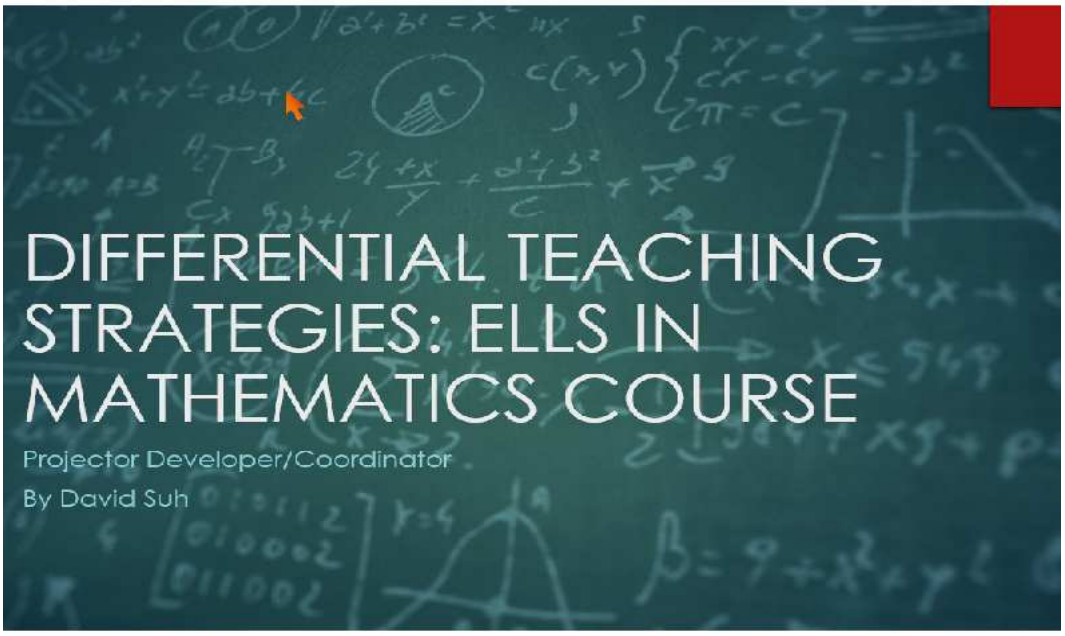
- Projector
- Laptop
- Writing note pad
- Pens
- Highlighters
- Speakers
- Microphone
- Wall Pad

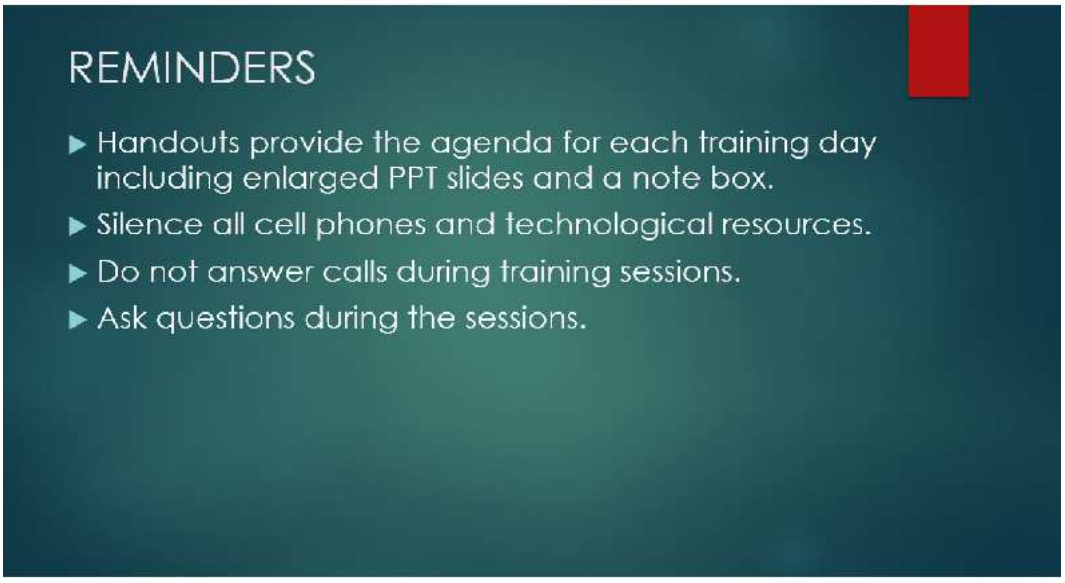
3-Day Professional Development		
DAY 1: Scaffolding Strategy		
Objective: Mathematic educators will learn how to utilize scaffolding strategies to help ELLs in mathematical classes.		
8:00-8:30 am	Sign-in/Breakfast/Pick up resources	
8:30-9:00 am	Welcome faculty, provide a brief overview of professional development, and introduce the trainers	
9:00-9:30 am	Present challenges and needs to help ELLs in mathematics classes.	
9:30-9:45 am	15-minute break	
9:45 am- 12:30 pm	Introduction to scaffolding strategy Implement scaffolding strategy Open Discussion (Think – Pair – Share)	
12:30-1:30 pm	Lunch Break	Lunch provided
1:30-3:30 pm	Activity 1: Creating a Scaffolding strategy on a mathematical topic. Activity 2: Discuss what scaffolding strategy other educators have created. Activity 3: Creating a Scaffolding strategy with other educators. Groups of 4. Activity 4: Present the scaffolding strategy to the audience.	
3:30-3:45 pm	End of day 1 Wrap-up and Assessment	
Day 2: Collaborative Learning Strategy		
Objective: Mathematic educators will learn to utilize collaborative learning strategies to support ELLs in mathematics classes.		
8:00-8:30 am	Welcome faculty to Day 2 Introduction and Overview	
8:30-10:30 am	Review of the Scaffolding strategies Discussions with other educators. (Think – Pair – Share)	
10:30-10:45 am	15-minute break	
10:45 am-12:00 pm	Activity 1: Introduction to Collaborative Learning Strategies Activity 2: Implement Collaborative learning strategies Activity 3: Open Discussion (Think – Pair – Share)	

