DESIGN-BASED RESEARCH FOR VIRTUAL LEARNING: A HOLISTIC PERSPECTIVE ON THE PEDAGOGICAL AND CONTEXTUAL FACTORS OF INTERACTIVE MOBILE TECHNOLOGY ON ENGLISH LEARNERS

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by

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DEDICATION

I dedicate this to the people in my life who make me smile and support me through thick and thin-my family: Mom, Dad, RJ, and Zaphira Alvarado. I am immensely grateful for your love and encouragement. “With God, all things are possible.”

For all the ones who have hit rock bottom. Let it be your new foundation to be stronger and better. “Life is not about how hard you hit. It’s about how hard you can get hit and keep moving forward.” -Rocky Balboa

ABSTRACT

Alvarado, Sonia Reneé, *Design-based research for virtual learning: A holistic perspective on the pedagogical and contextual factors of interactive mobile technology on English learner*s. Doctor of Education (Instructional Systems Design and Technology), May, 2022, Sam Houston State University, Huntsville, Texas.

The purpose of this design-based research study was to provide a holistic perspective on the pedagogical and contextual factors of interactive mobile technology on English learners and investigate the theoretical potential of audio-video software interventions for second language acquisition. Specifically, the study explored current virtual technologies for 2nd through 5th grade English learners designed to model face-to-face EL instruction due to the COVID-19 pandemic causing prolonged school closures. After evaluating three cycles of interventions founded on Stephen Krashen's and Lev Vygotsky's language learning theories and utilizing a teacher survey and researcher observations, the study identified an onslaught of key takeaways including the need for investment to establish necessary infrastructure, ed-tech policies and standards, and comprehensive pedagogical frameworks to effectively operationalize virtual learning curriculum and leverage best practices of interactive mobile technology. The study discusses the impact of the sudden shift to virtual contexts and provides suggestions for overcoming challenges in educational technology to move beyond surface levels of integration within the computer-assisted language learning contexts.

KEY WORDS: Interactive mobile technology; Bilingual education; English learners; Screencasting; Video conferencing; Computer-assisted language learning; Design-based research

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Thank you to all the teachers and staff who participated in this study. In the face of adversity, you demonstrated courage and grace.

PREFACE

In my current position as a Library Media Specialist and Instructional Technology Teacher, I found my passion. Experiencing the latest educational technology trends and district initiatives brought the realization of the need to investigate the development and application of educational strategies in leadership, professional development, educational technology theory, and research methods. These topics are necessary to trail blaze new initiatives and continue to contribute to instructional design within the education field. In my specific demographic, I noticed interesting patterns between the design process, implementation, and how it affected student achievement. Then suddenly, the world was bombarded with new terms such as *social distancing* and *contact tracing*, and I witnessed educators and students everywhere struggle to transition and adapt to the situation. In an attempt to capture what is likely to a miniscule portion of the grand scale consequences of the pandemic, the goals of this dissertation were to provide insight to the pedagogical and contextual factors that influence virtual learning environments. The knowledge gained hopes to advocate for elementary students and teachers, offering suggestions for leveraging technology tools to curriculum designers, and enlighten on the realities of implementation.

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CHAPTER I

Introduction

According to the National Council of La Raza (NCLR), Mather, & Foxen (2016), "in 2014, 32% of Latino children were living in poverty… [and] a full 62% of Hispanic youth were living in low-income families (below 200% of the federal poverty line)" (NCLR, et. al., 2016, p. ix). This negative factor directly causes inferior literacy and language proficiency levels of students as Hispanic English learners "consistently score lower on standardized tests compared to other demographics groups" (NCLR, et. al., 2016, p. 26). It also demonstrates a growing need to develop language acquisition techniques that serve all populations and provide equitable accessibility of educational technology and its corresponding software. School districts and educators have incorporated interactive mobile technology to target language development because state English Language Proficiency Standards (ELPS) continue to increase rigor without providing adequate practice material (Texas Education Agency (TEA), 2019). Currently, a student must advance by one level or achieve the highest level for a campus to receive credit (TEA, 2019).

Historically, educational pedagogy is lethargic to change with teacher-centered approaches encompassing the majority of practices. However, the novel coronavirus (COVID-19) has become the accelerating agent in forcing educational institutions to discover alternative solutions in extremely short periods (Comeau & Hattersley, 2020; Fishbane & Tomer, 2020; Kemp, 2020; Robles, 2020). The already challenging situation of language acquisition was burdened with additional hurdles due to school closures and the transition of face-to-face instruction to virtual learning amidst the pandemic. These

exacerbating conditions stemmed from sociocultural and economic factors such as the lack of equality in the accessibility of the internet and devices (Comeau et. al., 2020).

Statement of the Problem

Current K-12 and higher education organizations modified their primary instructional methods and transitioned into online learning pathways. According to the United Nations Educational Scientific and Cultural Organization (UNESCO) Institute for Statistics (2020), over 1.5 million pre-kinder-12th grade learners were affected by school closures caused by the coronavirus pandemic. With over 190 countrywide closures, over 90% of enrolled learners were impacted. The National Center for Education Statistics (2020), stated only 46% of the nation's schools had a written plan for a pandemic disease, and many of them did not have the infrastructure or resources to build an equitable and efficient online course platform for all their students (Kemp, 2020; UNESCO, 2020).

Moreover, current research in English language development (Barrow & Markman-Pithers, 2016; Castrillon, 2017; Park, 2011, Sharma & Chowdhry, 2018; Stiles & Louie, 2017; Thomas, 2017; Zhang, 2014) has demonstrated interactive mobile technology increases language proficiency skills through personalized instruction, promotes a low-affective filter communication environment, and targets second language acquisition (SLA) skills through the socialization of learning (Krashen, 2008). While there is much literature that focuses on second language acquisition methodologies on academic achievement in general, there was a need to identify examples and best practices of educational technology interventions designed specifically to improve second language skills.

It was beneficial to conduct a design-based research study to evaluate the effectiveness of interventions from synchronous and asynchronous screencasts and video conferencing as a current software technology for English language acquisition. In doing so, the researcher evaluated the entire ecology of the online education system to make improvements to software applications and design practices (O'Rourke & Stickler, 2017; Snyder, 2008). The design-based research study disclosed how crucial design is to influence interactive mobile technologies and their software applications as a means for supporting academic success in schools with high populations of Hispanic, English learners, and address current gaps in the field of educational. After three cycles of four phases in a design-based research series (ADIE) (Cochrane, et. al., 2017; Kim, et.al, 2015; Roblyer, 2015), researchers determined common themes and challenges to acquire a holistic perspective on the pedagogical and contextual factors of the intervention to make continuous improvements. The results of the study establish best practices for screencasting and video conferencing interventions in the future and addresses current gaps in the field of educational technology within the computer-assisted language learning context. It reveals the theoretical potential of these tools as a medium for second language acquisition, specifically for virtual learning situations.

Purpose and Significance of the Study

The goal of this study was to determine how screencast interaction platforms and video conferencing (synchronous and asynchronous) as interactive mobile technology might:

Goal 1: Determine what are some of the challenges, limitations, and advantages of different types of interaction platforms (synchronous and asynchronous).

Goal 2: Improve the theoretical potential of these interactive mobile technology interventions.

Goal 3: Increase the language competencies of students (listening, reading, writing, and speaking).

Goal 4: Confirm the Krashen comprehensible input, output, sheltered instruction, and Vygotsky sociocultural second language learning theories in virtual contexts.

The significance for this research study was to disclose the overall theoretical potential of these platforms in connection to the Vygotsky and Krashen language learning theories by exploring synchronous and asynchronous interactions. In addition, the study exposed the realities of practical implementation including the functionality of screencasting and video conferencing platforms through evaluation on the capacity of these tools as a medium for increasing second language acquisition.

Research Questions

RQ1. During virtual learning, how can educational technology (screencasting/ video conferencing platforms) support English language acquisition using the Vygotsky social constructivist and Krashen model of comprehensible input (O'Rourke & Stickler, 2017; Sanz, Levy, Blin, & Barr, 2016; Gallagher & Fazio, 2019; Wu, Hsieh, & Yang, 2017)?

RQ1a. How do the Vygotsky social constructivist and Krashen model of comprehensible input theoretical frameworks support instructional design for English learners?

RQ1b. How do the Vygotsky social constructivist and Krashen model of comprehensible input theoretical frameworks work in the virtual learning implementation context?

RQ2. What implications do preferred options and features of screencasting and video conferencing software mean towards different types of interaction platforms (synchronous vs. asynchronous) (Kear, Chetwynd, Williams, & Donelan, 2012; O'Rourke & Stickler, 2017; Sanz, et. al., 2016)?

RQ3. What are some of the challenges, limitations, and advantages of different types of interaction platforms (synchronous and asynchronous) after practical application (Satar, et. al., 2008; Smith, et. al., 2003)?

RQ4. How can these interactive mobile technology software interventions be improved (Cochrane, Cook, Aiello, Christie, Sinfield, Steagall, & Aguayo, 2017; Kim, Suh, & Song, 2015; O'Rourke & Stickler, 2017; Satar, et. al., 2008)?

Theoretical Frameworks

In the design of any educational curriculum requires the awareness and application of theoretical learning frameworks effective instruction. These models provide essential guidelines for educators to provide meaningful educational experiences.

Instructional Design Theoretical Frameworks

Instructional systems design (ISD) is what encompasses the theoretical systematic approach to teaching and learning. Originating from World War II to improve training, ISD is a combination of behavioral, psychology, and communication and information theories for the creation of instruction. A common model followed is the *Analysis Design Development Implementation Evaluation (ADDIE)* approach (Moore & Kearsley, 2012, p. 98). Through this model, course designers invest in a series of stages to assess and best plan how to meet objectives by determining which instructional materials are necessary, and which teaching strategies will deliver on the intended skills effectively (Moore, et.

al., 2012). The ADDIE framework provides a descriptive guideline for the design of effective instruction and its corresponding tools.

Descriptive and Design Theory. Dr. Charles Reigeluth discussed the systemic transformation of educational systems from teacher-centered to learner-centered, focusing on the need to prepare learners for life (Reigeluth, 1983). His research led to the development of formative research, or later termed, design-based research. This method is a blend of action, case-study research that allows the matching of methodologies to the appropriate situation with the overall goal of guiding individuals to learn and grow (Reigeluth, 1983). This process is determined by analyzing the contextual conditions in which the learning will take place, the learners' preferences, strengths and weaknesses, the objectives of what is to be learned, and the constraints of the situation (Reigeluth, 1983). This approach is within educational research methods thereby targeting dual goals of testing theory and validating practices by identifying characteristics of interventions and developing improvements (Sahrir, Alias, Ismail, & Osman, 2012).

Pogrow (1996) argues it is the researcher's role to develop ideas [promoting educational reform] and rationales, but "up to practitioners to figure out how to apply [them]" (Reigeluth, 1983, p. 15). Wang & Hannafin (2005) further implore design-based research offers the potential for both research and design of IMT and their virtual environments. This synergy allows for the manifestation of scientific and educational values in the advancement of the instructional design and technology field. Therefore, by advocating for the Krashen and Vygotsky second language learning theories within the design-based research, the study is demonstrating these theories are relevant and how they are applicable. While these theories are often considered descriptive theories of

education because they provide general explanations of the common processes for second language development, they are necessary to construct the design and development of techniques to help determine implementation protocols that are theoretically applicable to similar conditions (Reigeluth, 1983).

Second Language Acquisition Theoretical Frameworks

Stephen Krashen Theory of Language Acquisition. Krashen's theory of SLA (Jarvis & Krashen, 2014; Krashen, 2008; Rodrigo, Krashen, & Gribbons, 2004; Stairs-Davenport & Skotarczak 2018), describes possible factors that affect language development including motivation, self-confidence, and anxiety. His major theories stressed the importance of *comprehensible input,* or a student's ability to develop meaningful language skills at specific points in their life. In turn, the teacher would be required to adapt instruction to their individual ability level by utilizing *sheltered instruction* techniques like repetition, careful articulation, simplified or high-frequency vocabulary, building background knowledge, and additional time to process thinking, respond or reflect (Jarvis et. al., 2014; Krashen, 2008; Koura & Zahran, 2017; Rodrigo, et. al., 2004; Stairs-Davenport, et. al., 2018). The Krashen model features teaching strategies such as cooperative learning, reading comprehension strategies, and differentiation to improve the effectiveness of language instruction (Koura et. al., 2017; Stairs-Davenport, et. al., 2018).

While Krashen describes a plethora of SLA techniques to enhance English learner instruction, the most consistent recommendation is the practice of continuous opportunities for student input and output. Tasks that require students to discuss and think critically to produce words in written or oral format, or *output*, promote fluency

development and contextual feedback, which in turn, affect *input*, or the abilities to interpret language by reading and listening (Castrillon, 2017, pp. 93).

Vygotsky's Sociocultural Theory of Language Acquisition. Vygotsky's sociocultural theory is centered on the design of instruction through *scaffolding.* Scaffolding is a process that increases rigor systematically, initiating with prompting of prior knowledge and basic tasks to difficult and complex tasks. This process requires the instructor to adapt lesson material and delivery to accommodate student current proficiency levels and incorporate SLA techniques to bridge to potential levels. The area between each student level is described as the Zone of Proximal Development (ZPD) (Castrillon, 2017, p. 92; Koura et. al., 2017; Stairs-Davenport, et. al., 2018). Scaffolding strategies are applicable to all content areas and all demographics; however, for English learners, scaffolding is an essential teaching practice because it promotes increased levels of language skills through provisional support. Specifically for the development of speaking proficiency, which is categorized as a social skill, interactive mobile technology and its virtual platforms offer the sociocultural exchange of meaning (Satar & Ozdener, 2008).

Critics of the Krashen and Vygotsky theories argue the difficulty in ascertaining the SLA student's proficiency levels due to individual differences and preferences such as motivation, confidence, and anxiety (Dunn & Lantolf, 1998; Lei & Wei, 2019; Zafar, 2009). It is true; many adults achieved SLA without any assistance or guidance from these theories in practical settings, and instead were part of programs derived from the concepts of *sink* or *swim* (Lei, et. al., 2019; Zafar, 2009). Moreover, second language acquisition is not a one-size-all approach as multiple variables can affect student

language development, many of which are unrelated to educational techniques (i.e. genetics, cognitive growth rate, maturation, personal experiences and background) (Dunn, et. al., 1998; Lei, et. al., 2019; Zafar, 2009). However, the Krashen and Vygotsky models offer systematic approaches towards a comprehensive theory of second language acquisition based on a lifetime of research, observations, and studies (Lei, et. al., 2019; Zafar, 2009). In truth, like many learning models and processes, SLA encompasses too many variables to develop a foolproof theory. Nonetheless, the critical roles these frameworks have played in the facilitation of second language development for over thirty years are why the theories are still classified as classic models and utilized for instruction (Lei, et. al., 2019; Zafar, 2009). Instead, it is important to acknowledge the Krashen and Vygotsky SLA theoretical limitations, and continue to attempt to conceptualize their applications in further studies (Dunn, et. al., 1998).

More often than not, in virtual platforms, these SLA techniques may be overlooked because of the different learning environment and limitations to student physical proximity. Gestures and body language cues are difficult to transfer across virtual contexts. However, second language acquisition techniques embedded within technology-enhanced educational platforms can promote meaningful practices, such as reading aloud conversation transcripts, self-recording and reflections and collaborations (Sanz, et. al., 2020). Therefore, the potential is available for these second language learning theories to be implemented within the distance learning, virtual classrooms. Nonetheless, it is up to the instructors to adapt the instructional strategies into online contexts. Snyder (2009) argues, if teachers want to implement digitally mediated language activities, they should carefully structure and design activities founded on

sound, analytical learning pedagogies and theoretical models (Aydin & Yildiz, 2014; Gunn, et. al., 2012, p. 35). Martins & Moreira (2020) discuss how integration is *sine qua non*, and based on various elements including teacher input, context, theoretical models, and technology inclusion, to achieve successful and sustainable computer-assisted language learning interventions (Sanz, et. al., 2020). For this reason, the Krashen and Vygotsky second language learning theories are at the foreground of the intended goals of the study to evaluate the interactive mobile technology interventions (IMT) holistically and gain understanding towards learner's interactions with the IMT and make subsequent improvements (Sanz, et. al., 2016, pg. 119, 122).

Definition of Key Terms

Active Learning

The idea of students learning by being actively engaged with the content, usually in the form of having the student create a product to demonstrate understanding and application (Bolliger & Armier, 2013).

Authentic Learning

The concept of designing real world instructional, cognitive tasks that are relevant and meaningful to students. These tasks are multifaceted, motivational, and applicable to interdisciplinary situations and aid the student in achieving higher standards of learning. Examples include reflections, problem solving, and collaborations (Ozverir, Osam, & Herrington, 2017, p. 236).

Bilingual

A student who is enrolled in a dual-language program. For this study, the languages are Spanish and English. Students who are part of the bilingual program will have a certain percentage of courses in a different language other than English following policy on transition. A student may exit the program if they qualify according to district and state policy (Gonzalez, 2008).

Computer-Assisted Language Learning (CALL)

A term used to describe the use of computer-based language instruction. It is becoming obsolete as it limits the type of device used in language learning (Jarvis et. al., 2014).

Emergent Bilingual

A term to describe a student who is developing their language proficiency in English while acknowledging their potential and strength in their primary language (Texas Legislature Online, 2021).

English Language Learner (ELL) Obsolete

A student whose first language may not be English. They are in a program for the process of becoming proficient in English (TEA, 2019). A label is given to students who may require additional language accommodations and interventions for academic success. A student may exit the program if they qualify according to district and state policy. Term was replaced with *English Learner*.

English Learner (EL)

A newer term for a student whose first language may not be English (TEA, 2019). They are in a program for the process of becoming proficient in English. A label is given to students who may require additional language accommodations and interventions for academic success. A student may exit the program if they qualify according to district and state policy. Term replaced *English Language Learner*.

English as a Second Language (ESL)

A label given to students in a program who are in the process of becoming proficient in the English Language, and whose native language is not English (Gonzalez, 2008). A student may exit the program if they qualify according to district and state policy.

Information and Communication Technologies (ICT)

A term used to describe technologies that provide the exchange of information and communication opportunities of the user such as wikis, blogs, discussion forums, screencasts, and live video (Forbes & Khoo, 2015).

Interactive Mobile Technology (IMT)

A new term to describe non-traditional, paper-based instruments for instruction including but not limited to those with internet capabilities and devices with touch-screens (Park, 2011). Tools that can be easily moved to adapt instructional environments such as Chromebooks, iPads, Interactive flat panels, and mobile phones.

Interactive Mobile Technology Software (IMTS)

A term to describe software, which is available on interactive mobile technology (Alvarado & Song, 2019; Park, 2011). Generally, the software is web-based and can be accessed through applications or through a search browser from a device (see above). Examples of software include *SMART Notebook, Kahoot, Nearpod, ChatterpixKids, Quizziz, Google Suite* (*Docs, Slides, Sheets, Forms*, etc.).

Limited English Proficient (LEP)

A student whose first language is not English (TEA, 2019). A label is given to students in a program that may require additional language accommodations and interventions for academic success. A student may exit the program if they qualify according to district and state policy. Term was replaced by *Emergent Bilingual*.

Mobile-Assisted Language Learning (MALL)

A relatively new alternative term that describes electronic devices easily mobile, which target language acquisition (Jarvis, et. al., 2014). They may include phones, laptops, or tablets.

Second Language Acquisition (SLA)

The concept of learning a new language not native to the individual (TEA, 2013). The process of gaining the ability to listen, speak, read, and write in another language.

Technology Enhanced Language Learning (TELL)

Electronic devices that promote language acquisition including computers, spelling or grammar enhancers, or dictionaries (Jarvis, et. al., 2014).

Texas English Language Proficiency Assessment System (TELPAS)

A Texas State assessment given to only LEP (see above) students for assessing progress in the English language (TEA, 2019). Following state policy, students are administered online or paper-based tests and writing samples.

Texas Education Agency (TEA)

A state agency that oversees public education in the state of Texas for primary and secondary levels (TEA, 2019). It provides resources and expectations for school systems from academics, funding, and accountability.

Transition Student

A student who is in the process of moving their instruction from a language other than English, in this case, Spanish, to English (TEA, 2019). The students follow district plans based on the number of years in school and English proficiency.

Limitations

The major limitation for design-based research, specifically applicable to this study includes the small number of participants involved. The data gathered was from students who participated in the intervention, garnered through convenience, purposeful sampling. As these students were not selected at random, but instead chosen based on their LEP status from the campus and eligibility towards TELPAS measurements, the sampling was convenient. However, the goals of the study were to provide effective teaching tools and educational programs for this specific demographic, so the student data selected was purposeful for evaluation. Therefore, while the number of participants is one of the limitations of the study, they were the best candidates for evaluation and study.

In addition, these interventions were intended to expose the challenges of utilizing interactive mobile technology in virtual learning contexts. As such, the identification of variables that impede the facilitation of the interventions were necessary to provide possible curriculum solutions. It is noted that not all problems were addressed as they are beyond the scope of the study. Issues pertaining to the instructional design and delivery of the screencast and video conferencing initiative, which were sustainable and relevant to curriculum or delivery enhancement, were targeted in following design cycles.

Delimitations

Delimitations for this study were founded based on the recurring instructional design cycles including the language learning platform, the type of interaction mode (synchronous and asynchronous), the delivery of intervention, and the scaffolded ELPS activities. The major delimitation was the systematic approach to the development of the intervention activities and overall DBR study.

Summary

This design-based research study investigated the area of interactive mobile technology and audio-video software intervention as a means for supporting English learners through second language acquisition. The researcher reviewed literature in the area of educational technology to support English language acquisition and discussed challenges associated with technology integration within virtual learning environments. Furthermore, the study evaluates current audio-video software intervention technologies for second through fifth grade English learners designed to model face-to-face EL instruction through three cycles of interventions. The interventions were founded on Stephen Krashen's and Lev Vygotsky's language learning theories and utilized a teacher

survey and researcher observations to identify best practices and reveal the theoretical potential of how to leverage screencasting and video conferencing tools as a medium for second language acquisition. It addresses current solutions and limitations of these platforms and design models in the field of educational technology within the computer-assisted language learning context.

Organization of the Study

This DBR study is organized following a traditional education dissertation proposal format beginning with a thorough literature review on important background case law, standards and theoretical frameworks of bilingual and second language programs, educational technology to support English language acquisition, and benefits and challenges associated with technology integration within virtual learning environments for ELs. After the literature review, the researcher discusses the methodology of the proposed study, including the research questions, DBR phases and iteration cycle procedures, and researcher and participant background information. The researcher concludes the DBR proposal study with the data collection, instrument descriptions, and data analysis plan.

CHAPTER II

Review of Literature

The author focuses the literature review of current interactive mobile technology interventions designed specifically for English language development, especially those that target proficiency in the four modalities of language: listening, speaking, reading and writing. Second language acquisition terminology related to technology tools may include *computer-assisted language instruction (CALL), mobile-assisted language learning, computer-mediated communication tools*, and *technology-enhanced language learning* (Jarvis, et. al., 2014; Krashen, 2008; Rodrigo, et. al., 2004; Satar & Ozdener, 2008). Different terms may be used to describe distance-learning settings with technology as a medium such as *technology-enhanced learning environments (TELEs),* however, for this research, the terms **interactive mobile technology** and **virtual learning** will be utilized. These terms account for the current changes in the field of educational technology, and align more closely with the goals and objectives of this study (Wang & Hannafin, 2005). Moreover, research regarding the establishment of English language learner programs and theoretical concepts involving second language development is discussed, as understanding the foundation of these topics is vital to construct pedagogical and technological advancements. A special focus on different interaction technologies including screencasting and video conferencing tools and best practices of online/ distance education courses including the known benefits and challenges will conclude the review of literature being the primary method to be evaluated.

Bilingual and Foreign Language Education

Bilingual education is the use of two languages in academic content teaching within kindergarten through twelve grade contexts (Gonzalez, 2008; Martinez, 2012). Foreign language education, on the other hand, emphasizes second language acquisition, in this case, English. The Texas Education Agency (TEA) requires English learners (ELs) to participate in language proficiency assessments in order to monitor academic potential in English. While academic language proficiency is not equal to academic achievement, TEA argues having a full understanding of the English language will allow students the accessibility of academic concepts and skill learning because it provides a foundation of both social and academic language (TEA, 2019).

Since 1919, with Meyer v. *Nebraska* U.S. Supreme Court case, Bilingual Education has been a major controversial topic for debate (Gonzalez, 2008, p. 920). With complex issues regarding linguistics, culture, and legal policy, differing opinions on the most effective approaches to language acquisition remain. The EL label, originally Limited English Proficient, began with the Bilingual Education Act of 1968. Its goal was to develop and implement programs for students and provide additional language accommodations and interventions for academic success (Gonzalez, 2008; Stewner-Manzanares, 1988). The largest funding source of its day, the Bilingual Education Act of 1968 established policies for funding of competitive grants for school districts that encouraged English language programs including research, teacher preparation programs, technical assistance centers (Gonzalez, 2008, p. 919). Such examples include school districts that provided resources for education materials, training for educators and teacher assistants, developed and disseminated materials, and conducted parent

involvement projects that involved learning English (Stewner-Manzanares, 1988). Several amendments in 1974 and 1978 specified expectations for bilingual programs and defined eligibility of students who were previously denied an equal opportunity education by making schools accountable for providing instructional programs to promote academic achievement (Gonzalez, 2008; Stewner-Manzanares, 1988). Other amendments in 1984 and 1988 established funds distinctly for transitional and dual-language programs that previously were under political debate (Stewner-Manzanares, 1988). These amendments also stipulated the role of parents and guardians, and their right to decline enrollment in a particular program (Stewner-Manzanares, 1988). Later, the No Child Left Behind Act (2001) would include limiting bilingual programs to three consecutive years, at which point the student would commence English-only instruction (Gonzalez, 2008; U.S. Department of Education, 2019; U.S. Department of Education, 2019; U.S. Department of Education & Office of Civil Rights, 2017). Regardless of which program a student is enrolled in, the student may exit the program according to a plan based on the number of years in school and English proficiency. These key case law and national statutes laid the motivation and the pursuit of pedagogically sound English language learner programs in Texas. Due to the increase in English learner population and the location of the study, the subsequent paragraphs will focus on Texas second language acquisition programs.

Second Language Acquisition Programs in Texas

Each state develops standards for bilingual or foreign language programs that affect school districts. For example, the Texas Education Agency (TEA) oversees public education in the state of Texas for primary and secondary levels. It provides resources and expectations for school systems from academics, funding, and accountability. One of

the major accountability programs is the Texas English Language Proficiency Assessment System (TELPAS) to assess students' progress in learning the English language based on the English Language Proficiency Standards (ELPS) (TEA, 2013). The ELPS are utilized in the foundation and enrichment instruction of K-12 ELs and administered the TELPAS test annually until they qualify to exit the program; thus, achieving English proficiency equivalent to a non-native English speaker. The TELPAS test is administered only to those students who meet the criteria established by the state standards of Limited English Proficient (LEP) or English Learner (EL) and such programs that specifically target English instruction. English language proficiency is categorized by a student's ability in *listening, speaking, reading*, and *writing* modes of language following the ELPS -TELPAS Proficiency Level Descriptors (PLDs), which are rubrics that grade student online exams provided by the state. These rubrics score students in four proficiency levels: beginning, intermediate, advanced, and advanced high (TEA, 2019).

Furthermore, bilingual or foreign language programs may vary abundantly by school district and campus; they are based on a Transitional Bilingual Education model where English instruction amounts will fluctuate. Dual programs, which entail 50% English and 50% Spanish instruction, expose students to both languages in equal amounts within alternating days or weeks (TEA, 2009, p. 2). Early-exit, another transition model, focuses on accelerated English instruction in all areas with first-language support for 2-5 years before possibly qualifying to exit the program (TEA, 2009, p. 1). Late-exit models are formatted the same; however, the program is extended until six or seven years of enrollment (TEA, 2009, p. 1). Ultimately, the establishment of English language learner

programs in Texas and their continuing increase of high expectations have led to the need for technological intercession to target language development. However, this is not the only factor to consider when designing instructional technology for second language acquisition.

Second Language Acquisition Theoretical Frameworks

The awareness and application of theoretical second language learning frameworks are one of the primary measures for effective language acquisition and development. These models provide guidelines for teachers to provide meaningful second language acquisition (SLA) techniques. Foundational SLA theories include:

Stephen Krashen Theory of Language Acquisition

Krashen's theory of SLA (Jarvis, et. al., 2014; Krashen, 2008; Rodrigo, et. al., 2004; Stairs-Davenport, et. al., 2018), describes common variables that may affect language development such as motivation, self-confidence, and anxiety. His main argument imposed the importance of *comprehensible input*, which affects a student's ability to develop meaningful language at their pace. Therefore, the teacher must adapt the language to each students' individual level through sheltered instruction strategies like repetition, careful articulation, simplified or high-frequency vocabulary, building background knowledge, time to process and respond and reflect (Jarvis, et. al., 2014; Krashen, 2008; Koura et. al., 2017; Rodrigo, et. al., 2004; Stairs-Davenport, et. al., 2018). The Krashen model features effective teaching strategies such as cooperative learning, reading comprehension strategies, and differentiated instruction through the inclusion of the four language modalities targeted in the state ELPS standards (listening, speaking, reading, writing) (Koura et. al., 2017; Stairs-Davenport, et. al., 2018).

Despite there being numerous SLA techniques to support English learners, the most consistent recommendation is the practice of on-going input and output. “The more comprehensible input through listening and reading opportunities students face, the closer they are to SLA” (Castrillon, 2017, pp. 92) In addition, opportunities to speak or write, otherwise identified as output, “develops fluency, raises language awareness and generates immediate, constant feedback” (Castrillon, 2017, pp. 93). Therefore, interactive mobile technology, which provides both input and output, is ideal.

Vygotsky's Sociocultural Theory of Language Acquisition

In Vygotsky’s sociocultural theory, instruction begins with prompting of prior knowledge and opportunities for students to achieve higher levels of mental processes such as problem solving and metacognition skills through the process of *scaffolding*. This process is an adaptation of lesson material (input) to accommodate student levels as they increase, while providing SLA techniques to address the knowledge gap; It is often referred to as the Zone of Proximal Development (ZPD) (Anderson, 2018; Castrillon, 2017, p. 92; Koura et. al., 2017; Stairs-Davenport, et. al., 2018). Although scaffolding strategies are applicable to all content areas and all demographics, for English learners, scaffolding empowers students to reach higher levels of language comprehension and application through provisional support.

Noam Chomsky Language Development Theory

Noam Chomsky’s theory on the innate ability for language development is described as the intuitive knowledge of correct grammar through a process known as Language Acquisition Device (LAD) (Çakiroglu, 2018; Costley & Nelson, 2013).

Piaget Developmental Cognitive Theory

J. Piaget's (1971) Developmental Cognitive Theory, which describes the mental stages of development of a child with sensory-motor intelligence growth, usually the period from birth to 18 months (Çakiroglu, 2018). Piaget argues that language development occurs alongside cognition through "experiences, social transitions, maturation, and balancing over time" (Çakiroglu, 2018, p. 203).

Cummins Language Proficiency Theory

Cummins (1999) theories on *Basic Interpersonal Communicative Skills (BICS)* and *Cognitive Academic Language Proficiency (CALP)* (Khatib & Taie, 2016, p. 382). BICS describes basic, conversational literacy skills and CALP describes higher levels of proficiency skills of oral and written expression, understanding, and concepts of academic language (Cummins, 1999; Khatib et. al., 2016). He established the Cummins' Four Quadrants Model (1999) to assist educators with the design and structure of language-embedded academic tasks to meet students' needs (Cummins, 1999; Khatib et. al., 2016).

Overall, a curriculum that uses interactive mobile technology and its corresponding software interventions may better service English learners if they are based on the foundational theoretical frameworks on second language acquisition described above. While all theories are valid, the researcher will focus on Krashen's theory of comprehensible input and output, and Vygotsky's theory of scaffolding, as these are most applicable in the design of the type of language acquisition interventions being utilized in the study. These interventions will be conducted by implementing current digital technology tools by exploring two different types of interaction, synchronous and

asynchronous. The functionality of each platform will be discussed to evaluate the capacity of these tools as a medium for increasing second language acquisition through purposeful interaction.

Digital Technology Tools in Education

Interactive mobile technology or *mobile technology* are defined as non-traditional, paper-based instruments for instruction including but not limited to those with wireless internet capabilities and devices with touch-screens (Park, 2011). According to Park (2011), "applications of mobile learning [interactive mobile technology] range widely, from K–12 to higher education and corporate learning settings, from formal and informal learning to classroom learning, distance learning, and field study" (Park, 2011, pg. 78). Hardware often associated with interactive mobile technology includes typical devices such as cell phones, smartphones, palm pilots, handheld computers or tablet PCs, laptops, and personal media players (Park, 2011). Touch-screen tools that are physically easy to move, adapt to instructional environments. School districts will often purchase devices such as Chromebooks, iPads, and other touch-screen tablets. More importantly, are the interactive *mobile technology software*, which is available on the devices. Generally, the software is web-based and can be accessed through applications or through a search browser from the device. These web 2.0 software program applications that incorporate the mobile aspect of touch-screen capabilities allow users to collaborate, create, and communicate ideas for recreational and educational purposes (Park, 2011). Examples of such software may include *SMART Notebook, Kahoot, Nearpod, ChatterpixKids, Quizziz, Screencastify, Flipgrid, Google Suite (Docs, Slides, Sheets, Forms, etc.).* While the definition of what mobile technology (or mobile learning) is still under debate, according

to Persson & Nouri (2018) the underlying principles include portability, accessibility, personalization, social connectivity, and motivation for learning in formal and informal contexts (Persson, et. al., 2018, p. 191).

Educational technology tools are ideal because of their adaptability and variety of options to incorporate multisensory and multi-disciplined material for all ages. Activities can be modified to meet personalized, individual needs, and support traditional tools and methods (Huang, 2014; Nemeth & Simon, 2013). Specifically, for second language acquisition, technology-rich approaches allow students to demonstrate their knowledge and connect linguistically in a low-anxiety community through the socialization of learning. This coincides with the sociocultural theory of language acquisition (Castrillon, 2017).

Interaction and Communication

Different devices such as tablets or Chromebooks, and corresponding software such as Google Suite, SMART Notebook, Screencastify, or apps like ChatterpixKids and Flipgrid, allow for interactive audio, video, and/or touch-ability. These types of mobile technology offer, “portability, functionality, [and] convenience” (Amelia & Abidin, 2018). The platforms from which they are accessed provide divergent methods to increase motivation and engagement through blended learning, game-based learning, personalized learning, or active learning, or combinations of several approaches (Amelia, et. al., 2018; Persson, et. al., 2018). Effectively designed technology integration that is engaging and student-centered has the potential to target content and language acquisition simultaneously while decreasing the stress and anxiety produced by the learning environment (Satar, et. al., 2008; Stairs-Davenport, et. al., 2018).

Interaction has long been considered as one of the most important factors in online student satisfaction (Bolliger, Supanakorn, & Boggs, 2010). Furthermore, technologies with interaction platforms allow educators to personalize and humanize e learning by including rich media components such as audio or video platforms. These Web 2.0 elements endeavor to engage students in active, meaningful learning (Bolliger, et.al., 2010, p. 714). The rapid growth of new technologies that have emerged has prompted the need to revise delivery structures and re-think pedagogical practices. Instructional designers and educators have unique opportunities to foster interaction and collaboration among learners to create true learning communities through technology, interaction and collaboration in either asynchronous or synchronous learning networks (Belderrain, 2006, p. 139-140).