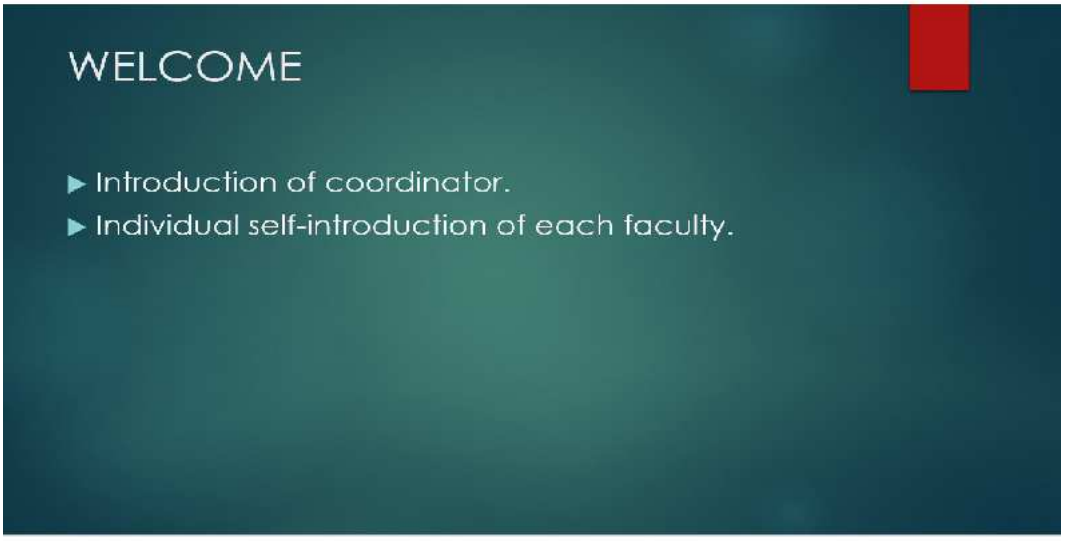
12:00-1:00 pm	Lunch Break	Lunch Provided
1:00-3:30 pm	Activity 1: Creating a Collaborative Learning strategy on a mathematical topic. Activity 2: Discuss what Collaborative Learning strategy other educators have created. Activity 3: Creating a Collaborative Learning strategy with other educators. Groups of 4. Activity 4: Present the Collaborative Learning strategy to the audience.	
3:30-3:45 pm	End of day 2 Wrap-up and assessment	
Day 3: Differentiated Instruction Strategy & Assessments		
Objective: Mathematic educators will learn to utilize differentiated instruction strategies and create assessments to help ELLs in mathematical classes.		
8:00-8:30 am	Welcome faculty to day 3 Introduction and Overview	
8:30-10:00 am	Review of Collaborative Learning Strategy Introduce differentiated instruction to help ELLs. Implementation of how to utilize differentiated instruction and build assessments.	
10:00-10:15 am	15-minute break	
10:15 am-12:00 pm	Activity 1: Create differentiated instruction plans for a mathematical topic. Activity 2: Discuss with different partners what differentiated instructions other educators have created. Activity 3: Create a differentiated instruction plan with other educators—Group of 4.	
12:00-1:00 pm	Lunch Break	Lunch Provided
1:00-3:00 pm	Activity 4: Create an assessment correlated with differentiated instruction with other educators—Group of 4. Activity 5: Present the differentiated instruction assessments to the audience.	

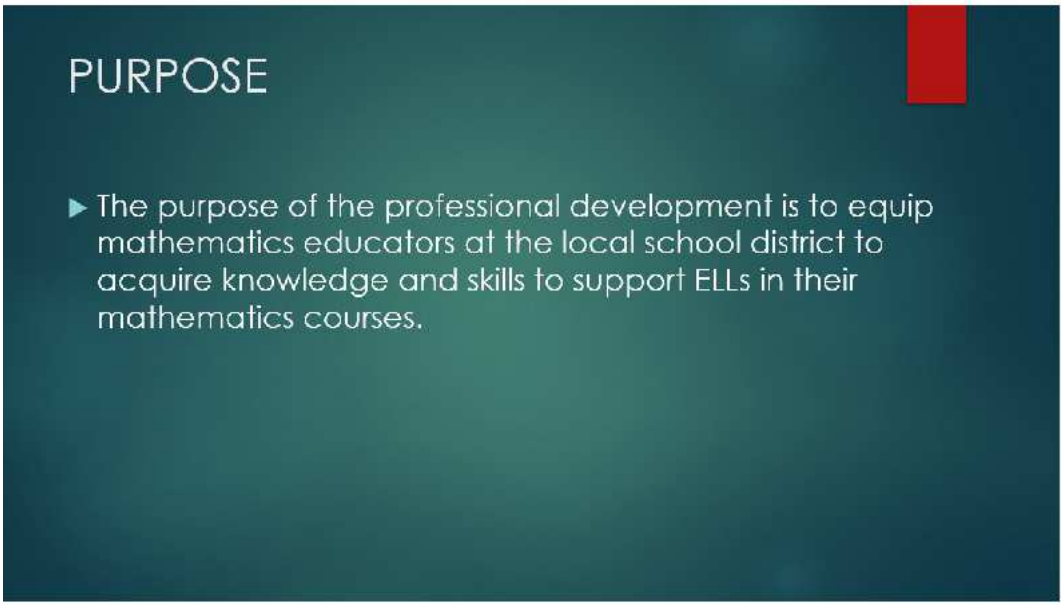
3:00-3:30 pm	End of day three and professional development Wrap-up and assessment	

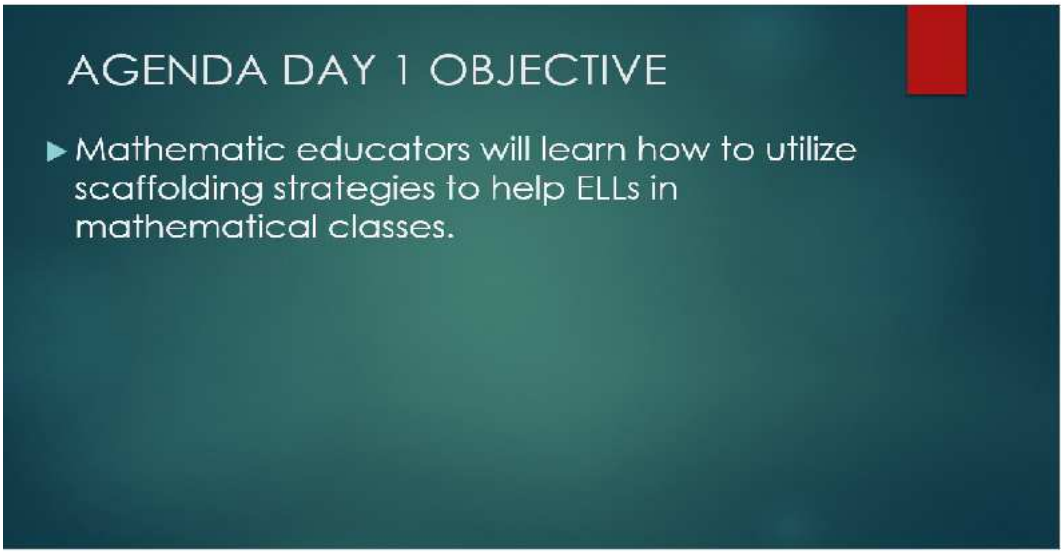
The PowerPoint

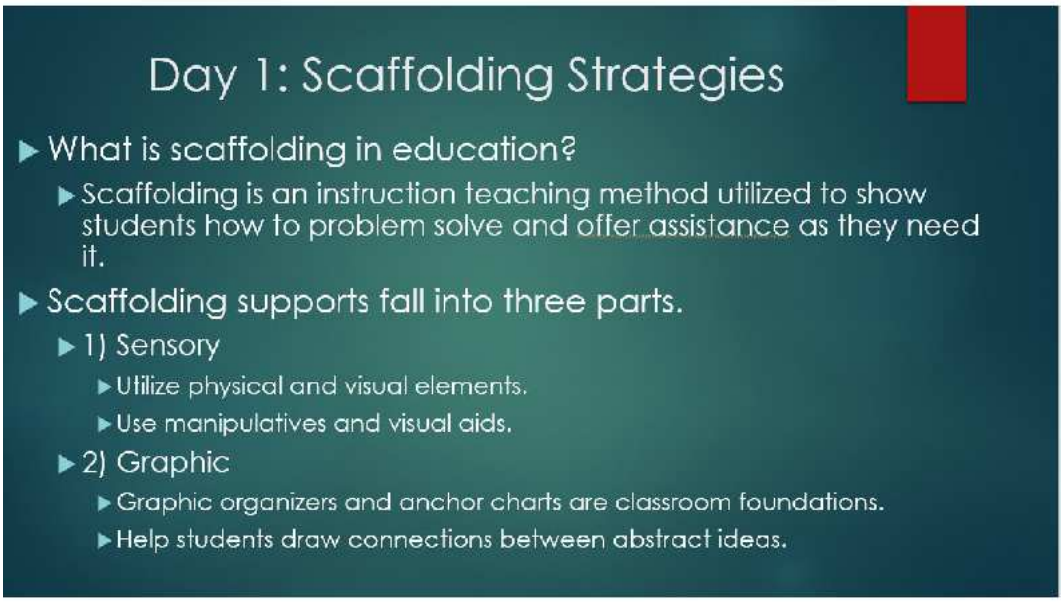





WELCOME
Introduction of coordinator.
Individual self-introduction of each faculty.


PURPOSE
The purpose of the professional development is to equip mathematics educators at the local school district to acquire knowledge and skills to support ELLs in their mathematics courses.


AGENDA DAY 1 OBJECTIVE
Mathematic educators will learn how to utilize scaffolding strategies to help ELLs in mathematical classes.


Day 1: Scaffolding Strategies
What is scaffolding in education?
Scaffolding is an instruction teaching method utilized to show students how to problem solve and offer assistance as they need it.
Scaffolding supports fall into three parts.
1) Sensory
Utilize physical and visual elements.
Use manipulatives and visual aids.
2) Graphic
Graphic organizers and anchor charts are classroom foundations.
Help students draw connections between abstract ideas.

Day 1: Scaffolding Strategies Cont.

- Scaffolding support continued
  - Interactive-
    - Collaborative learning is an important part of the classroom.
      - Jigsaw groups
      - Think-Pair-Share
- Discuss with a partner on the different scaffolding supports.
  - Think-Pair-Share
    - Move around the room and find a partner to discuss on the topic.

Scaffolding Strategy: Prior Knowledge

- Build on prior knowledge.
  - Utilize mini-lessons.
  - Build on the academic language
  - Utilize entry or exit tickets.
  - Front-load vocabulary
  - Have a quick class discussion
- Think-Pair-Share
  - Discuss on what you learned from the prior knowledge for scaffolding strategy.

Scaffolding Strategy: Model the Mathematical Problem

- Modeling the mathematical problem
  - Use different strategies to connect with students.
    - Thinking Maps
    - Flow charts
    - Graphic organizers
    - Math games
    - Modeling steps
    - Hands-on practice
    - Example of an assignment or a rubric.
- Mixed-Pair-Share
  - Discuss with a partner on what you learned on modeling the mathematical problems.

Scaffolding Strategy: Encourage Participation

- Encourage participation
  - Use different strategies to encourage participation.
    - Using Equity Sticks
    - Wait time
      - The silence might feel uncomfortable at first, but ELLs will eventually begin to participate.
    - Make sure students are participating equally.
- Mixed-Pair-Share
  - Discuss on the different strategies what you learned to encourage participation for ELLs.

LUNCH BREAK

PRACTICAL APPLICATION

- Creating scaffolding strategies on a mathematical topic.
  - Use a mathematical topic and apply a scaffolding strategies.
  - It can be for an Integrated 1, Integrated 2, or Integrated 3 class.
- Discuss what scaffolding strategy other educators have created.
  - Walk around the room and find a person who picked the same class as you and have a discussion on what you created.
  - Walk around the room and find a person who picked a different class and have a discussion.

PRACTICAL APPLICATION

- Creating a lesson with scaffolding strategies with other educators. Groups of 4.
  - Collaborate with other educators in a group of 4 and pick a mathematical topic.
    - Designate a task for each member.
    - Write the information on the Wall Pad.
- Present the scaffolding strategy to the audience in the specific groups.
  - Walk around the room and look at other groups' Wall Pad.
  - Go next to your group's Wall Pad and present it when it is your group's turn.

DAY 2: COLLABORATIVE LEARNING STRATEGY

END OF DAY 1

SURVEY

AGENDA DAY 2 OBJECTIVE

- Mathematic educators will learn how to utilize collaborative learning strategies to support ELLs in mathematics classes.