Synchronous Activities. Many organizations choose synchronous options such as streaming live audio/video chats through Zoom, Skype, or Google Meets, to mimic traditional classroom formats. Similar terms include synchronous computer-mediated communication settings, or video conferencing that supports interaction and learner-centeredness using face-to-face interactive teaching experiences at long distances (O'Rourke, et. al., 2017; Smyth & Zanetis, 2007). Depending on the type of interaction, such as a lecture, practical demonstration, question and feedback, facilitated discussion, or student presentation, the web-based streaming of live lessons promotes student engagement (Smyth, et.al, 2007). For the situation of school closures or courses in which students are separated geographically, live audio/video sessions are the next best alternative to traditional classroom formats. Synchronous video conferencing optimizes existing resources (platforms have a free version or are low cost to set up, assuming the

organization has established equitable internet and device access for all students), may reach large quantities of students within a specific timeframe, and ensure consistent teaching delivery and facilitation in real-time (Swarm, et.al, 2013).

Asynchronous Activities. Cummins, Rajan, Hodge, and Gouripeddi (2016) determined the use of asynchronous video discussions to provide meaningful insight to different types of mediums for communication and interaction in online courses. Asynchronous interaction puts the student in charge to self-initiate learning. One key strength of asynchronous learning is the self-paced component as it provides opportunities for deeper reflection and critical thinking through the flexibility of the response time (Madden, Jones, & Childers, 2017). Moreover, this independence in turn, allows for more purposeful two–way communication between the instructor and student, facilitating an understanding of thinking processes (Madden et.al, 2017). However, given that assignments are self-initiated, some students may demonstrate more willingness to respond than others may. The main importance of asynchronous activities is the creation of strict guidelines for the course. Expectations for number of posts, types of media, or length of presentation for grading purposes hold students accountable. Without these requirements explicitly stated prior to dissemination of activities, the instructor will have numerous headaches, from unsubmitted assignments, to lackluster submissions requiring additional work for both the student and instructor. A perceived challenge included the additional time required to grade asynchronous assignments (Cummins et.al, 2016).

Nonetheless, certain asynchronous activities may increase engagement and promote active learning. Bozkurt, Karadeniz, & Kocdar (2017) argued the effectiveness of social networking sites (SNS) in distance education courses. Their research argues that

SNS provide a public, online space for students to promote collaboration and active learning by humanizing the educational experience. These platforms are structured in similar formats and their utilization promotes socialization and increases student participation and sharing of ideas (Bozkurt, et.al, 2017).

Interestingly, it is important to note that there are subtle differences of each type: synchronous and asynchronous modalities that often blur the two. For example, within synchronous platforms such as Google Meet or Zoom, the user has the audio-video option that is clearly mirroring face-to-face interaction. However, these platforms also include instant group and/or private text chats that can be perceived as *quasi-synchronous*, as they are in a more delayed timeline (Smith, et. al., 2003). On the other hand, for email exchanges and blog or comment posts are characterized as asynchronous communication, although many may be in response to a previous discussion. Some researchers argue these communication mediums are simply synchronous in a much slower degree, and purport the importance behind the intention of the communication, whether it be written or text-based, oral, or visual, or a combination, to determine the modality (O'Rourke, et. al., 2017; Smith, et. al., 2003; Wang, 2004). Regardless, of what they are officially termed in the specific situation, their potential to enhance the sociocultural aspects of distance education courses remains.

Furthermore, Farajollahi, Zare, Hormozi, Sarmadi, & Zarifsanaee (2010), describe the importance to create student or learner centered courses, which highlight effective features and characteristics of learning models including constructivist learning foundations, and purposeful interaction in different forms: learner-content, instructor-learner, learner-learner, and content-content. The emphasis is on the alignment between

learner needs, available technologies, learning theory, pedagogical principles, and learner styles as key factors to understanding for the creation of effective education courses (Farajollahi, et. al., 2010).

Self-paced Interaction and Videos. A study conducted by Cummins, Rajan, Hodge, Y Gouripeddi (2016), investigated the use of asynchronous video discussions and demonstrated the value of student preparation and background research. The study did provide meaningful insight to different types of mediums for communication and interaction in online courses (Cummins, Rajan, Hodge, Y Gouripeddi, 2016). Completely asynchronous interaction allows the user to decide the when and where learning will take place. One key strength of asynchronous learning is the self-paced component as it provides opportunities for deeper reflection and critical thinking as learners can be flexible in their response time to prompts (Hromalik & Koszalka, 2018; Madden, et. al., 2017). Moreover, this independence also allows for more purposeful two–way communication between the instructor and student and facilitates an understanding of a learner's own and peers' thinking process with the extended time (Madden, et. al., 2017). Some students may demonstrate more willingness to respond in group settings over longer periods. However, from the instructor perspective, viewing asynchronous screen castings may be time consuming (Madden, et. al., 2017). However, it is noted, instructors should create guidelines for use such as providing instructions for number of posts, types of media, or length for grading purposes. Some challenges instructors perceived included the additional time required to grade such assignments (Cummins, et. al., 2016).

Social-network and Group Interaction. Bozkurt, et. al., (2017) examined 2,065 student perceptions on the effectiveness of social networking sites (SNS) for communication in distance education courses. Their quantitative research argues that SNS provide a public, online space for students to promote collaboration and active learning by humanizing the educational experience. While platforms may differ in form, their structure is similar and their utilization promotes socialization and increases student participation and sharing of ideas (Bozkurt, et. al., 2017). Forbes et al., (2015), argue the value of Information and Communication Technologies (ICT) based on the influence of pedagogical implications from constructivism and sociocultural perspectives of learning. They explain the need for transformation of teaching methods, rather than substitution of traditional tasks to digital forms (Forbes et. al., 2015). Furthermore, Farajollahi, et al. (2010), investigate how constructive and independent learning theories, and communicative and interaction theories affect learning. They describe the importance of creating student or learner centered courses where the instructor provides active learning opportunities, constructive and timely feedback, and various communication methods. Farajollahi, et al. (2010), highlight effective features and characteristics of learning models including constructivist learning foundations, purposeful interaction in different forms: learner-content, instructor-learner, learner-learner, and content-content, flexibility, encouragement of active learning, and evaluation. Although their model is only a theoretical framework, they emphasize alignment between learner needs, available technologies, learning theory, pedagogy principles, and learner styles as key factors to understand for the creation of effective education courses and technology tools

(Farajollahi, et. al., 2010). Moreover, the capacity of these tools lies in the ability to harness their best features for second language acquisition.

Blended Learning

Ideally, establishing courses that support multi-dimensional learning modalities and preferences among students for instruction would require a blend of synchronous and asynchronous learning activities (Swarm, Vincent, & Gordon, 2013). Bonk and Graham (2005) discuss necessary instructor and pedagogy shifts to design blended courses effectively, utilizing best practices that may determine what category level they reach. The first level, *enabling* blended courses the objective is to provide different modalities for flexibility, and additional access and convenience. The second level, *enhancing* blended courses is to promote incremental changes by addition supplemental resources in either face-to-face format or online platforms. The last level, *transforming* blended courses, involves quintessential changes to pedagogy, altering teaching and learning methods from passive to active for students to construct their own knowledge (McGee & Reis, 2012). The latter category being the ideal goal for every organization, as activities should complement each other, providing options for demonstrating student knowledge, exchange of ideas and concepts, and consistently engaging learners. Overall, synchronous and asynchronous communication platforms are complementary and when utilized in combination, and positively impact oral proficiency skills (Oztok, Zingaro, Brett, & Hewitt, 2013; Satar, et al., 2008).

Active and Authentic Learning

Active learning is the concept of *learning by doing*, which encourages students to actively engage with course content by requiring students to generate and share their products (in this case screencasts in learning online environments). There is educational value in students actively processing new information using online platforms as learning by doing has the potential to increase levels of student satisfaction, engagement, connectedness, and learning" (Bolliger & et al., 2013, p. 201). In doing so, active learning approaches allow meaningful learning experiences for students as they create hands-on activities that allow them to process course materials and communicate newly acquired skills and concepts (Bolliger, et al., 2013). Moreover, rich media such as digital audio or video files incorporate sensations of sight and sound to online platforms. These elements not only assist students who prefer visual or auditory learning styles but also enrich the overall learning environment for all students, especially second language learners who may benefit from these multisensory scaffolding strategies (Bolliger, et.al., 2013; Hamidi & Bagherzadeh, 2018).

Similar to active learning, authentic learning is the instructional design of real-world tasks, which are relevant and meaningful to students. This includes cognitive tasks that are beyond limited classroom exercises, which indirectly provide motivation to achieve knowledge that is applicable in context and in doing so, the students increase attainment (González-Peiteado, Pino-Juste, & Rodríguez-López, 2017). Examples of authentic learning include tasks with opportunities to reflect, collaborate, and problem-solve while integrated within multiple interdisciplinary topics (Ozverir, et. al., 2017, p. 236)

Digital Technology Tools to Enhance Second Language Development in K-12

According to research (Amelia, et.al. 2018; Istrate, 2018), there are numerous benefits of incorporating technology for language development. These benefits include the ability to easily collaborate, share, and submit products of student language learning performance in various formats: videos, documents, blogs, wikis or other web 2.0 articles for documentation of progress. These products promote active engagement and social interactions, while offering alternatives for knowledge demonstration (Gustad 2014; Irudayasamy, Hankins, & March, 2018; Kukulska, & Viberg, 2018; Lu, Meng, & Tam, 2004; McDonough & Sato, 2019; Pellerin, 2014; Sánchez-Gómez, Pinto-Llorente, & García-Peñalvo, 2017; Zhou & Wei, 2018). These computer-mediated forms of communication and social software have beneficial effects on language skills as students shape the curriculum through individualization of self-created audio/visual artifacts and increased interactions (Cortez & Roy, 2012; Davies, 2011; Watt, 2010; Valeri, 2015; Zhou & Wei, 2018).

Nonetheless, key factors to consider is the application of the technology. A systematic approach with purposeful implementation will promote success in student language proficiency (Li, Jee, & Sun, 2018). Research-based SLA practices include frequent assessments designed at the student's language proficiency, small group activities with opportunities to respond to academic English questions and receive individualized feedback, and the promotion of socioemotional development through positive teacher-student relationships and the facilitation of peer interactions (Barrow, et.al., 2016; Cunningham, 2019; Cunningham, 2019; Jackson III, 2015; Stiles, et. al., 2017; Thomas, 2017).

It is important to note that although digital technology tools may be designed originally to enhance one modality of language acquisition, they may indirectly promote development in other modalities simultaneously. For example, while listening to podcasts, the student may be targeting listening skills and subject matter may develop as time progresses, given the episodic nature of podcasting. Common themes can be identified, and students may increase understanding of content in the new language. Moreover, if the students were to record their own podcasts, they would evolve to target the speaking modality. Therefore, several digital technology tools may serve multiple forms of language advancement.

Digital Technology Tools to Enhance Listening

Podcasting and multimedia presented through iPads or tablets, vlogs, and audiobooks can be authentic listening comprehension tools to promote second language development (Gustad, 2014; Sejdiu, 2017; Stacy & Aguilar, 2018). These tools can be easily integrated into existing curriculum and provide opportunities for students to become motivated in the new language, but offer an alternative to strengthen listening skills.

Digital Technology Tools to Enhance Writing

Software such as the Grammarly extension for Google Chrome, may provide user-friendly grammar or writing assistance, which increases metacognition and promotes self-efficacy and confidence (Alam & Mizan, 2019; Carranza Alcántar, Torres, & Maciel Gómez, 2018; Gustad, 2014; Pellerin, 2014; Pierson, 2014; Shi, 2018; Thomas, 2017; Thomson, 2011; Wang & Vasquez, 2012). This indirectly assists EL students in retaining content by creating a ubiquitous learning environment to engage in the language learning

process without constraints of time, space, or social pressure to perform. Screencasting, weblogs, or similar software is also linked to success in promoting writing. The interaction of student work that is 'live' facilitates in-depth discussions and feedback on student writing, rather than the traditional 'static copy'. Screencasts offer a platform to easily add comments and serve as asynchronous communication that leaves little room for misunderstanding (Valeri, 2015; Young & Kajder, 2013).

Digital Technology Tools to Enhance Reading

Other technology tools provide adaptive reading material, such as Newsela, or annotation systems to personalize learning through artificial intelligence software. In doing so, the tools diminish high affective filters for second language learners by altering the instructor position from *authority* to *source* and improved personal connections between peers and instructor (Amelia, et.al., 2018; Casarez, Agan, Self, Anderson, Atwood, & Heron, 2019; Freeman, 2012; Garcia Mayo, 2013; Istrate, 2018). This metaphorical idea depicts the learner's possible negative feelings, attitudes, and motivations toward SLA, and alternately increases self-confidence. Not only does this enhance literacy skills, but also research has demonstrated student preference towards web 2.0 technologies for academic development as technology can increase motivation towards the reading process, and improve comprehension in the new language (Pierson, 2014).

Digital Technology Tools to Enhance Speaking

The audio, video, and other multimedia such as screencasts, offer platforms to post questions for students to communicate with others and practice. These tools allow individual feedback and language development through teacher and peer socialization

(Amelia, et. al., 2018; Casarez, et. al., 2019; Freeman, 2012; Garcia Mayo, 2013; Istrate, 2018). A recent study conducted by Wu, Hsieh, & Yang (2017), revealed that participants' oral proficiency was significantly enhanced as the flipped instruction led not only to meaningful learning, but additionally facilitated positive interaction and collaboration, making them more competent in a variety of learning activities, including "storytelling, dialogue interaction, class discussion, and group presentations," (Wu, et. al., 2017, p.151).

Screencasting. Recent studies (Sharma, et. al., 2018; Stiles, et. al., 2017; Thomas, 2017; Valeri, 2015) show an increase in student engagement and academic development by exposure to screencasting software. Screencasting provides opportunities for teachers and students to record read aloud or fluency tasks, explain math problems, or offer feedback on virtually any web-based document (Casarez, et.al. 2019; Green & Green, 2018; Sejdiu, 2017; Valeri, 2015). It is also an alternative to traditional language instruction that has demonstrated positive results in speaking abilities (Alvarado, et.al, 2019; Jarvis, et. al., 2014; Krashen, 2008; Koura et. al., 2017; Rodrigo, et. al., 2004; Valeri, 2015).

Even with the numerous innovations of hardware and software related to mobile learning, it is still a field plagued by limitations of technological and pedagogical considerations, specifically within the sub-field of language acquisition (Burston & Arispe, 2018; Freeman, 2012; Park, 2011). More research is necessary to address trends and best practices of mobile technologies that increase specific domains of language acquisition (listening, speaking, reading, and writing). Particularly those that focus on specific age groups, as activities vary greatly depending on their age and developmental

level (Burston, et. al., 2018; Castrillon, 2017; Nemeth & Simon, 2013; Persson, et. al., 2018; Watt, 2010; Zhang, 2014). Continuing research that works towards identifying practical knowledge and application, which support multicompetent- communicated students, is essential towards best practices of interactive mobile technology, especially differentiation by the type of literacy competencies that EL students possess (Ortega, 2017). Specific research is needed to identify the realities in which these interventions are conducted.

Benefits and Challenges to Digital Technology Tools

As with any program, digital technology tools are not without their limitations. Studies have demonstrated that issues arise regarding the equitable accessibility of hardware and software necessary for these tools to be effective (Alvarado, et. al., 2019; Comeau et. al., 2020; Fishbane et. al, 2020; Kemp, 2020; Robles, 2020). In addition, the bombardment of digital tools without systematic design or implementation may cause cognitive overload and lead to substandard learning outcomes (Kear, et. al., 2012; Wang, et. al., 2020; Wynder, 2018). However, with training and practical execution, digital tools offer alternative platforms, and provide numerous, long-term benefits (Amelia, et.al., 2018; Belderrain, 2006; Bolliger, et.al., 2010; Cummins, et. al., 2018; Farajollahi, et.al., 2010; Huang, 2014; Kear, et.al., 2012; Madden, et. al., 2017; Nemeth, et.al., 2013; O'Rourke, et.al., 2017; Park, 2011; Persson, et.al., 2018; Smyth, et.al., 2007; Swarm, et.al, 2013).

Accessibility

Educational technology interventions often viewed as instant and omnipotent solutions to problems of traditional instruction, but as tools for reducing educational inequities. Because the primary method for preventing the spread of COVID-19 is social distancing, having a digital learning platform designed to continue language development is not only beneficial, but also necessary. Nonetheless, latest data reports only 60% of the world's population is online (Alvarado, et. al., 2019; Comeau et. al., 2020; Fishbane et. al, 2020; Kemp, 2020; Robles, 2020). While some demographics are privileged to continue education online, the vast majority do not have the access, or technology affluence. Most students are participating through their parents' cell phones and the gap of equitable access will become further noticeable the longer online learning continues (Alvarado, et.al., 2019; Comeau et.al., 2020; Fishbane et. al, 2020; Kemp, 2020; Robles, 2020). Even those families that have access may not have the sufficient bandwidth or number of devices to support the number of children and working adults in the same household. Parents that have been forced to work from home may find homeschooling their students an additional burden, despite having clear school district support in place, specifically for low-income households, even as school districts and states require low-tech alternatives to try to accommodate students (Adely & Balcerzak, 2020).

Public and private educational partnerships from publishers, telecommunication organizations, and educators, are banding together to identify solutions to the crisis of establishing online learning and broadcasting platforms that meet state educational and national health requirements (Alvarado, et.al., 2019; Tam & El-Azar, 2020). Internet service providers are offering months of free internet for students, waiving late fees, and

offering Wi-Fi hotspots to help with the crisis to stay connected. Furthermore, school districts are deploying school buses equipped with Wi-Fi in rotating schedules to neighborhoods identified with need for internet access (Alvarado, et. al., 2019; KPRC & Click2Houston.com 2020). In reality, the Covid-19 pandemic has brought awareness that these inequities not only exist on a grand scale, but the situation has exacerbated the lack of resources and funding evident in demographics which are often short changed including low socioeconomic students and minorities (Amiel & Reeves, 2008).

Cognitive Overload

It is argued the heavy combination of different media such as auditory, textual, and visual materials via online platforms may cause cognitive overloads since students are forced to split attention between various simultaneous occurrences (Kear, Chetwynd, Williams, & Donelan, 2012; Wynder, 2018). This phenomenon is increased with second language learners who are ultra-sensitive to visualizations and may easily be overwhelmed with information and stimuli (Wynder, 2018). Nonetheless, the exposure to multiple forms of communication can benefit students to develop positive behaviors and interaction skills when careful design and utilization of these modalities is constructed with student-centered approaches and aligned to SLA theories such as chunking or individual ZPD levels (Kear, et. al., 2012; Wang, Fang, & Gu, 2020; Wynder, 2018).

Training and Practice

For effective virtual platforms to be successful, multiple training sessions and subsequent performance support are necessary for teachers, students, and staff (Kear, et. al., 2012; Kirkpatrick, et. al., 2016). Moreover, constant updates and versions of platform tools and features require consistent training sessions or just-in-time learning refreshers

(Wang, 2004). Providing easily accessible support websites, or specific go-to personnel with questions or troubleshooting are crucial to the success of programs. As with any teaching courses, regardless of the modality, proper planning and structure of procedures is necessary to ensure lesson flow and time management, while maintaining flexibility and improvisation skills and adaptations to real-time stimuli (Kear, et. al., 2012). Similar to face-to-face instruction, in virtual platforms teachers often have to deviate from intended lesson plans to address gaps in instructional concepts or enhance learning opportunities based on student participation and feedback, and situational limitations such as internet outage, connectivity issues, or malfunctioning technology (Kear, et. al., 2012).

Communication Alternatives

Virtual systems offer convenience and flexibility as students have 24-hour access to materials. Additionally, with the decrease in travel, many virtual platforms are cost-saving for institutions to implement, especially those that offer free packages such as Google Workspace, Canvas, Blackboard (Belderrain, 2006; Bolliger, et.al., 2010; Huang, 2014; Kear, et. al., 2012; Madden, et. al., 2017; Nemeth, et. al., 2013; O'Rourke, et. al., 2017; Park, 2011; Persson, et. al., 2018; Smyth, et. al., 2007). These alternatives to face-to-face instruction offer multiple ranges of communication modes for students and teachers. Students in various situations impeded from a traditional education format such as in the case of illnesses or medical procedures, extreme weather conditions (snow days), and suspensions, school closures, etc. benefit from virtual platforms. Participation in virtual learning also increases the development of skills for continued success in future employment including time management, collaboration, research, critical thinking,

technical communication, and self-initiative (Amelia, et.al., 2018; Belderrain, 2006; Bolliger, et.al., 2010; Cummins, et.al., 2018; Farajollahi, et.al., 2010; Huang, 2014; Kear, et.al., 2012; Madden, et.al., 2017; Nemeth, et.al., 2013; O'Rourke, et.al., 2017; Park, 2011; Persson, et.al., 2018; Smyth, et.al., 2007; Swarm, et.al, 2013).

Summary

The literature review encompasses four major concepts, beginning with national and state policies and case law concerning the foundational second language programs and theories. These policies include bilingual and foreign language education definitions founded on the case Meyer v. *Nebraska* U.S. Supreme Court, the Bilingual Education Act of 1968, and its subsequent amendments. These measures helped to develop and implement SLA programs and allowed the interpretation for how they may affect instructional approaches (Stewner-Manzanares, 1988). Additionally, Texas specific state standards centered on accountability for teachers and a basis for funding in relation to student language proficiency via criteria, rubrics, standardized assessments, and program models such as Limited English Proficient or English Learner labels, English Language Proficiency Standards and Texas English Language Proficiency Assessment System, transitional, dual, and early or late exit models (TEA, 2013). The literature further divulged key second language learning theories from Krashen, Vygotsky, Chomsky, Piaget, and Cummins and their influence on student language development using different instructional strategies (Anderson, 2018; Çakiroglu, 2018; Castrillon, 2017; Costley & Nelson, 2013; Jarvis, et. al., 2014; Khatib & Taie, 2016; Koura et. al., 2017; Krashen, 2008; Rodrigo, et. al., 2004; Stairs-Davenport, et. al., 2018).

Following these fundamental principles, the literature exposes the connection to divergent digital tools and how they may provide alternative opportunities to develop second language development through interaction software in different modalities (i.e. synchronous and asynchronous) and increase engagement and collaboration by minimizing pressures to produce evidence of learning (i.e. wikis, podcasts, videos, etc.) (Bozkurt, et. al., 2017; Cortez & Roy, 2012; Davies, 2011; Madden, et. al., 2017; Park, 2011; Smyth, et.al, 2007; Watt, 2010; Valeri, 2015; Zhou & Wei, 2018). Finally, the literature review concludes with the most common challenges in facilitating second language development through digital platforms, including accessibility, technology affluence, and cognitive overload, and described possible solutions and benefits to its use including the personalization and socialization of learning (Belderrain, 2006; Bolliger, et.al., 2010; Huang, 2014; Nemeth, et. al., 2013). The essential harbinger of effectiveness for any of these tools, lays in the design and delivery. Making distinct connections between the purpose and objectives of the intended lesson and blending tools to enhance instruction by harnessing their best features.

CHAPTER III

Methodology

In this chapter, the researcher discusses the methods used for data collection and how the data was interpreted to answer the research questions of the study. Chapter III includes a review of the research method and justification, research design alignment to research questions, participant and instrument descriptions, procedures of the study, the data collection process, and data analysis, and researcher credibility and ethical considerations.

Purpose

The purpose of this study was to provide a holistic perspective on the pedagogical and contextual factors of interactive mobile technology on English learners. This research study discloses the overall theoretical potential of these platforms in connection to the Vygotsky and Krashen language learning theories by exploring synchronous and asynchronous modes of interventions. The functionality of the platform is discussed to evaluate the capacity of screencast and video conferencing interaction tools as a medium for increasing second language acquisition through purposeful interaction.

Research Questions

The research questions below guided the study:

RQ1. During virtual learning, how can educational technology (screencasting/ video conferencing platforms) support English language acquisition using the Vygotsky social constructivist and Krashen model of comprehensible input (O'Rourke & Stickler, 2017; Sanz, Levy, Blin, & Barr, 2016; Gallagher & Fazio, 2019; Wu, Hsieh, & Yang, 2017)?

RQ1a. How do the Vygotsky social constructivist and Krashen model of comprehensible input theoretical frameworks support instructional design for English learners?

RQ1b. How do the Vygotsky social constructivist and Krashen model of comprehensible input theoretical frameworks work in the virtual learning implementation context?

RQ2. What implications do preferred options and features of screencasting and video conferencing software mean towards different types of interaction platforms (synchronous vs. asynchronous) (Kear, Chetwynd, Williams, & Donelan, 2012; O'Rourke & Stickler, 2017; Sanz, et. al., 2016)?

RQ3. What are some of the challenges, limitations, and advantages of different types of interaction platforms (synchronous and asynchronous) after practical application (Satar, et. al., 2008; Smith, et. al., 2003)?

RQ4. How can these interactive mobile technology software interventions be improved (Cochrane, Cook, Aiello, Christie, Sinfield, Steagall, & Aguayo, 2017; Kim, Suh, & Song, 2015 O'Rourke & Stickler, 2017; Satar, et. al., 2008)?

Design Based Research Method

The systematic design of instruction is embedded into every curriculum design. This approach is a method which targets research, design, and delivery of technology-enhanced learning environments in real-world contexts, directly matched with the virtual learning phenomenon currently revolutionizing education today (Cochrane, et. al., 2017; Kim, et.al., 2015). Design based research has often been utilized for research with intentions of bridging theory into practice by systematically evolving teaching practices with new tool integrations and continuously observing and innovating strategies to enhance them (Kim, et. al, 2015; Sanz, et. al., 2016). The intention is two-fold: designing

and testing specific interventions based on theoretical frameworks and investigating relationships between them in practical settings, and in turn, contributing to the chosen theories (Design-Based Research Collective, 2002). Design based research facilitates human learning and development within specific situations and is goal oriented (Reigeluth, 1983). This theory allows the research to identify "*how to do* education, not *what is* [education]", exploring characteristics of effectiveness, preferences, and appeal of participants (Reigeluth, 1983, p. 634). Additionally, it improves sustainability of the IMT interventions through the knowledge gained and pursuit to mimic successes and mitigate failures (Sanz, et. al., 2016).

Design-based research can be traced to primitive forms of market research, and then slowly evolved into scientific research from the works of John Jones, Bruce Archer, and Herbert Simon. They focused on research *on* design, rather than research *for* design (Archer, 1965; Christensen & West, 2017). Specifically, in the education field, DBR emerged with the work of Ann Brown and Allan Collins through design experiments (Brown, 1992; Christensen, et.al, 2017; Collins, 1992). Brown and Collins note key characteristics of DBR is it found in authentic environments, influenced by the learning environment (students, teachers, curriculum, technology, content experts, etc.), contribute to existing learning theories, and includes multiple cycles of assessments, all within a comparison of groups (Christensen, et.al, 2017). There are several variations to the term, depending on the specific intentions of the research group, even within the education discipline, which are reflective in an entire paradigm of literature (Wang, et. al., 2005).

Design-based research, sometimes called formative research, or developmental research, directly and indirectly, offers key concepts and insights to the potential of both

products and theoretical models because it naturally studies the impact of instructional design and development efforts or evaluation activities of particular processes (Richey, 1994). Through this process, the researcher is able to identify knowledge production, understand proclivities, and predict outcomes for the intended audiences, whether it be through a product, theory, or model (Cohen, Manion, & Morrison, 2011; Richey, 1994; Richey & Klein, 2005). In a similar study, (Hooshyar, Binti Ahmad, Yousefi, Fathi, Abdollahi, Horng, & Lim, 2016) evaluated an intelligent tutoring system to determine the effect on problem-solving skills of novice computer programming students. The system offered a motivational online game-based formative assessment to explore the practical uses for similar tools via scaffolded lessons on computer programming tasks and suggested pathways on student learning based on their activity. The application offered a visualization of the task throughout the lessons and utilized the game to present formative assessments. The results of the study indicated the potential gains in student learning outcomes due to the increase in enjoyment and motivation, simulations of topics, more personalized teaching, and multimode assessment avenues (Hooshyar et al., 2016).

Current literature comprises design-based research in broad characteristics including that it is situated within a real-world context, design-driven for the evolution of a design, iterative in multiple cycles, requires collaboration between participants and researchers, builds upon theories, but are practical, and produce actual evaluative results (Christensen, et.al, 2017; Laleka & Rasheed, 2018; Wang, et. al., 2005). Haughton (2019) concluded the design-based research process provided opportunities for continuous improvement and review of instructor methods and student experiences, focusing on concepts of instruction development being a journey, rather than an outcome. The study

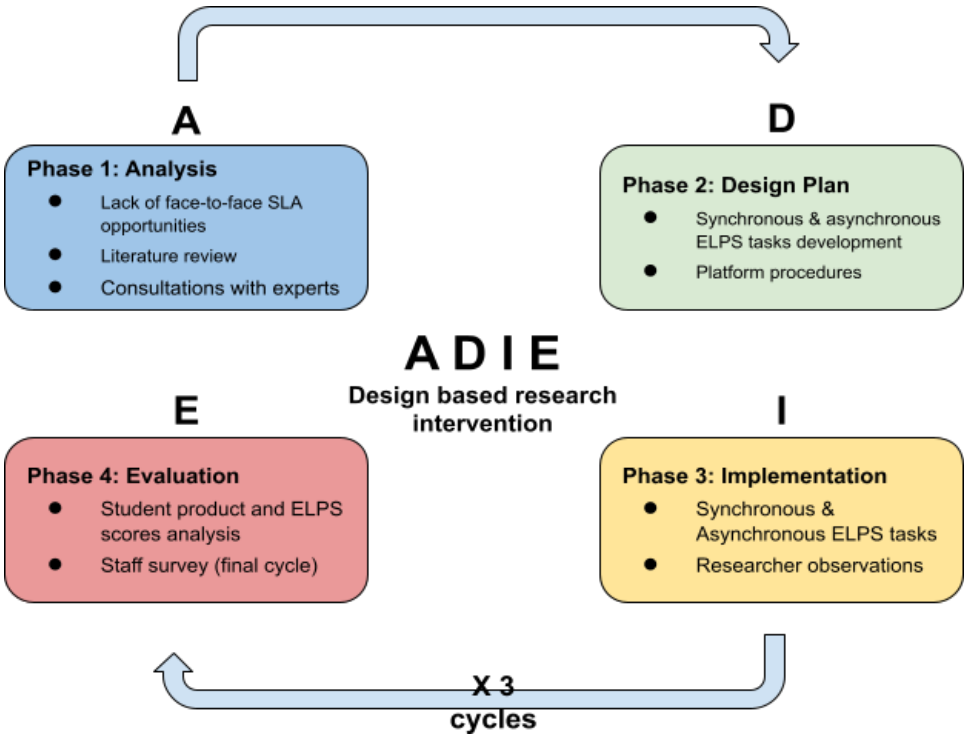
determined DBR approaches allow for the application of real-world expectations beyond the classroom and are applicable to any discipline (Haughton, 2019, p. 74).

Design Based Research Intervention- ADIE

In conscious conjunction with the Krashen and Vygotsky second language learning theories discussed above, the design-based research (DBR) process utilized throughout the study comprised of four major phases with three full iteration cycles lasting approximately one year. The four phases were composed of *Analysis, Design Plan, Implementation*, and *Evaluation (ADIE)* (Repeat). These phases were based on the foundational instructional design model: ADDIE (Analysis, Design, Development, Implement & Evaluate) with five original phases (Cochrane, et. al., 2017; Kim, et.al, 2015; Roblyer, 2015). Moreover, the traditional model has been shortened by aggregating design and development phases into one, *design plan* phase to create shorter turnaround times while maintaining the integrity of the model. In addition, being the same stakeholders are involved with both phases for this specific study, the conjunction of the phases integrated seamlessly. This process is represented in Figure 1 below, *Flowchart of ADIE Model (*Adapted from *Cochrane, et. al., 2017*; *Kim, et. al., 2015; Roblyer, 2015).*

Figure 1

Flowchart of ADIE Model



Note. (Adapted from Cochrane, et. al., 2017; Kim, et. al., 2015; Roblyer, 2015).

Furthermore, the first phase, *analysis*, investigated the problem, which consisted of the lack of face-to-face language acquisition opportunities amidst the pandemic, specifically those that target the ELPS. During this stage, consultations with coordinators, program directors, teachers, and personal experience in the field were established. This was consistent with the need to support design with research from the onset, and formalize what theories or frameworks apply to guide the interventions, in addition to a review of literature and examples of virtual learning platforms (Wang, et. al, 2005). In the second phase, *design plan*, the IMT interventions were established utilizing synchronous and asynchronous applications, and the development and alignment of practical goals for

the intervention questions and rubric (Wang, et. al, 2005). In the *implementation* phase, the IMT interventions were carried out with teachers, administrators, and the researcher conducting observations in virtual learning contexts. This addressed the need to conduct research in a "representative real-world setting" to account for pedagogical and contextual factors that may have influenced the design and implementation process (Wang, et. al, 2005). In the final phase, *evaluation*, the analysis of student products (videos, discussions, and participation), learning environment, and identification of challenges and limitations was conducted through a teacher survey and observations. Recurring themes and evidence of authentic learning artifacts were gathered to conduct iterations of the intervention including the identification of possible solutions in the learning platforms, instructional design, and delivery. The entire ADIE cycle repeated in two other cycles for a final reflection and the identification of implications toward theory and practice for computer-assisted language learning (Ozverir, et. al., 2017, p. 264). This allowed the intervention data to be analyzed immediately and continuously to construct validity in generalizations of the design and application of the interventions for future studies (Wang, et. al, 2005).

The DBR interventions were facilitated through the collaboration of EL content experts, teachers, students, and primary researchers in a real world, virtual learning setting. Moreover, the data obtained to conduct the study included student language proficiency scores, participant surveys, and overall English-speaking proficiency for LEP classified students, which originated from an initiative according to the campus' improvement plan, specifically to improve TELPAS scores. The data collection occurred naturally during the virtual academic school day, as part of the instructional practices

already in place to monitor language proficiency growth. As such, the researcher was not obligated to request permission for the students to participate in the interventions; however, the researcher was required to obtain permission from the school district to analyze the data collected through the interventions and for the teacher survey (see appendix F for more information). As the data set was obtained from a previous and present term in on-going iteration phases, the study was categorized as a design-based research study. The researcher purports the IMT tools provided affordances for students in virtual learning environments because the instructional content and delivery had been adapted specifically for ELs and cognitive language learning goals (Berland & Wilensky, 2015).

Justification and Review of the Method

This study evaluated the use of IMT programs in practice for EL and ELP skills as part of an on-going iterative design-based research. Design-based theory in educational research was a justifiable approach for "its pragmatism in testing [theories] and validating the practicality" of programs or tools (Said & Syarif, 2016; Sahrir, et. al., 2012, p. 109; Richey, et. al., 2005). The results offer implications for similar situations, and not just contextual or specific to the studied application (Richey, 1994). Richey (1994) argues for design research in the importance of the impact of the product (i.e., application, program, etc.) on the learner and field. From the overall evaluation outcomes such as those of Kirkpatrick & Kirkpatrick (2016), participant satisfaction, evidence of learning, change of behavior or skill development, and the organizational impact can be addressed through the effectiveness of the program being studied (Richey, 1994; Richey, et. al., 2005). Ibrahim (2016) further advocates for developmental research such as Hooshyar et al.