REVIEW OF THE SCAFFOLDING STRATEGIES

- Positives to integrate scaffolding strategies in the classroom for ELLs.
  - Challenges ELLs through discovery and deep learning.
  - Engages ELLs in driving discussions in small and large classes.
  - Spurs ELLs to become better students.
  - Increases the possibilities for ELLs to meet instruction objectives.
  - Allows individualized instruction.
  - Provides a welcoming and caring learning environment.

REVIEW OF THE SCAFFOLDING STRATEGIES

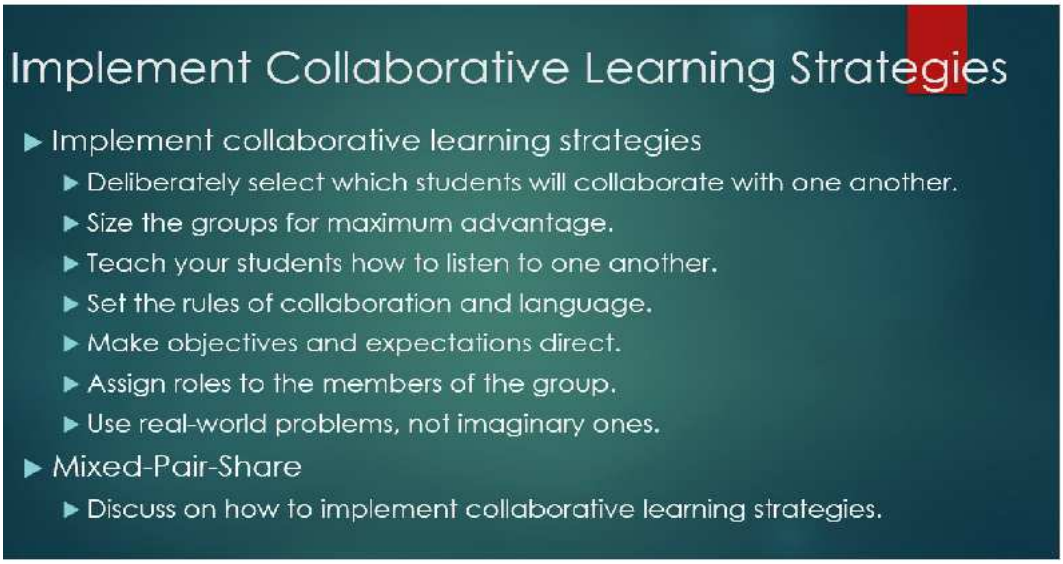
- Challenges to integrate scaffolding strategies in the classroom for ELLs.
  - Planning for and implement scaffolds is demanding and time consuming
  - Selecting right scaffolds that match the diverse learning and communication styles of ELLs.
  - Not knowing the ELLs well enough.
    - Especially on their cognitive and intuitive abilities to provide suitable scaffolds.
  - Using the right judgment when to remove the scaffold so the ELLs does not depend on the support.

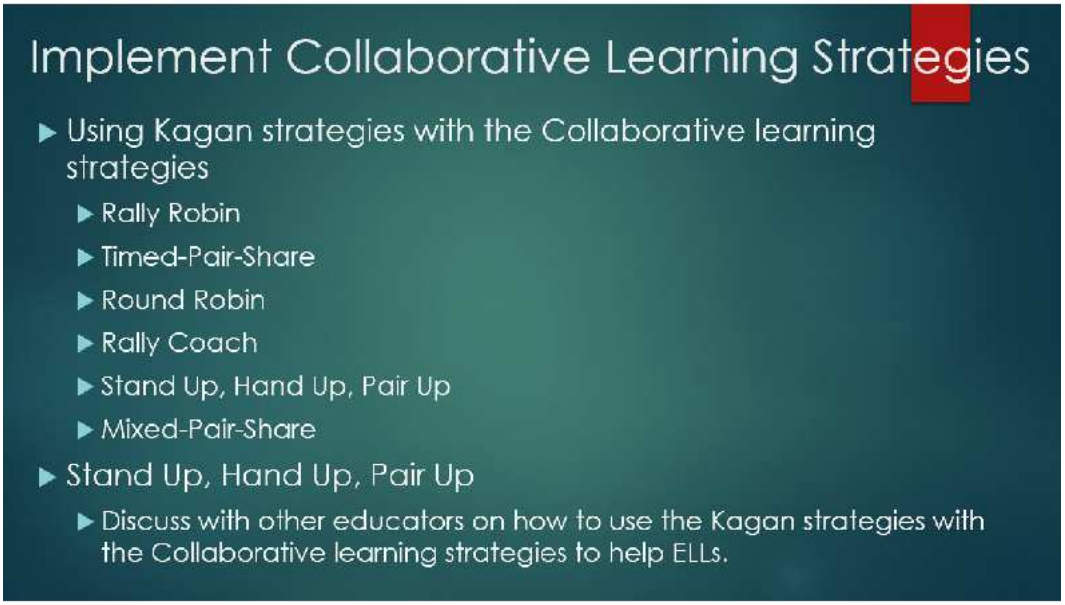
REVIEW OF THE SCAFFOLDING STRATEGIES

- Mathematics educators discuss how they implement scaffolding strategies in their mathematics classes.
  - Move around the room and discuss with a partner on how you are going to implement the scaffold strategies to support ELLs.
  - Move around the room and discuss with a different partner on how you're going overcome the challenges to use scaffold strategies to support ELLs.