(2016) to be “employed when developing instructional materials to facilitate instruction” as a means of developing or enhancing instructional materials and practices, which in turn, empirically promote their effectiveness, and general usability across disciplines (Ibrahim, 2016, p. 5; Richey et al., 2005). In doing so, the researcher can focus on strengths and weakness, gaining participant feedback to overcome weaknesses in following iterations (Reigeluth, 1983). Overall, design [developmental] research (of the educational product, software, learning/instructional strategy, etc., or formative research) navigates how new technologies may alter future trends and affect instructional design and techniques.

The research method and its data collection process included qualitative data from student English language proficiency artifacts, staff survey, and researcher observations throughout the ADIE cycles. These instruments were necessary to harmonize with the research questions intended to address the goals of the study because the questions are based on the improved iterations of screencast and video conferencing interventions on English learners; and the identification of what features of screencasting and video conferencing software are preferred and why. The design-based methodology addressed the qualitative nature of the research questions as it allowed the researcher to collect data in its natural setting, not only sensitive to the students and staff under study, but to provide both inductive and deductive themes which adhered to the district’s TELPAS initiatives, and aligned to the campus improvement plan (Author, 2019; Creswell & Poth, 2018).

According to Wu, et al., (2017), online verbal interaction through a screencast interaction platform influenced the English as foreign language (EFL) learners’

perceptions and oral proficiency (Wu, et. al., 2017, p.144). In doing so, it not only exposed the benefits of utilizing educational technology to enhance second language acquisition, but also identified the context in which the students responded and how the intervention affected their thoughts and behaviors (Creswell, et. al., 2018, p. 46; Wu, et. al., 2017). The intervention offers the best alternative to a true experiment in educational research where a random selection of schools and participants is impractical (Cohen, et.al., 2011, p. 322). The three-cycle series of DBR allowed repeated interventions and language proficiency evaluation, offering the opportunities to observe the effects of the screencast interaction platform over time and identify evidence of learning (Cohen, et.al., 2011, p. 323).

Moreover, generalizability for naturalistic research is interpreted with the understanding of contextual variables, and in this situation were specific to the population and goals of this study. Therefore, while transferability and comparability are possible, the selection, setting, and construct effects may limit the potential for external validity for other demographics (Cohen, Manion, & Morrison, 2011). However, given the nature of design-based research and the iterative processes that evolved, the approach is useful for designers of EL curriculum in relevant virtual learning situations or those seeking to add to traditional learning environments. Lastly, this design-based research study uncovered the theoretical potential of how to leverage different interaction technology tools such as screencasting as mediums for second language acquisition within the field of educational technology, specifically computer-assisted language development contexts. Gallagher & Fazio (2019) conducted a similar study in which they utilized DBR for curricular integration and professional development. Their open-coding analysis exposed themes for

the need for teachers to develop understanding to the overall process of planning and practicing integration. In addition, more importantly is the value of DBR as a professional learning method for the improvement of specific goals for the authenticity of the process and outcomes, as it facilitates professional learning growth while improving instruction (Aksela, 2019; Gallagher, et al., 2019).

There was a need for design flexibility, providing students with ownership to independently configure individual applications, match their personal goals, purposes, preferences, and motivations to achieve higher standards of learning and reveal sustainable interactive mobile technology and their subsequent second language acquisition activities (Sanz, et.al, 2016). Gunn & Herrick (2012), argue the importance of a support or implementation model, both robust and self-sustaining to change, including the loss or gain of key stakeholders. Often, when these stakeholders leave, or new members take their place, the initiative fails, regardless of the affordance it holds. Whether it be a method, theory, technology tool or application, a support model is necessary to uphold the integrity of the intervention and sustain collaboration between stakeholders (Gunn, et. al., 2012).

Role of the Researcher

The role of the researcher was to coordinate the facilitation of the EL interactive mobile technology interventions with teachers. The design and delivery of interventions was be based on curriculum experts, campus administration input, and the standards of district and state expectations for EL including the ELPS and campus improvement plan. The researcher also conducted interventions and engaged in observations to gather firsthand experience of the implementation process and suggest iterations. The researcher

played the role of an advocate for the intervention, provided training, materials, etc., and a critic to holistically identify worldviews and true feedback on the interventions (Design-Based Research Collective, 2002).

Background of the Researcher

The researcher is a school librarian and instructional technologist for the campus conducting the interventions. As such, the researcher was accessible to the intervention participants, curriculum, and virtual learning platforms. The researcher was in an advantageous environment to conduct the study. Moreover, researcher bias, preferences, biography, background and agenda influenced the already subjective nature of the qualitative data analysis (Cohen, et.al., p. 554). Caution and self-awareness of these issues were necessary for the researcher directly involved in the screencast and video conferencing interventions and the recording observer. This was addressed with an observation template and checklist. Furthermore, because the goals of DBR is to continuously evolve instructional design and practices through the iteration cycles, the researcher was gathering data within naturally occurring curriculum development contexts, and purporting the knowledge gained of the process to further enhance instruction via methodical scaffolding for IMT.

Participant Selection

For ethical purposes, the specific information regarding participant selection was kept confidential, in accordance with the Family Educational Rights and Privacy Act (FERPA). Participants were selected from a school district located in Texas, which employs over 6,000 members throughout over 45 campuses (and growing) and support facilities. In 2019, there were over 43,000 students, 34.5% were classified as ELs, and

39.8% were classified as Bilingual/ESL (Author, 2019). It is noted that enrollment numbers were not as high as projected due to the pandemic. See Table 1 for demographics.

Table 1

Demographics of Participants

	Count
Teachers and Staff	40+
Students	600+

Note. (Anonymous, 2021).

Study Location

The design-based research study was conducted based on campus-based initiative, and took place at an elementary school with a student population average of 600, including pre- kindergarten regular, and Head Start classes, and kindergarten through fifth grade. The campus serviced over 75% economically disadvantaged students and had about 63% ELs. The campus had several school buses whose routes include ranch homes in rural areas over a 30-minute drive away (Author, 2019).

The campus is within a school district with over 90% population of Hispanic students, which are classified as EL, ESL, or Bilingual, and are more at risk for low academic success. Many situations involve students being *hosted* by a friend or family member to attend a local public school in this area. Generally, this involves the parent or guardian signing additional notarized paperwork discussing the student's home belongs to the campus, and explicitly states the student will reside there during the academic year. The host, or individual allowing the student to reside in their physical address that

belongs to the campus, will need to complete the school district's Host Questionnaire Interview conducted by an administrator on campus. The questions establish residency and understanding of the situation on why the student will live there and the expected duration. A notarized host application is also required to deter fraud, validate the legality of their responses, and set responsibilities, which are gained with the student residing in their home. Finally, a copy of a water, electric, or other utility bill for the current month with the name and physical address of the homeowner/host and their Texas DPS driver's license or identification card are required for approval. The district conducts unannounced home visits throughout the year to verify residency (Author, 2019).

Moreover, the goal for the number of participant data was 100 students. However, given student mobility over time, the Coronavirus pandemic, and the majority of students in 100% virtual learning formats, one of the major limitations of the study was the student and staff participation. At the start of the school year, between 8-10% of students were attending classes face-to-face. Nonetheless, this percentage fluctuated with the quarantine status of students, faculty, and the community Coronavirus positivity rate.

Population Sample

Criteria for participants selected included those LEP students from grades 2nd - 5th only from one school. Within those students, participants included females and males between the ages 7 to 10, and special population groups of LEP, Special Education, and Section 504, which were randomized throughout the sessions according to campus enrollment procedures (Author, 2019). Moreover, the students who participated in the intervention were those that were administered TELPAS. While the entire district was trained on these IMT interventions and encouraged to participate, only the participating

campus followed a systematic methodology according to Krashen's comprehensible input and output, and Vygotsky's scaffolding theories of second language acquisition (Anderson, 2018; Castrillon, 2017, p. 92; Hamidi et.al., 2018; Jarvis, et.al., 2014; Krashen, 2008; Koura, et.al., 2017; Rodrigo, et.al., 2004; Stairs-Davenport, et.al., 2018). For this reason, the entire district was not included in the staff survey. Data could provide an overview of intervention effectiveness in a general sense, but due to the lack of control of extraneous variables such as intervention delivery at differing campuses, in addition to the indeterminable amount of exposure to the interventions, the researcher did not include all LEP students from the district in the study. The staff survey was open to all teachers from the participating school that implemented the asynchronous and synchronous EL interventions as only a means for final reflection of intervention and future improvements.

Moreover, for this reason, one of the major limitations of the study is the number of students and teachers participating as the DBR intervention as it is based on garnered participants through convenience, purposeful sampling. These students were not selected at random, but instead chosen based on their LEP status and eligibility of TELPAS. However, as the entire purpose of the study was to improve teaching tools and programs for this specific population of students, the teacher and student participants selected were the ideal candidates for evaluation of the DBR study. Additionally, as the IMT interventions were the most controlled for variables including time, scaffolded ELPS prompt questions, and facilitators, these were the best options for viable analysis, instead of the entire LEP population of the school district.

Furthermore, the sampling, although small and considered convenient, allowed the researcher to expose the on-going contextual and pedagogical realities of the sudden transition of the education system to virtual learning. The direct contact (albeit virtual) with participants and observations and experiences gained by the researcher as both critic and advocate of the interventions allowed the truths to become known. In doing so, the DBR allowed for improvements to the subsequent cycles, and offers theories to the potential of IMT applications in virtual contexts.

Procedures

Prior to data analysis, the researcher requested permission to conduct the study from the Institutional Review Board (IRB) of Sam Houston State University. Once IRB approval was granted, the researcher completed the DBR study (see appendix E for more information). The researcher had already requested permission to conduct design-based research with the selected school district from the superintendent, within the scope of the campus interventions that were part of the improvement plan. The district approved the study through the understanding the student's identities remain anonymous in the report, and the instruction received through the interventions do not digress from the district-approved TELPAS intervention initiatives taking place (see appendix F for more information).

Furthermore, the DBR intervention began with teacher and staff training on the program software and implementation plan, followed by an initial setup of modules. Student product submissions were evaluated for feedback. The researcher collected blind student products and scores from interventions and compiled them in a Google Sheet. Only the researcher and dissertation chair had access to this data set. For data analysis,

student identification tabs such as names were eliminated, and only the grade level, gender, and scores for each topic were included. However, the school-level committee and administration had access to all student data to discuss the progress on the initiative and identify potential improvements. Concerning access to student-created videos demonstrating their language proficiency scores, only teachers, intervention staff, the researcher, and district-approved personnel, had access. Parents of students could obtain access to student videos as well, should they desire; however, all videos required the student to access via their Google single-sign on login credentials, which the district provides, or through the individual student QR codes provided by the teacher, or intervention staff. Guest access was available for Flipgrid, but only for viewing, and only for individual student evaluations such as for Response to Intervention (RTI), Language Proficiency Assessment Committee, Section 504, or Special Education review meeting, all of which followed FERPA guidelines.

Intervention Implementation Outline

The intervention implementation followed four phases, composed of Analysis, Design Plan, Implementation, and Evaluation ADIE (Repeat) (Adapted from Kim, et. al., 2015; Roblyer, 2015).

I. Phase 1: Analysis
    A. Identification of problem
    B. Committee of content experts and literature review discussion

II. Phase 2: Design Plan
    A. Synchronous IMT interventions- Google Meets
    B. Asynchronous IMT interventions- Flipgrid

C. Teacher and Staff Training- Interaction platforms, TELPAS Proficiency Level Descriptors, student speaking self-evaluation and other techniques for documentation

III. Phase 3: Implementation

A. Small group and whole group interventions

B. For asynchronous activities, students conducted modules at their own pace after initial topic discussion and brainstorming.

C. For synchronous activities, approximately 30–45-minute daily sessions.

IV. Phase 4: Evaluate (Repeat)

A. Grading and Feedback- Teachers, intervention staff and the researcher utilized the TELPAS PLD rubric (The language proficiency scores categorized from 1 through 4 with Beginner = 1, Intermediate = 2, Advanced = 3, and Advanced High= 4) to grade student submissions and score at the completion of asynchronous activities. Provided feedback to students for improvement.

B. Intervention Iterations- Utilize staff and researcher observations, staff survey, and administration walkthroughs to identify further problems and possible solutions for next cycle.

V. Repeated phases for another 2 cycles.

VI. Final Reflection

Data Collection and Management

Approximately, in spring 2021, data collection took place and included the identification of participant scores from TELPAS campus data between 2016-2020, researcher observations, and data generated from student audio-video modules including PLD scores. The audio-video data was stored electronically within each program platform (i.e., Flipgrid audio-video recordings are automatically uploaded to each grid.) Only student participants and intervention staff had access to view the videos, which were conducted for the duration of the DBR interventions. These data sources were utilized in unison to identify trends and patterns for future cycles of the DBR study to construct intervention improvements. Furthermore, at the conclusion of the final cycle, the teacher survey was administered anonymously to provide insight to the overall program effectiveness, bringing to light unique perspectives regarding implementation challenges and benefits. At the conclusion of the dissertation analysis, approximately fall 2021, the videos and all data pertaining to student language proficiency scores were deleted.

While the timeline for data collection may seem short (five months), because the study was based on a campus initiative already in place, the entire ADIE process for the intervention cycles actually began since the start of the academic school year, placing the true timeline at one academic year (ten months). Moreover, since the initiative began in August 2020, data was available retroactively from that time, and prior years from the intervention pilot study as a baseline for improvement. Given that language development does not progress linearly, and is a micro part of a complex system of variables such as proficiency level, personal motivations and preferences, data collection was best through

longitudinal study over a semester with multiple intervals (Sanz, et.al., 2016, p. 120). The DBR approach offers these opportunities, while simultaneously capitalizing on the virtual characteristics within the platforms and intervention. In addition, the timeline (one academic year) was necessary to capture the on-going realities of the overnight transition of face-to-face learning to virtual pathways, and expose the challenges and benefits of IMT.

Instruments

Qualitative instruments were utilized to conduct the study including the language proficiency submissions from the interaction platforms, the staff survey, and researcher observations. Similar studies (Al-Seghayer, 2017; Almekhlafi, 2006; Huong, 2018; Stanley & Zhang, 2018) measured student behaviors and perceptions on educational technologies within different language proficiency group comparisons, as this study proposes. The researcher utilized an online survey in combination with observations and student artifacts from the interventions to identify possible learning gains and continuously improve the design.

Teacher and Intervention Staff Participant Survey

A teacher and intervention staff participant survey with open-ended questions allowed for practical and insightful comments from respondents (Cohen, et.al., 2011, p. 392). This data set was utilized to identify educator perceptions of the intervention and gather related themes such as the benefits and challenges of the modules in terms of pedagogy and curriculum. Sum Cheung & Foon Hew (2009) describe questionnaires as the most common data collection method (Sum Cheung & Foon Hew, 2009, p. 166). The survey was adapted from Kirkpatrick & Kirkpatrick's blended evaluation approach of

open-ended items and sample tools from *Kirkpatrick's Four Levels of Program Evaluation* (2016, p. 110-117). Please see appendix C for survey. In addition, due to the various factors surrounding the pandemic, the survey and all forms of communication with the intervention teachers and staff were conducted in virtual/ online formats. The survey was strictly available online with no physical contact to any individuals. The goal for responses for the survey was thirty.

Researcher Observations

The researcher conducted naturalistic observations within the small groups to gather descriptive information on the challenges and benefits of the interventions in the form of *chronologs*, recorded daily at the conclusion of the interventions (Cohen, et.al., 2011, p. 466; DeMonbrun, Finelli, & Shekhar, 2015). Please see appendix D for researcher observation template. The goal for the researcher was to collect one hundred observations.

Interactive Mobile Technology Platforms for Interventions

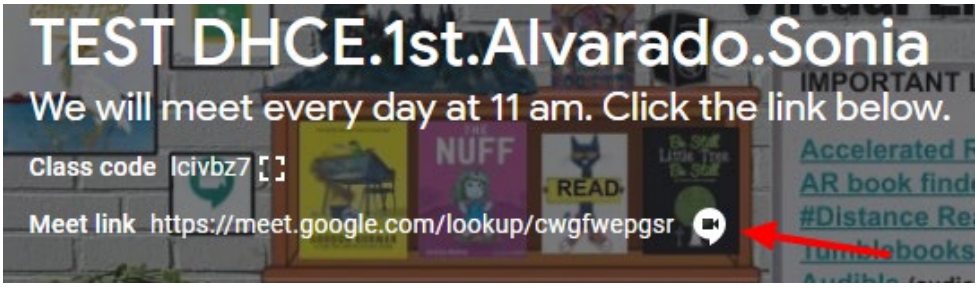
Throughout the DBR study, the IMT interventions were conducted within synchronous and asynchronous platforms, due to the majority of students participating in virtual learning pathways. The following paragraphs document research procedures and examples of the intervention for the first phase, should the study be repeated in the future, or the expansion of the audio-video screencasting programs for other educational technology evaluations occur. Moreover, this provides contextual details important to describe the overall convoluted challenges and potentials of educational technology such as screencasting.

Google Meets

For synchronous interventions, Google Meets was utilized. The platform is part of the district approved telecommunication platforms for its feasibility as part of the Google Classroom integration in place. Within the EL intervention blocks, the teacher facilitated interventions by following systematically scaffolded activities that integrated Krashen and Vygotsky theoretical frameworks. The students participated by joining the live sessions and utilizing embedded microphones and webcams on the device to respond to oral and written tasks or prompts. Google Meet links were available from the teacher's Google Classroom as depicted on Figure 2, *Google Classroom Meet Link.* Once in the Google Meet, the student and teacher had a variety of buttons and tools to facilitate communication.