Collaborative Learning Strategies

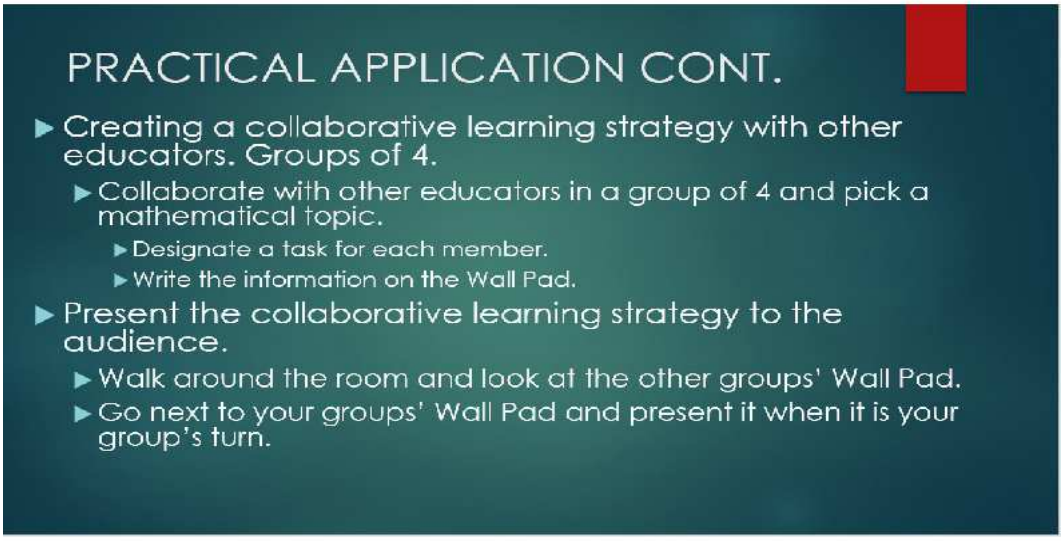
- Collaborative Learning
  - Found it roots back in the 1980s.
  - Idea was based on perhaps didactic learning might not be the best way.
- Collaborative learning allows
  - Active interaction with other students.
  - Accountable to other students.
  - Heterogeneous grouping
  - Positive interdependency
  - Social skills taught directly

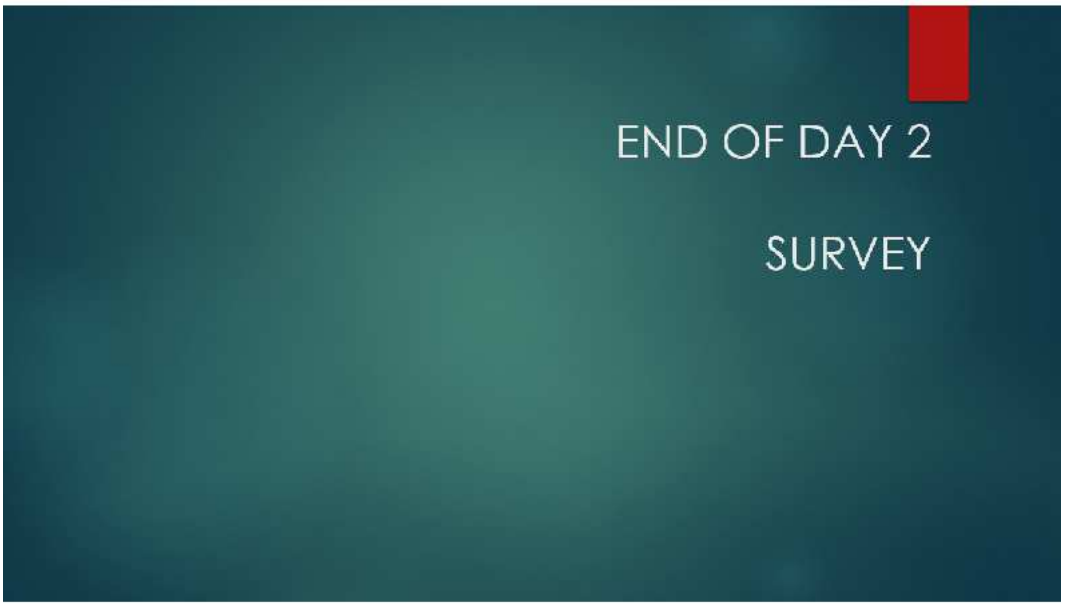

Implement Collaborative Learning Strategies
Implement collaborative learning strategies
Deliberately select which students will collaborate with one another.
Size the groups for maximum advantage.
Teach your students how to listen to one another.
Set the rules of collaboration and language.
Make objectives and expectations direct.
Assign roles to the members of the group.
Use real-world problems, not imaginary ones.
Mixed-Pair-Share
Discuss on how to implement collaborative learning strategies.


Implement Collaborative Learning Strategies
Using Kagan strategies with the Collaborative learning strategies
Rally Robin
Timed-Pair-Share
Round Robin
Rally Coach
Stand Up, Hand Up, Pair Up
Mixed-Pair-Share
Stand Up, Hand Up, Pair Up
Discuss with other educators on how to use the Kagan strategies with the Collaborative learning strategies to help ELLs.

PRACTICAL APPLICATION

- Creating a collaborative learning strategy on a mathematical topic.
  - Use a mathematical topic and apply collaborative learning strategies.
  - It can be for an Integrated 1, Integrated 2, or Integrated 3 class.
- Discuss what collaborative learning strategy other educators have created.
  - Walk around the room and find a person who picked the same class as you and have a discussion on what you created.
  - Walk around the room and find a person who picked a different class and have a discussion.


PRACTICAL APPLICATION CONT.
Creating a collaborative learning strategy with other educators. Groups of 4.
Collaborate with other educators in a group of 4 and pick a mathematical topic.
Designate a task for each member.
Write the information on the Wall Pad.
Present the collaborative learning strategy to the audience.
Walk around the room and look at the other groups' Wall Pad.
Go next to your groups' Wall Pad and present it when it is your group's turn.