Figure 2

Google Classroom Meet Link



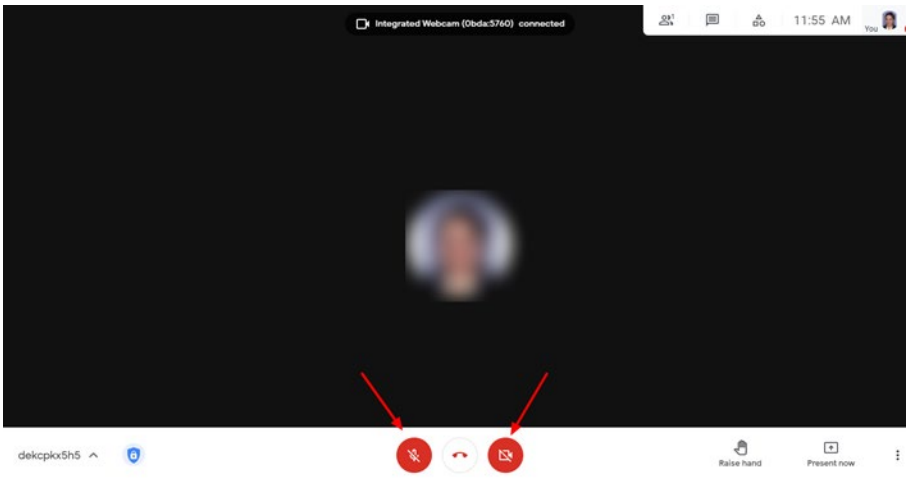
Note. Students who used a Chromebook, iPad, or desktop computer went to the teacher's Google Classroom and clicked the meet link to join a live synchronous session.

Moreover, Figure 3, *Google Meet Platform,* and Figure 4, *Teacher Scaffolding and Student Presentation,* demonstrate options available including microphone, camera, and presentation sharing. Chats, polls, breakout rooms for small groups, and Q&A tools were

also available, though some are part of the paid version of the Google for Education program. It is important to note that certain features did not appear until later in the year after several updates were made to the Google Meets platform. This is discussed in more detail in the results section.

Figure 3

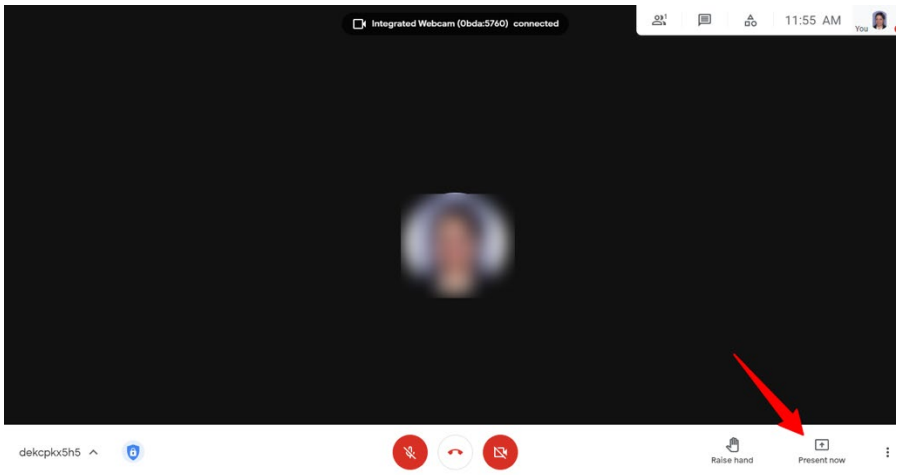
Google Meet Platform



Note. Students used the microphone and camera icons to toggle them on and off during the interventions.

Figure 4

Teacher Scaffolding and Student Presentation

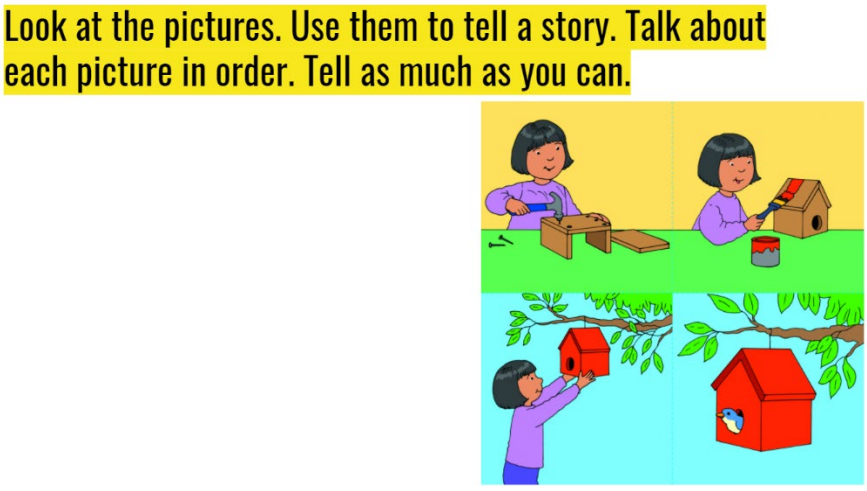


Note. Teachers used the 'present now' option to demonstrate tasks and directions. Students utilized this feature to display their product.

Teachers facilitated a variety of lessons integrating ELPS activities in their live sessions following the district approved scope and sequence. The activities provided different tasks for students to perform such as Figure 5, *Google Slides with ELPS Activity Example* and Figure 6, *ELPS Activity Example of Pdf* and Figure 7, *ELPS Activity Example Task Cards [excerpt]*. All of these activities were presented virtually.

Figure 5

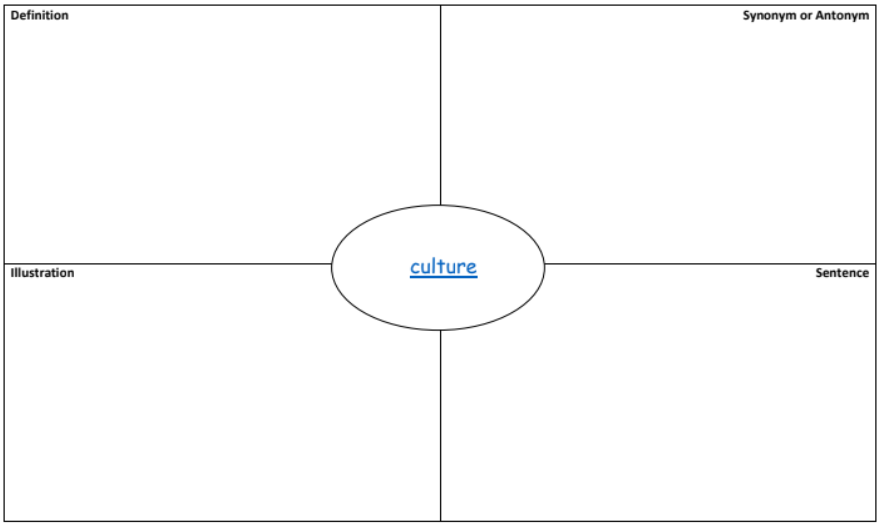
Google Slides with ELPS Activity Example



Note. Teachers used different tasks that prompt second language development skills such as Google Slides.

Figure 6

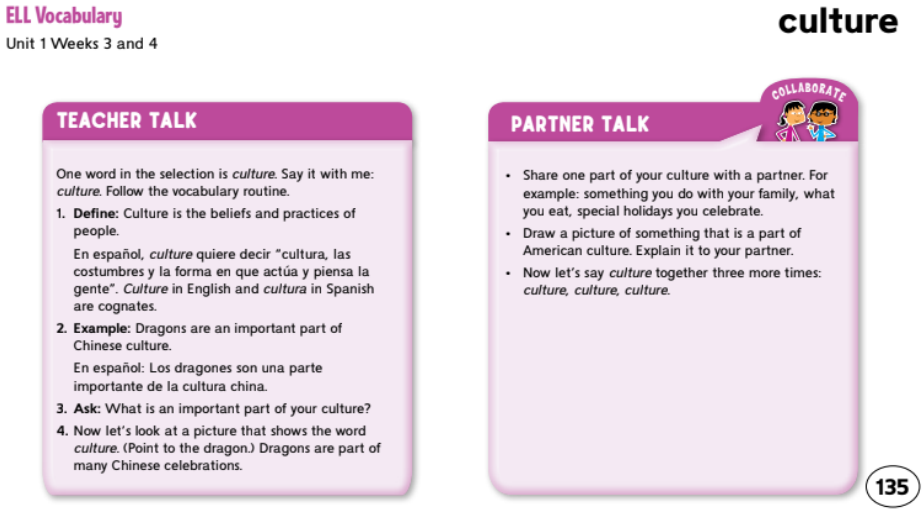
ELPS Activity Example of Pdf



Note. Teachers used different tasks that prompt second language development skills using digital handouts (pdfs).

Figure 7

ELPS Activity Example Task Cards [excerpt]



ELL Vocabulary
Unit 1 Weeks 3 and 4

culture

TEACHER TALK

One word in the selection is *culture*. Say it with me: *culture*. Follow the vocabulary routine.

1. **Define:** Culture is the beliefs and practices of people.
   En español, *culture* quiere decir "cultura, las costumbres y la forma en que actúa y piensa la gente". *Culture* in English and *cultura* in Spanish are cognates.
2. **Example:** Dragons are an important part of Chinese culture.
   En español: Los dragones son una parte importante de la cultura china.
3. **Ask:** What is an important part of your culture?
4. Now let's look at a picture that shows the word *culture*. (Point to the dragon.) Dragons are part of many Chinese celebrations.

PARTNER TALK

COLLABORATE

- Share one part of your culture with a partner. For example: something you do with your family, what you eat, special holidays you celebrate.
- Draw a picture of something that is a part of American culture. Explain it to your partner.
- Now let's say *culture* together three more times: *culture, culture, culture.*

135

Note. Teachers used different tasks that prompt second language development skills using digital handouts (pdfs) (Frey, Kratky, Lesaux, Linan-Thompson, Short, & Turner, 2017).

Flipgrid

Flipgrid was utilized for asynchronous second language proficiency development. Flipgrid is an online audio-video platform as well, that simultaneously promotes student engagement and formative assessment in a social-emotional learning discussion environment (Microsoft, 2019). The grid was shared between teachers and intervention staff. Students accessed via student QR codes, links, or grid code. Options for logging in include students' registration using their school identification number, or Google single sign-on login credentials. Figures 8-11 provide examples on different options for logging in. The software may be used via the mobile app or web-based, depending on the device for virtual learning (iPad, desktop, or Chromebook). Students who used an iPad entered by clicking on the Flipgrid app. They either selected the QR Code option or utilized a student QR card to scan and enter, or inputted the grid code provided by the facilitator.

Figure 8

Flipgrid Student QR Code Example

Note. Students used a camera from any device to go directly to the grid.

Figure 9

Flipgrid.com- Login Using a Flip Code

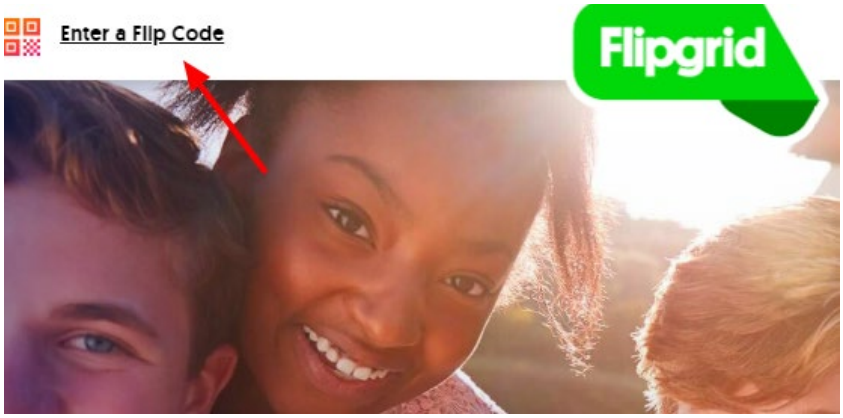
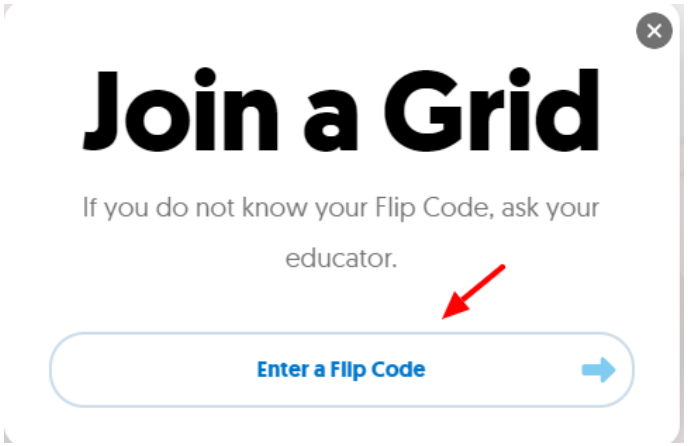


Figure 10

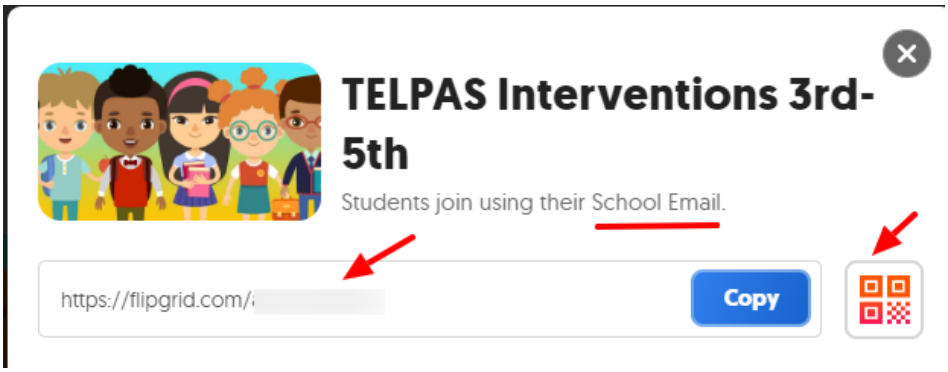
Flipgrid Enter Flip Code



Note. Chromebook or computer go to the website www.flipgrid.com and clicked *enter a flip code*.

Figure 11

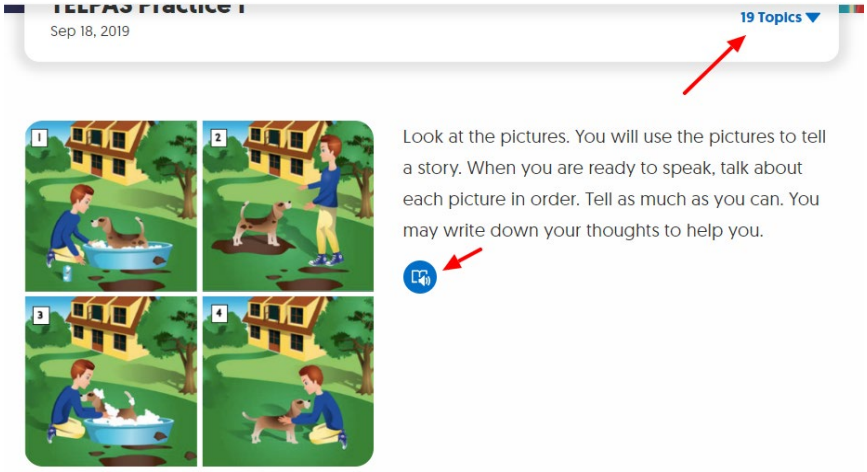
Flipgrid Code Sharing



For this platform, short 1-2-minute topics founded on Krashen and Vygotsky theoretical frameworks, with video, images, or audio prompts were stored in a grid. Examples of activities that targeted second language skills are shown in Figure 12, *Flipgrid TELPAS Prompt Example.*

Figure 12

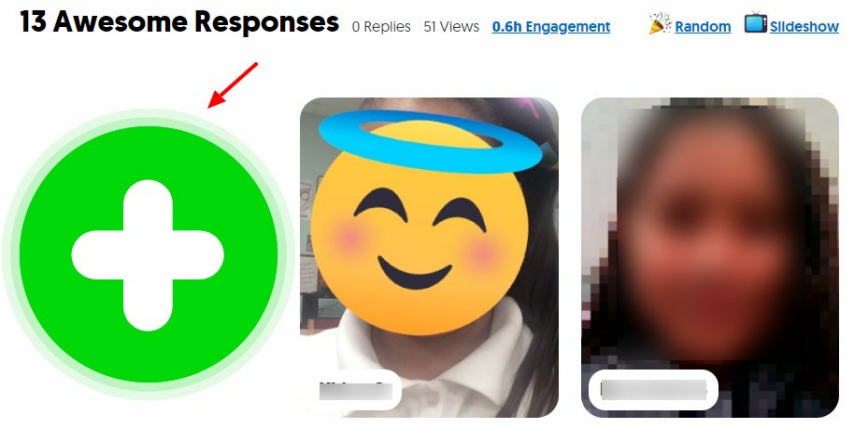
Flipgrid TELPAS Prompt Example



Students responded to the grid by creating a video. Options to add frames, stickers, or text are available. Figures 13 and 14 demonstrate how to respond to a prompt. After several updates later in the year, the Flipgrid software also added options to present a screen, draw on a whiteboard, and record audio only options.