END OF DAY 2
SURVEY

DAY 3: DIFFERENTIATED INSTRUCTION STRATEGY & ASSESSMENTS

AGENDA DAY 3 OBJECTIVE

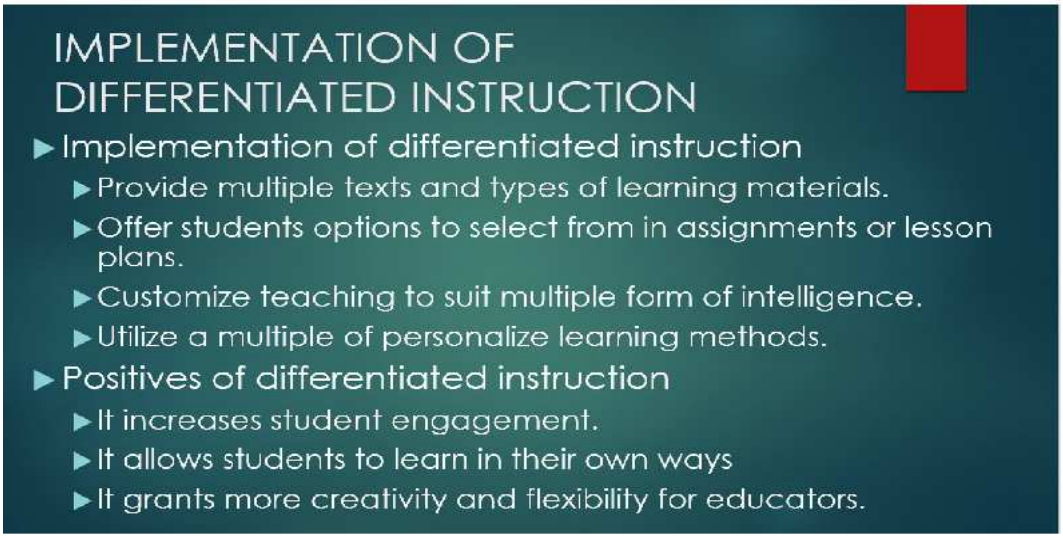
- Mathematic educators will learn to utilize differentiated instruction strategies and create assessments to help ELLs in mathematical classes.

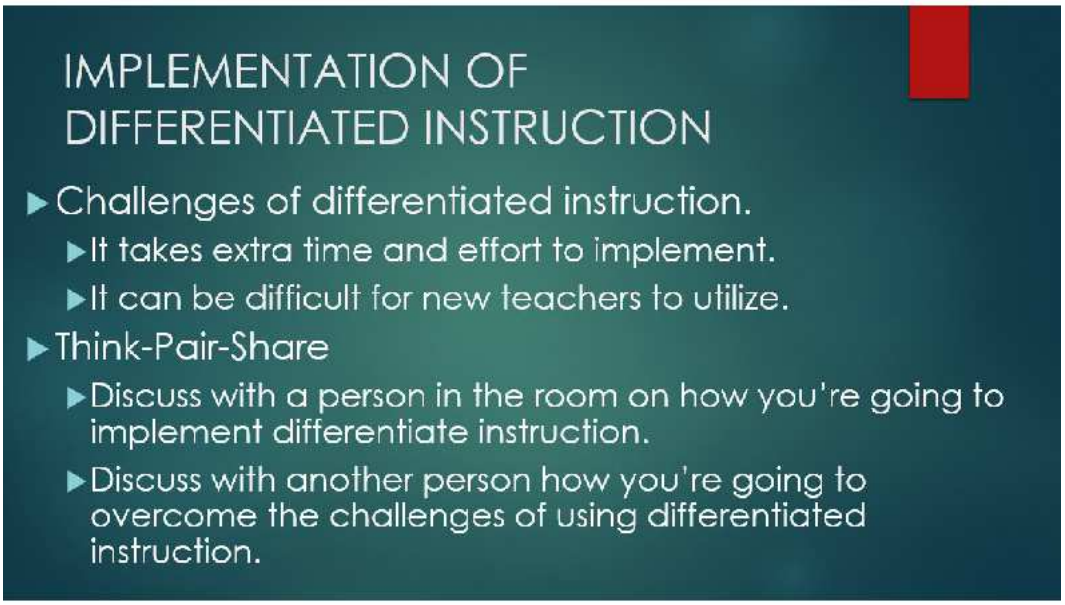
REVIEW OF COLLABORATIVE LEARING STRATEGY

- Positives of collaborative learning strategy
  - Development of higher-level thinking and oral communication.
  - Exposure to and a rise in comprehension of diverse outlooks.
  - Increase in self-esteem and responsibility.
  - Improves social interactions.

REVIEW OF COLLABORATIVE LEARNING STRATEGY

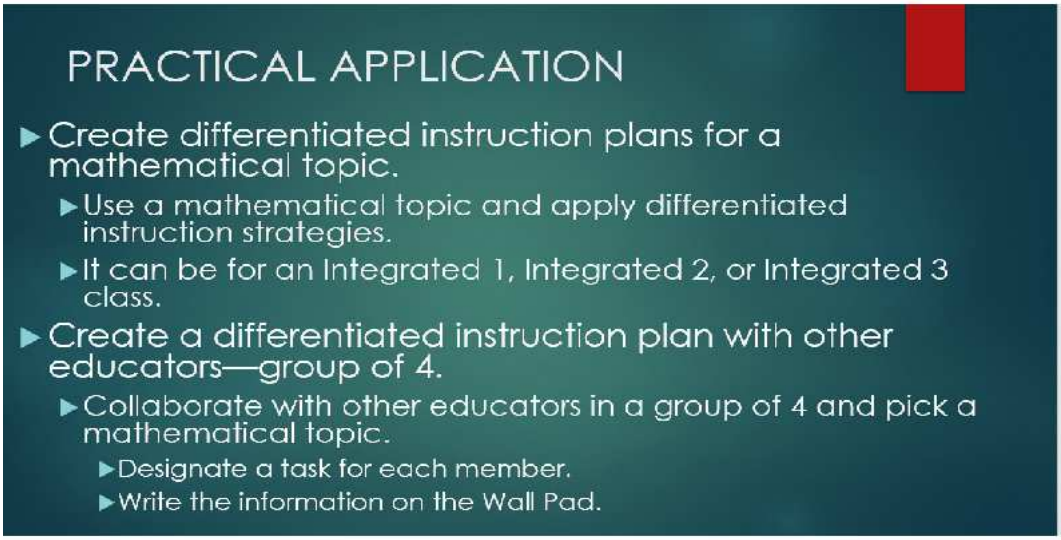
- Challenges of collaborative learning strategies
  - Sometimes individuals don't get along
  - People may not pull their weight in the discussions.
  - Individuals need to go at different speeds.
  - Someone may try to take over the group.
- Mathematics educators discuss how they implement collaborative learning strategies in their mathematics classes.
  - Move around the room and discuss with a partner on how you are going to implement the collaborative learning strategies to support ELLs.
  - Move around the room and discuss with a different partner on how you're going overcome the challenges to use collaborative learning strategies to support ELLs.

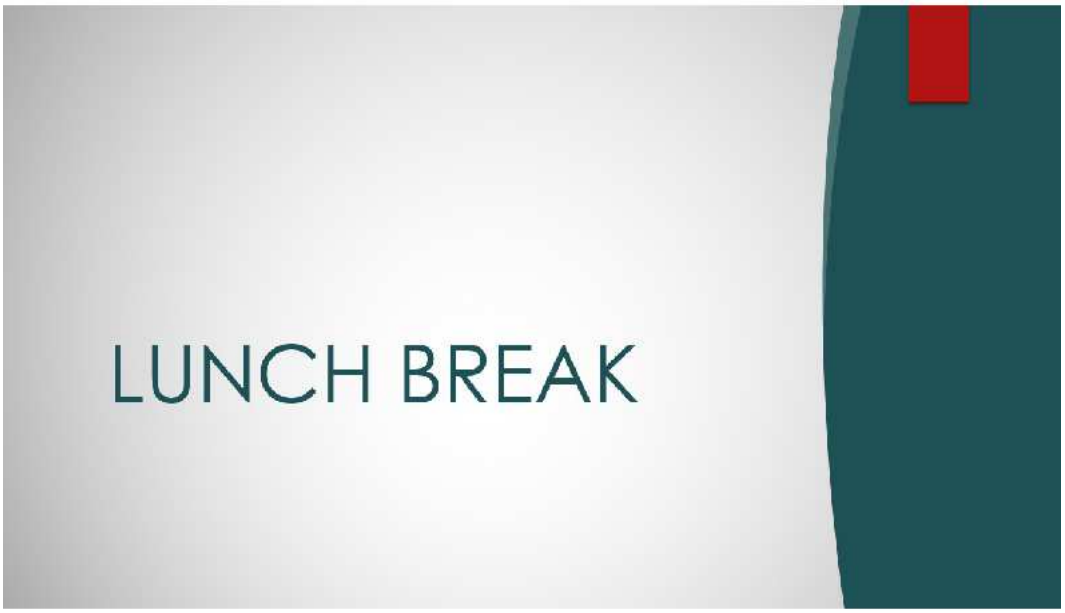

IMPLEMENTATION OF
DIFFERENTIATED INSTRUCTION
Implementation of differentiated instruction
Provide multiple texts and types of learning materials.
Offer students options to select from in assignments or lesson plans.
Customize teaching to suit multiple form of intelligence.
Utilize a multiple of personalize learning methods.
Positives of differentiated instruction
It increases student engagement.
It allows students to learn in their own ways
It grants more creativity and flexibility for educators.

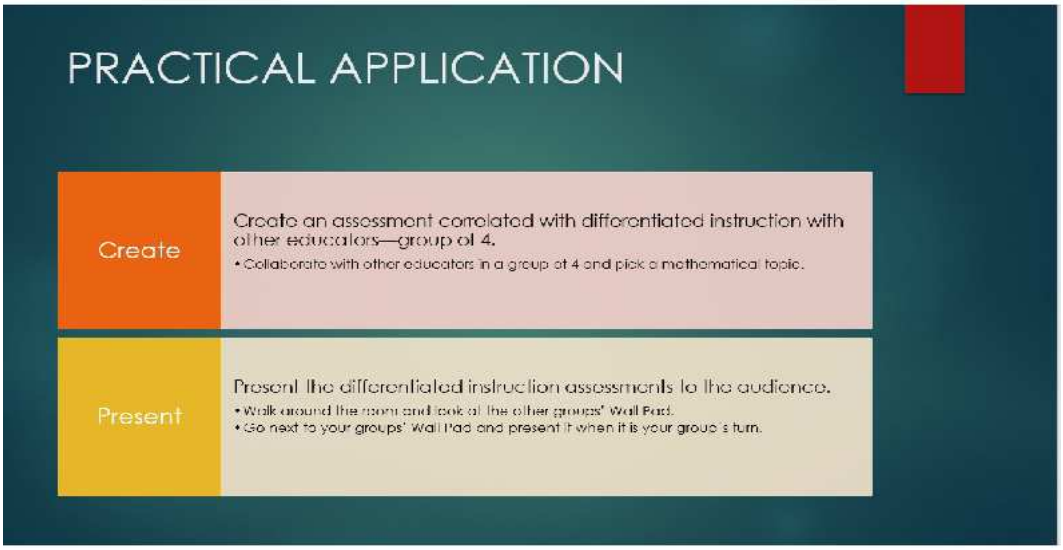

IMPLEMENTATION OF
DIFFERENTIATED INSTRUCTION
Challenges of differentiated instruction.
It takes extra time and effort to implement.
It can be difficult for new teachers to utilize.
Think-Pair-Share
Discuss with a person in the room on how you're going to implement differentiate instruction.
Discuss with another person how you're going to overcome the challenges of using differentiated instruction.

IMPLEMENTATION OF DIFFERENTIATED INSTRUCTION ASSESSMENTS

- Creating differentiated assessments
  - Adjusting questions
  - Create informal pre-learning assessments.
  - Create games and assessment
  - Students self-grading and tracking
  - Project-based assessments
  - Post learning assessments
- Mixed-Pair-Share
  - Discuss with a person in the group on how you're going to create differentiated assessments to help ELLs.


PRACTICAL APPLICATION
Create differentiated instruction plans for a mathematical topic.
Use a mathematical topic and apply differentiated instruction strategies.
It can be for an Integrated 1, Integrated 2, or Integrated 3 class.
Create a differentiated instruction plan with other educators—group of 4.
Collaborate with other educators in a group of 4 and pick a mathematical topic.
Designate a task for each member.
Write the information on the Wall Pad.


LUNCH BREAK


PRACTICAL APPLICATION
Create
Create an assessment correlated with differentiated instruction with other educators—group of 4.
• Collaborate with other educators in a group of 4 and pick a mathematical topic.
Present
Present the differentiated instruction assessments to the audience.
• Walk around the room and look at the other groups' Wall Pad.
• Go next to your groups' Wall Pad and present it when it is your group's turn.


END OF PROFESSIONAL DEVELOPMENT
SURVEY & THANK YOU

The Activity Sheets

Day 1: Activity Sheet

Introduction

Presentation:

Time: 30 minutes

The coordinator will have a presentation. The coordinator will inform the present challenges and needs to help ELLs in mathematics classes. The coordinator will inform the trend on what challenges mathematics educators to face to support ELLs and why educators have those difficulties. It will be a transition to discuss the scaffolding strategy.