Figure 13

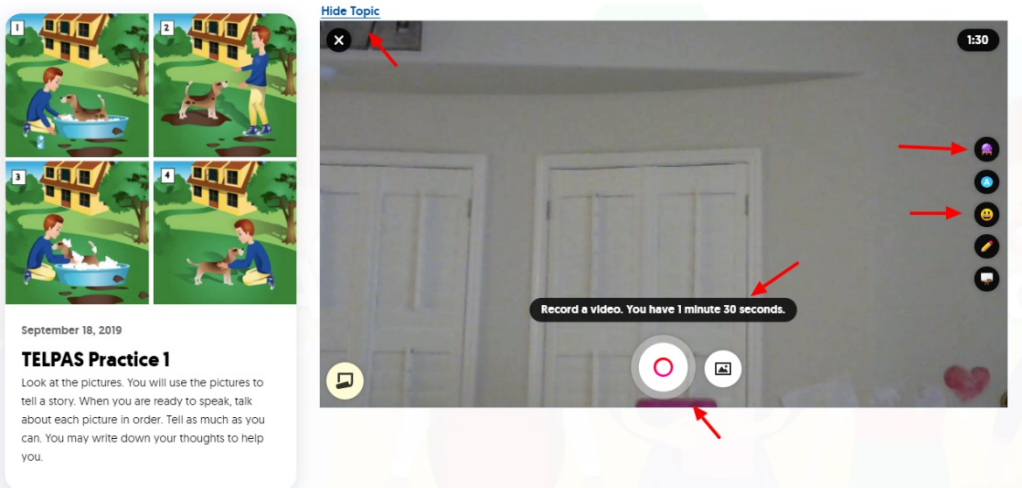
Flipgrid- Responding to a Prompt



Note. The student clicked on the large *plus* button to record their video response to the prompt.

Figure 14

Flipgrid Prompt Recording Options

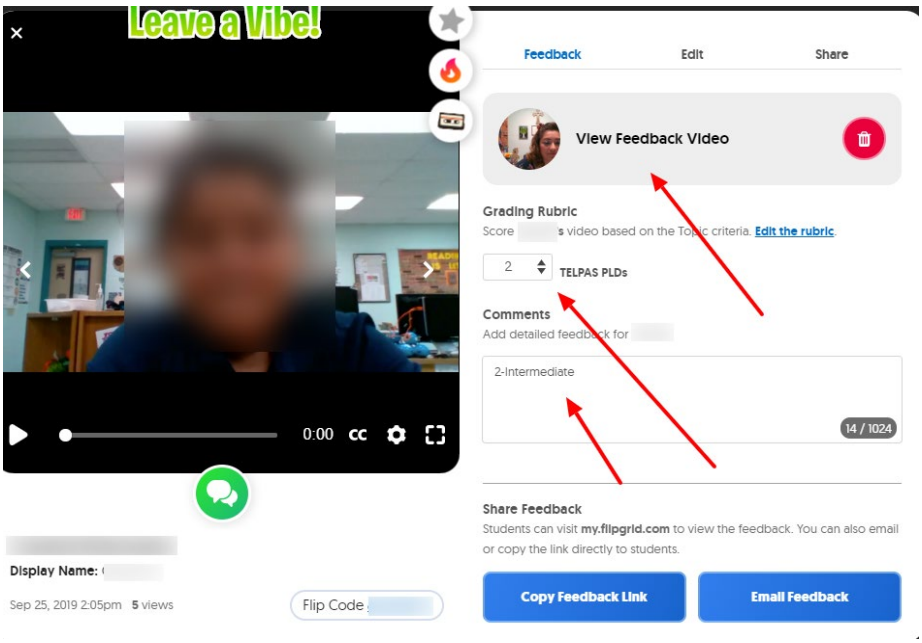


Note. The platform offered the student to view or hide the topic, explains how much time is allotted for the recording, and provides options for adding stickers, blurring the video feed, or inserting text.

The Flipgrid program also offers a method for feedback as depicted in Figure 15, *Flipgrid Grading and Feedback*. The teacher is able to record a video response, add comments privately, and score submissions based on a rubric of their choice.

Figure 15

Flipgrid Grading and Feedback



Note. Once submitted, the facilitator was able to provide feedback to each student in text or video for students.

Validity of Instruments

Survey research is often conducted within education because of the constructive feedback it provides and descriptive nature (Huong, 2018; Phillips, Aaron, & Phillips, 2013). Moreover, surveys are a method that provides information from a sample of respondents who are part of the larger, target population, and offers opinions, attitudes, and insight on previous experiences (Huong, 2018). The survey objectives directly aligned to the research questions and identified contextual factors that may have affected the overall implementation of education technology and identify other variables to consider. Nevertheless, there are limitations to survey instruments such as the possibility of non-response and/or sampling (Phillips, et. al., 2013).

Non-response errors were addressed through staff submission of the survey during the school day. This addressed the possibility of no-responses, as the facilitator was available to administer and assist in survey completion. However, all participants were required to submit a statement their responses were voluntary and confidential. They were be able to deny participation, so the researcher was only be able to facilitate those teachers who had signed and agreed to the survey administration. Moreover, sampling error is a possibility with the small group sample and whose selection was not random, but rather purposeful due to the eligibility of LEP status. Although the survey data, which was open-ended in format, provided a holistic, personal view of the interventions. Therefore, the reliability of the data collected from the surveys was met, as the results were be garnered with other qualitative data. In addition, as the DBR study was based on ADIE cycles of interventions to promote language acquisition, the surveys ensured the program maximizes instruction and leverages positive change by determining cause and effect relationships of success factors (Kirkpatrick et. al., 2016, p. 8; O'Rourke & Stickler, 2017; Sanz, Levy, Blin, & Barr, 2016; Gallagher & Fazio, 2019; Wu, Hsieh, & Yang, 2017). These phases were based on the foundational instructional design model: ADDIE (Analysis, Design, Development, Implement & Evaluate) with five original phases, shortened to create faster turnaround times while maintaining the integrity of the model (Cochrane, et. al., 2017; Kim, et.al, 2015; Roblyer, 2015).

Moreover, researcher observations were conducted by the researcher within the small groups to gather descriptive information on the challenges and benefits of the interventions in the form of *chronologs*, recorded daily at the conclusion of the interventions (Cohen, et.al., 2011, p. 466; DeMonbrun, Finelli, & Shekhar, 2015). The

goal for the researcher was to collect one hundred observations. The chronolog format is founded on commonalities of observation checklists designed for various educational technology lesson evaluations to increase validity and reliability (DeMonbrun, Finelli, & Shekhar, 2015; Murray, 1983; Texas Teacher Evaluation & Support System, 2020; University of Illinois at Chicago). Other data that is relevant and important to the analysis of program improvement was addressed in the survey such as teacher years of experience, technology affluence, and opinions regarding the program challenges. The chronologs were structured in an online Google format template with short answer questions and observation checklist selections to identify observation protocols, ensure observations were consistent across time, and measure what was intended. This included basic demographic information of participants, date and time stamp, lesson platform, and situational effects, which improved reliability and validity of the observations. The final question was a long open-ended question for observations based on the student rubric and in conjunction with the observation protocols based on the form questions (DeMonbrun, et. al., 2015; Murray, 1983; Texas Teacher Evaluation & Support System, 2020; University of Illinois at Chicago). Please see appendix D.

Data Analysis

In this study, data analysis included measures on student demographics for comparison, and staff perception of the overall usability of the screencasting and video conferencing platforms, their perception of the intervention including questions, troubleshooting, and experiences, and actual performance data measured through students' language proficiency scores by using qualitative methods. For this design-based research study, inferential analysis using a staff survey, researcher observations, and

student products comprised the qualitative data set. These instruments were vital to provide a holistic view of the technology intervention and expose the actual challenges, benefits, and experiences of a unique group of participants under the specific conditions of the phenomenon (Cohen, Manion, & Morrison, 2011, pg. 309). Characteristics of survey items were developed after consultation with educational field experts, a literature review of sample instruments, and expert-developed question stems (Stanley, et. al., 2018). The opportunity for participants to respond to open-ended questions allowed the researcher to obtain authentic, honest, and in-depth perspectives on the TELPAS interventions and software programs, which is the primary purpose of qualitative research (Cohen, et. al., 2011, pg. 393).

Survey

Surveys were administered to teachers and intervention staff at the conclusion of the final phase. The teacher and intervention staff survey contained questions regarding their preferences toward the program, what challenges they may have faced, and suggestions on improving the interventions. The survey questions asked staff to describe if and how the screencasting and video conferencing platforms may have changed or improved engagement, language proficiency, and enlighten if and why a particular platform feature is favored. Questions highlighted engagement and learning aspects of the activity, and confirmed the effect of language development (Stanley, et. al., 2018). Moreover, these questions could help improve the design of similar interventions using comparable technology software in the future.

Moreover, the survey questions were established from similar studies previously conducted and validated through a pilot test with a small group of students and teachers.

This process addressed question formatting and identified effective word phrases for each category, in order to obtain the best results (Kear, et. al., 2012; O'Rourke, et. al., 2017; Sanz, et. al., 2016; Gallagher, et. al., 2019; Satar, et. al., 2008; Smith, et. al., 2003; Wu, et. al., 2017). The surveys were revised based on the sample exposed to staff and students. The responses provided necessary support for the assumption that tools such as screencasting and video conferencing platforms will increase student confidence, engagement and language learning through scaffolding and comprehensible input and output activities (Stanley, et. al., 2018). The validation process consisted of the requirement to agree to the participation, submit an answer, date and specific time allotted to record, and authentic email address. The date of each participant response will be automatically recorded. Furthermore, this data set can be exported into a .CSV file. Please see appendix C.

Researcher Observations

The researcher conducted naturalistic observations within the small groups to gather descriptive information on the challenges and benefits of the interventions in the form of *chronologs*, recorded daily at the duration of the interventions (Cohen, et.al., 2011, p. 466; DeMonbrun, et. al., 2015). The validation process for the chronologs was be based on an observation checklist and template to identify observation protocols, ensure observations were consistent across time, and measure what was intended. This included demographic information of participants, date and time, lesson platform, and situational effects, which improved reliability and validity of the observations. Please see appendix D.

The survey responses and researcher observations were analyzed for common themes to gather descriptive information on the challenges and benefits of the interventions from both student task submissions and educator perspectives (Cohen, et. al., 2011). The researcher conducted open-coding data analysis by counting frequencies of occurrence, noting patterns and themes of repeated ideas to cluster into categories (Cohen, et. al., p. 561). Saldana (2016) describes coding as a heuristic, problem-solving technique in which the researcher has to identify connections from data to reach analysis following repetitive cycles with no special formula or algorithm to follow (p. 8). From the repetitious themes, the researcher identified any noticeable relationships between variables, and built a logical chain of evidence. This process allowed the notation of causality and establishment of inferences, which led to conceptual theories to explain the phenomena of possible influence of second language proficiency abilities from the interventions using an interaction virtual platform (Cohen, et. al., 2011, p. 555).

Reliability and Validity of Data Analysis

This data analysis process was necessary to filter overwhelming amounts of data, and allow the movement from the specific thoughts of participants to more general themes that may explain the phenomena in theoretical constructs (Cohen, et. al., p. 555). The survey allowed the researcher to expose the specificity of the intervention technology tools, and provided important worldviews of why and how the intervention was perceived (Cohen, et. al., 2011). Moreover, Almekhlafi (2006) recommends more qualitative research including observing students using CALL is needed to expose the best techniques and strategies to use CALL. In fact, conducting student observations will increase understanding of CALL utility for learning SLA and the strategies users follow

to maximize their benefit (Almekhlafi, 2006). In a related study (Franco-Camargo & Camacho-Vasquez, 2018), researchers utilized observations to document and reconstruct social situations and collect evidence to evaluate the effects of ICT and expose potential problems with the technologies to correct mistakes as the intervention continued.

A similar study conducted by Stanley, et. al., (2018) measured student behaviors and perceptions on student-produced videos (screencasts) within different language proficiency skill group comparisons. The researchers utilized an online survey in combination with assessment data from the course to expose possible learning gains for students-generated videos. Moreover, another similar study conducted by Al-Seghayer (2017), tested participants' proficiency scores and the main effect of different interactions (i.e., well-structured vs. poor-structured) of an electronic device to aid ESL learners' reading comprehension. The results demonstrated the ESL learners, especially those in lower proficiency levels, benefited from more structured, or scaffolded text organization (Hamidi et. al., 2018; Seghayer, 2017). Additionally, Almekhlafi (2006) directed another comparable study to evaluate the effects of CALL users on EFL students. Using student scores and responses to open-ended questions in categorized topics, Almekhlafi (2006) reported overall advantages in CALL technologies including multimedia elements, improving in language and comprehension skills, while disadvantages were limited to computer problems and difficulty with the program. Lastly, the results of the study demonstrated a significant difference in achievement between CALL users compared to nonusers in the EFL students (Almekhlafi, 2006).

Ethical Considerations

Confidentiality and privacy for student language proficiency data, observations, and survey is of utmost importance. With this in mind, only the researcher and dissertation chair had electronic access to student TELPAS language proficiency scores for the duration of approximately three months for data analysis and dissertation writing completion. After such time, the e-documents will be only privy to campus administrators and individual teachers of students for educational purposes, and all files were deleted. All information available on the dissertation including names, faces, and other identifiable features were removed for the assurance of FERPA compliance, and participant anonymity.

Informed consent from the school district was obtained prior to intervention data analysis, as well as staff survey participants (Cohen, et. al., 2011). These consent forms were included with a credible explanation of the researcher's intentions and utilization of the student data, with the clause describing the data was obtained from a campus-based intervention, and with no cost and high benefit ratios. Furthermore, it expressed the importance of the research to benefit future student interventions and addressed the on-going academic and language development campus improvement plan (Cohen, et. al., 2011, p. 542)

Summary

This design-based research study allowed for an iterative process to leverage positive change by investigating relationships from theoretical frameworks in practical settings in the area of second language acquisition utilizing interactive mobile technology software interventions to support Hispanic, English learner’s language proficiency. By

conducting observations in the form of chronologs, adapting changes to improve the program based on those observations, there was immediate feedback and advancement of student success. Also, in evaluating the program at the conclusion of the study by analyzing themes from staff survey responses and interpreting student evidence of learning artifacts, the study exposed the realities in designing and operationalizing digital platform SLA interventions that are not only achievable, but sustainable.

CHAPTER IV

Results

In this chapter, the researcher reported the results from data collection to answer the research questions of the study. Chapter IV includes results that are organized first, by the analysis of survey responses and coding landscape results, and continue with *a priori* codes and thematic statements identified. Following these, the results from observations and student products from the design-based research cycles are provided chronologically. Lastly, results are provided by research question.

The purpose of this design-based research study was to disclose the theoretical potential of screencasting and video conferencing platforms in connection to the Vygotsky and Krashen language learning theories by evaluating synchronous and asynchronous interactions in practical implementations. The study took place in an elementary school in south Texas with over 60% English learners and approximately 600 students. Data was collected from research observations, student English language proficiency products, TELPAS scores, and teacher/ staff survey. The open-coding methods used included descriptive and holistic coding processes (De-Cuir-Gunby, Marshall, & McCulloch, 2011; Saldana, 2013).

The DBR study results revealed eight *a priori* codes and ten derived themes discussed in more detail below. Significant statements and phrases from the data survey responses are included in this chapter and are summarized to address each research question. The themes generated from the participant data including teacher/staff survey, student TELPAS scores, and researcher observations are described based on the repeated substantial statements and phrases, and patterns recognized.

The research questions for the study were:

RQ1. During virtual learning, how can educational technology (screencasting/ video conferencing platforms) support English language acquisition using the Vygotsky social constructivist and Krashen model of comprehensible input (O'Rourke & Stickler, 2017; Sanz, Levy, Blin, & Barr, 2016; Gallagher & Fazio, 2019; Wu, Hsieh, & Yang, 2017)?

RQ1a. How do the Vygotsky social constructivist and Krashen model of comprehensible input theoretical frameworks support instructional design for English learners?

RQ1b. How do the Vygotsky social constructivist and Krashen model of comprehensible input theoretical frameworks work in the virtual learning implementation context?

RQ2. What implications do preferred options and features of screencasting and video conferencing software mean towards different types of interaction platforms (synchronous vs. asynchronous) (Kear, Chetwynd, Williams, & Donelan, 2012; O'Rourke & Stickler, 2017; Sanz, et. al., 2016)?

RQ3. What are some of the challenges, limitations, and advantages of different types of interaction platforms (synchronous and asynchronous) after practical application (Satar, et. al., 2008; Smith, et. al., 2003)?

RQ4. How can these interactive mobile technology software interventions be improved (Cochrane, Cook, Aiello, Christie, Sinfield, Steagall, & Aguayo, 2017; Kim, Suh, & Song, 2015 O'Rourke & Stickler, 2017; Satar, et. al., 2008)?

Technology Survey Responses

The open-ended survey was administered from June 10, 2021 to July 10, 2021. A total of thirty participated. The majority of teachers had over 20 years of experience. Table 2 and Figure 16 summarize the demographic results. Survey demographic results indicated most teachers rated themselves at *above average* for technology proficiency as seen in Table 3 and Figure 17.

Table 2

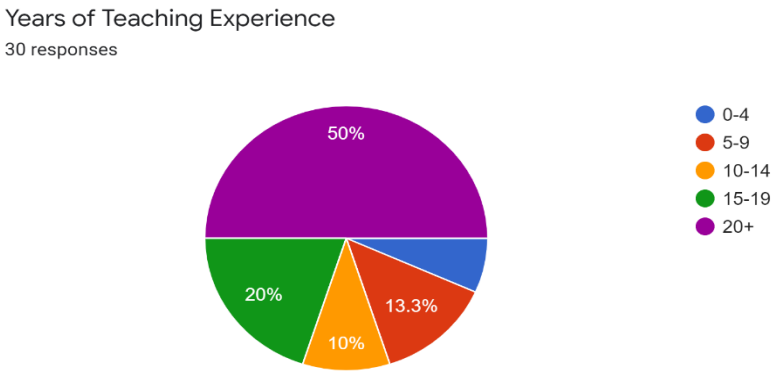
Years of Experience: Teacher/ Intervention Staff Survey

Years of Experience	Count	Percentage
0-4 years	2	6.7
5-9 years	4	13.3
10-14 years	3	10
15-19 years	6	20
20+ years	15	50

Note. Teacher and staff survey, (Anonymous, 2021).