15-Minute Break

Presentation:

Time: 1 hour and 45 minutes

The coordinator will have a presentation. The coordinator will inform on the scaffolding strategy and how it is an excellent strategy in the classroom setting. The coordinator will advise on how to implement the scaffolding strategy for all students and how to help ELLs while using the scaffolding strategy.
There will be an open discussion on how to incorporate scaffolding strategies to support ELLs in mathematics classes.

Lunch Break

Activity 1: Creating a scaffolding strategy on a mathematical topic.

Time: 30 minutes

Educators will establish a mathematical topic, possibly from Integrated 1, Integrated 2, or Integrated 3. There they will brainstorm and create a scaffolding strategy for a mathematical topic.

Activity 2: Discuss with different partners what scaffolding strategy other educators have created.

Time: 10 minutes

Educators will move around and find a partner to discuss what scaffolding strategy other educators have created and bring out their opinion on why it would be adequate to help ELLs.

Activity 3: Creating a scaffolding strategy with other educators in groups of 4.

Time: 40 minutes

Educators will work in groups of 4 and create a scaffolding strategy in a specific mathematical topic. They will brainstorm together and write the information on a Wall Pad. The groups will post the Wall Pad on the side walls of the conference room.

Activity 4: Present the scaffolding strategy to the audience.

Time: 40 minutes

First, educators will go around to look at the different Wall Pads. Next, the group of 4 will present their information, and others will listen to the group's perspective. The coordinator will facilitate the discussions when there are questions.

End of Day 1 Activities

Day 2: Activity Sheet

Presentation:

Time: 2 hours

The coordinator will have a presentation. The coordinator will review the positives of using scaffolding strategies to support ELLs in a mathematics classroom. The coordinator will inform various examples of mathematical topics while using scaffolding strategies and show the connection to how it helps ELLs. Educators will have discussions with other educators on the topic as well.

15-minute break.

Presentation:

Time: 1 hour and 45 minutes

The coordinator will have a presentation. The coordinator will introduce the Collaborative Learning Strategies. The speaker will inform how to inform Collaborative Strategies in a classroom setting and how to utilize Collaborative Strategies to help ELLs

to succeed in mathematics classes. There will be an open discussion with educators on using Collaborative Strategies to help ELLs succeed in mathematics classes.

Lunch Break

Activity 1: Creating a Collaborative Learning strategy on a mathematical topic.

Time: 40 minutes

Educators will first establish a mathematical topic, possibly from Integrated 1, Integrated 2, or Integrated 3. They will brainstorm and create a Collaborative Learning strategy for a mathematical topic.

Activity 2: Discuss with different partners what Collaborative Learning strategy other educators have created.

Time: 10 minutes

Educators will move around and find a partner to discuss what Collaborative Learning strategy other educators have created and bring out their opinion on why it would be practical to help ELLs.

Activity 3: Creating a Collaborative Learning strategy with other educators in groups of 4.

Time: 50 minutes

Educators will work in groups of 4 and create a Collaborative Learning strategy in a specific mathematical topic. They will brainstorm together and write the information on a Wall Pad. The groups will post the Wall Pad on the side walls of the conference room.

Activity 4: Present the Collaborative Learning strategy to the audience.

Time: 50 minutes

First, educators will go around to look at the different Wall Pads. Next, the group of 4 will present their information, and others will listen to the group's perspective. The coordinator will facilitate the discussions when there are questions.

End of Day 2 Activities

Day 3: Activity Sheet

Presentation

Time: 1 hour and 30 minutes

The coordinator will have a presentation. The coordinator will review the Collaborative Learning Strategy and the practicality of using Collaborative Learning strategies to support ELLs in mathematics classes.

Next, the speaker will introduce differentiated instruction to help ELLs. The coordinator will inform on how to utilize differentiated instruction to help students in mathematics classes. Then coordinator will inform how it will impact specifically for ELLs. Also, while advising on differentiated instruction, the coordinator informs how to build assessments to help ELLs.

15-minute break

Activity 1: Create a differentiated instruction plan for a mathematical topic.

Time: 40 minutes

Educators will first establish a mathematical topic, possibly from Integrated 1, Integrated 2, or Integrated 3. They will brainstorm and create a differentiated instruction plan for a mathematical topic.

Activity 2: Discuss with different partners what differentiated instructions other educators have created.

Time: 10 minutes

Educators will move around and find a partner to discuss what differentiated instruction the other educators have created and bring out their opinion on why it would be effective to help ELLs.

Activity 3: Creating a differentiated instruction plan with other educators in groups of 4.

Time: 55 minutes

Educators will work in groups of 4 and create a differentiated instruction plan in a specific mathematical topic. They will brainstorm together and write the information on a Wall Pad. The groups will post the Wall Pad on the side walls of the conference room.

Lunch Break

Activity 4: Create an assessment correlated with differentiated instruction with other educators in groups of 4.

Time: 70 minutes

Educators will work in groups of 4 and create an assessment correlated with a differentiated instruction plan in a specific mathematical topic. They will brainstorm together and write the information on a Wall Pad. The groups will post the Wall Pad on the side walls of the conference room.

Activity 5: Present the differentiated instruction assessments to the audience.

Time: 50 minutes

First, educators will go around to look at the different Wall Pads. Next, the group of 4 will present their information, and others will listen to the group's perspective. The coordinator will facilitate the discussions when there are questions.

End of day 3

Project Evaluation

Name of Trainer(s):
Date:
Topic:

	Strongly Disagree	Somewhat Disagree	Neither Agree nor disagree	Somewhat Agree	Strongly Agree
The content was relevant to my position **as an** educator.	1	2	3	4	5
The content improved my comprehension **and knowledge to** help ELLs in my class.	1	2	3	4	5
The content prepared me with sufficient knowledge, skills, and practices to support ELLs in my class.	1	2	3	4	5
The content improved and enhanced my teaching strategies to support ELLs in my class.	1	2	3	4	5
What are your recommendations to improve or enrich the professional development in the future?					

Appendix B: Themes and Coding

Curriculum
- What worked with the curriculum
- What did not work with the curriculum
- Recommendations to improve curriculum

Instruction
- What worked with instruction
- What did not work with the instruction
- Recommendations to improve instruction

Assessment
- What worked with assessments
- What did not work with assessments
- Recommendations to improve assessments

General Complaints

General Recommendations

Miscellaneous

.