Figure 16

Years of Teaching Experience



Note. Teacher and staff survey, (Anonymous, 2021).

In their open-ended response for their rating, teachers overwhelmingly described a sudden immersion of sink-or-swim educational technology integration. Collectively their responses depicted a resigned tone of great improvement, not just regarding the technical aspects of implementing the virtual platforms, but the conscientious adoption of when to use what edtech to promote the intended skills.

Table 3

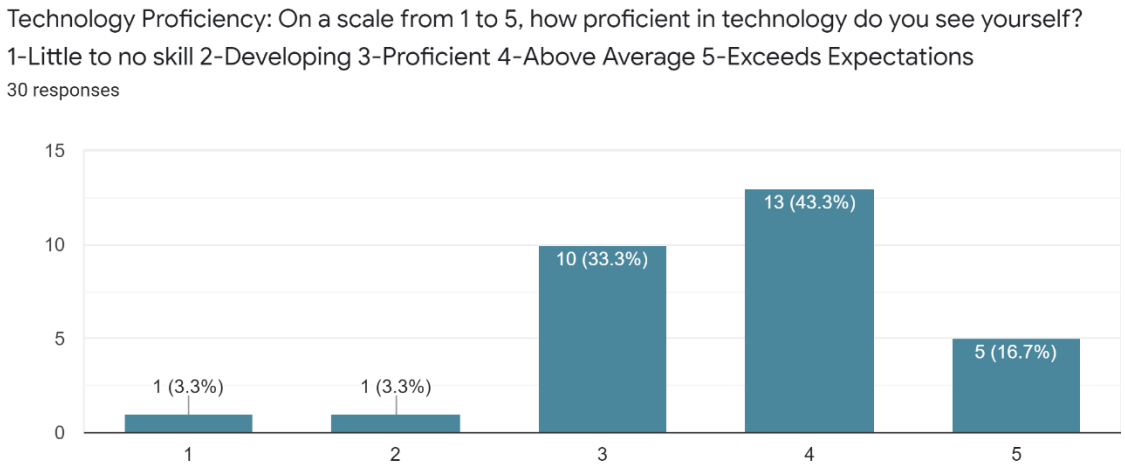
Technology Proficiency: Teacher/ Intervention Staff Survey

Technology Proficiency	Count	Percentage
1 Little to no skill	1	3.3
2 Developing	1	3.3
3 Proficient	10	33.3
4 Above Average	13	43.3
5 Exceeds Expectations	5	16.7

Note. Teacher and staff survey, (Anonymous, 2021).

Figure 17

Technology Proficiency



Note. Teacher and staff survey, (Anonymous, 2021).

The 2020-2021 school year was a transitory year for educational technology in K-12. School districts that had little to no plans for a 1:1 student device program found themselves unprepared for the onslaught of needs to operationalize virtual learning curriculum (Comeau et. al., 2020; UNESCO, 2020). Those that did, including this campus still faced adversity in the distribution of equitable internet connectivity and how to best support virtual learning models. Major negative factors on the effectiveness of virtual learning platforms deemed by teachers were the *student home situation, connectivity,* and *not enough time to master* the virtual platform to maximize instruction as seen in Table 4 and Figure 18. Student home situation and connectivity issues were related to each other, as many teachers expressed the inequitable access to internet, parental support (including technology affluence and regular content support), and a home environment that was not conducive for learning. This was affected by the physical

location of where the student would connect from, number of individuals using the internet, multiple sibling households, whether parents were working full time from home, or students were being cared for by a grandparent, and the number of other distractions being at home advances (television, game-system, food proximity, etc.). For the open-ended *other* response, teachers included student apathy and lack of time to master so many resources available in order to know how to use them effectively to target language learning skills.

Table 4

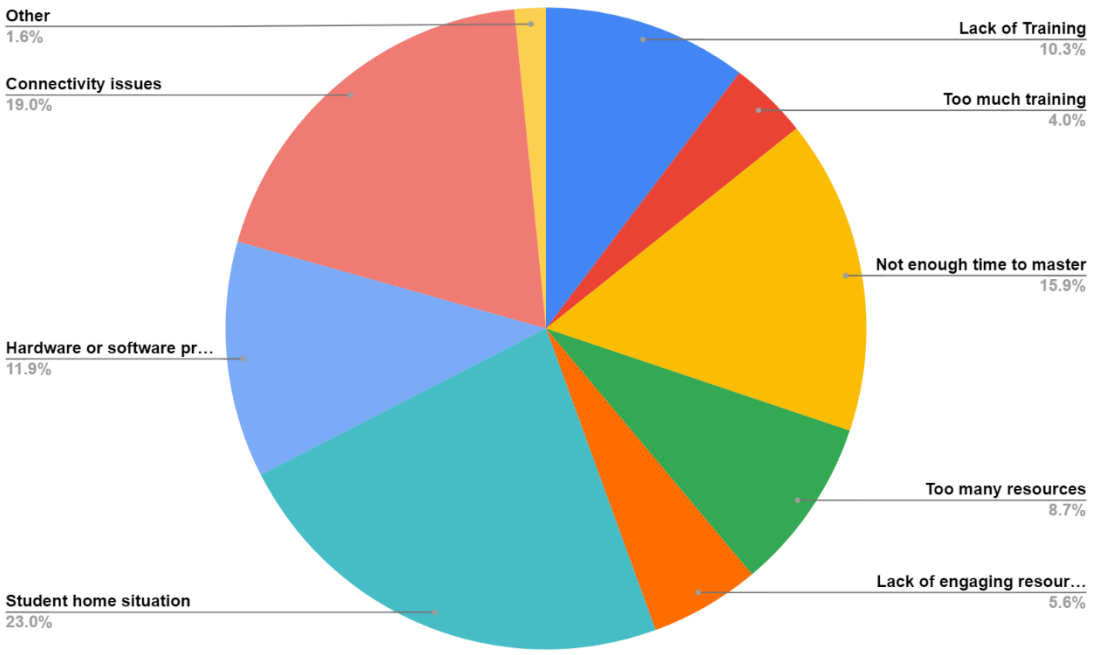
Factors Contributing to Failure of Virtual Programs: Teacher Intervention Staff Survey

Factors	Count	Percentage
Lack of Training	13	10.3
Too Much Training	5	4.0
Not Enough Time to Master	20	15.9
Too Many Resources	11	8.7
Lack of Engaging Resources	7	5.6
Student Home Situation	29	23.0
Hardware or Software Problems	15	11.9
Connectivity Issues	24	19.0
Other	2	1.6

Note. Teacher and staff survey, (Anonymous, 2021).

Figure 18

Negative Factors Contributing to Failure of Virtual Programs



Note. Teacher and staff survey, (Anonymous, 2021).

Moreover, the rest of the teacher and staff survey consisted of a qualitative data set with open-ended questions. These questions allowed deeper understanding of contextual factors that affected the study. Codes were created based on repeated themes to expose contrasting elements of data while reducing data. To improve accuracy, the descriptive coding process was conducted over a series of pattern logging and reviewing decisions for holistic coding (De-Cuir-Gunby, Marshall, & McCulloch, 2011; Saldana, 2013). First cycle descriptive coding allowed documentation and analysis of a variety of products (observation notes, artifacts, survey or interview responses) and environments of fieldwork (Saldana, 2013, p. 88). Second cycle holistic coding assisted in the investigation of narrowing broad topic areas within computer assisted language learning contexts (Saldana, 2013, p. 142). Code development was an iterative process (De-Cuir-

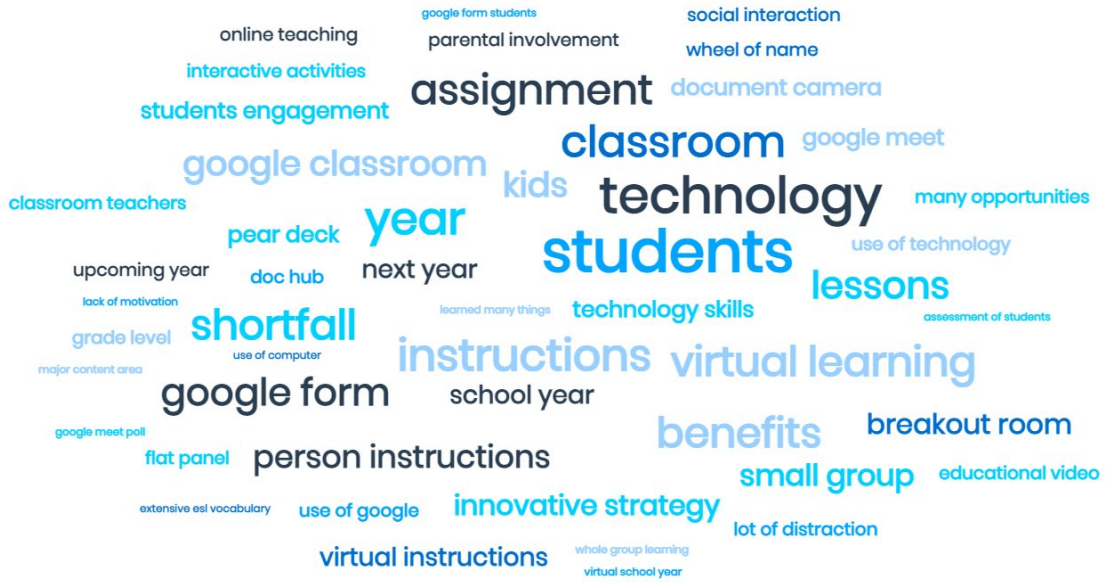
Gunby, et. al., 2011; Saldana, 2013). Codes were developed from a priori existing theory and concept (theory-driven) as well as emerged from the raw data (data driven) (De-Cuir-Gunby, et. al., 2011; Saldana, 2013).

Code Landscape

To enhance the credibility and trustworthiness, increase the organization of observations as the analysis proceeded, code landscaping methods were conducted (Saldana, 2013, p. 194). All open-ended question responses were submitted for analysis. Saldana posits (2013), code landscaping allows the visualization of text by analyzing the frequency of words or phrases and increasing the size of text (p. 199). Figure 19 depicts the word cloud from MonkeyLearn.com, a free word cloud generator.

Figure 19

Word Cloud 1



Note. MonkeyLearn.com

The program also provides a detailed word analysis csv with a word count to reveal frequent and relevant terms. The top 5 words are shown in Table 5 and Table 6 (Saldana, 2013, p. 199). The word *students* was the most frequent and third-most relevant term identified for this program. The phrase *virtual learning* was the most relevant term identified.

Table 5

Word Analysis Count

Word	Count
Students	82
Technology	42

continued

Word	Count
Year	25
Instruction	20
Classroom	18

Note. MonkeyLearn.com

Table 6

Word Analysis Frequency

Word	Frequency
Virtual learning	0.997
Google form	0.609
Students	0.608
Google classroom	0.499
Instruction	0.332

Note. MonkeyLearn.com

The process was repeated with another free word cloud program, WordArt.com to compare and contrast results. This software does not provide word analysis, but it allows the user to choose from pre-existing shapes to match the theme. A pencil was chosen to relate to education as shown in Figure 20. In both word clouds, the word *students* is the largest word indicating its frequency. This correlates to the relating themes centering the desire to improve student learning as many of the open-ended responses were written with the student's interests at heart.

Figure 20

Word Cloud 2

Note. WordArt.com

Codes

A priori codes include: *Socio-technical environment restraints*, *pedagogical struggles, pedagogical strategies, SLA conceptual reference, edtech application reference, instructional design reference, professional development and training reference, autonomy/control over learning* described in more detail in Table 7 (Amelia, et.al., 2018; Belderrain, 2006; Bolliger, et.al., 2010; Castleberry, et. al., 2018; Cummins, et. al., 2018; Dey, 1993; Farajollahi, et.al., 2010; Huang, 2014; Kear, et.al., 2012;

Lockmiller, 2021; Madden, et. al., 2017; Nemeth, et.al., 2013; O'Rourke, et.al., 2017; Park, 2011; Peel, 2020; Persson, et.al., 2018; Saldana, 2016; Smyth, et.al., 2007; Swarm, et.al, 2013).

Table 7

Codebook

Code Name	Definition	Inclusion	Exclusion	Example
SLA conceptual/ curriculum reference	Second language acquisition techniques and curriculum	Comprehensible input Output Scaffolding Extra time ELP domains	Not pedagogy Not teaching strategies that are specific to language development or edtech tool	Speaking opportunities Fluency Vocabulary Listening skills Reading passages
Edtech tool application reference	Describes a tool with technology to facilitate instruction	Google Meets Flipgrid Nearpod Google Forms Google Slides Breakout Rooms Chat Comment Kahoot Quizizz	Not teaching strategies Not language development tools	Collaborative Ease of use Robust Inclusive Universal Flexible
Socio-technical environment restraints	Social and technical problems and issues impeding instruction	WiFi connectivity Parental support Technology affluence Physical constraints Location Bandwidth	Not teaching practices or skills Not related to teacher experience	Engagement Lost access Limited service Disruptions

continued

Code Name	Definition	Inclusion	Exclusion	Example
Pedagogy/ teaching strategy	Teaching strategies and ideologies regardless of platform	Classroom management Student grouping Methods	Not language strategies or edtech tools	Cooperative, flipped, whole group, small group, independent
Pedagogy/ teaching strategy	Teaching strategies and ideologies regardless of platform	Classroom management Student grouping Methods	Not language strategies or edtech tools	Cooperative, flipped, whole group, small group, independent
Instructional design reference	Identifying what approaches best meet student needs (combination of materials and methods)	Planning Learning model and framework	Not singular to edtech or teaching and learning practices	System, plan, cycle, model
Professional development and training reference	Continuing education to improve skills	Formal and informal PLCs Training Videos Workshops Courses	Not teacher experience	Training support and examples Lesson guides Templates
Pedagogical struggles	Problems with connecting teaching and learning ideologies to virtual learning contexts	Engagement Proximity control Classroom management Technology affluence	Not teacher experience Not teacher PD	Bridging teaching into virtual platform
Autonomy/ control over learning	Problems with engagement and classroom management to virtual learning contexts	Engagement Proximity control Classroom management	Not teacher PD	Safety Security Privacy Control

continued

Code Name	Definition	Inclusion	Exclusion	Example
		Technology affluence Motivation Self-initiative Efficacy Parental support		behavior and outcomes

Note. (Amelia, et.al., 2018; Belderrain, 2006; Bolliger, et.al., 2010; Castleberry, et. al., 2018; Cummins, et. al., 2018; Dey, 1993; Farajollahi, et.al., 2010; Huang, 2014; Kear, et.al., 2012; Lockmiller, 2021; Madden, et. al., 2017; Nemeth, et.al., 2013; O'Rourke, et.al., 2017; Park, 2011; Peel, 2020; Persson, et.al., 2018; Saldana, 2016; Smyth, et.al., 2007; Swarm, et.al, 2013).

The entire coding process consisted of weekly 2-hour sessions in over 3 months for a total of approximately 30 hours. The following subsequent paragraphs explain the codes and significant statements or phrases identified within the study.

SLA Conceptual Reference

Krashen and Vygotsky language acquisition theoretical frameworks were evident throughout the DBR data collection. From researcher observations, student products, and teacher survey responses, the conceptual strategies of SLA were integrated seamlessly. The use of media to build background knowledge, make real-world connections to better understand concepts, extra time to respond are SLA strategies that transcend across all learning models (face-to-face, hybrid, or virtual). In many situations, the EL student's home language is not English, but the school's rich language environment increases development of skills. "The Spanish students in a Spanish home environment did not have where to learn more extensive ESL vocabulary as if they had been in a regular f2f environment," one teacher responded. During virtual instruction, with students learning

from home, and many not getting the amount of exposure to the language as they would have in person, the importance of SLA theories and strategies increased tenfold.

The researcher was able to capture the effects of digital application on the second language learner's motivation. The platform offered the necessary frequency and consistency of SLA comprehensible input and allowed students multiple methods for managing anxiety and bolstering self-confidence, to challenge themselves academically and learn from their mistakes. In this way, students were able to guide their own learning and track their progress, while instructors to provide targeted feedback to students (Housel & Oranjian, 2021). Teachers constructed lessons that offered multiple opportunities to respond by embedding digital organizers, open-ended questions with sentence stems, visual cues and prompts to connect and exchange ideas, develop vocabulary because they acknowledged the "importance of comprehensible input and lowering of affective filter" for EL students.

Multiple teacher responses indicated *scaffolding* was the most important strategy in virtual learning platforms. Due to remote learning, teacher modeling and scaffolding steps for tasks and instructional expectations were essential for students to stay focused. One staff response was, "With larger groups it was harder to get everyone on the same page…literally." The virtual platforms as tools using Krashen and Vygotsky's input and output opportunities and scaffolding skills to develop language proficiency support current literature, that educational technology offers alternative equitable digital options to build twenty-first century skills when lessons are founded on language learning theories.

Edtech Application Reference

“A tool is only as good as the hands that wield it”. Depending on the situation, including the intended lesson skills, goals, objectives, almost any platform is effective. When describing the educational technology platforms (Google Meets and Flipgrid), teachers expressed a clear understanding it would not solve all their problems. From the onset, the transition from face-to-face to virtual, and later a blend of the two was a series of epic disasters. Teachers expressed a need for consistency across disciplines, classes, and grade levels. With teachers at different levels of confidence, this affected the level of impact the tool had on instruction. Many suggested minimizing the different applications (third party) and providing ample time to practice and implement. Until finally, staff mastered the tools and identified how to assert the best features each offered to increase engagement, motivation, and language development.

Educators identified synchronous platforms like Google Meets for live communication and exchange, immediate feedback, active learning, listening and comprehension were the next best thing when physical, face-to-face instruction was not possible. Incorporating virtual field trips and interactive games made monotony of the screen time disappear. With polls, chat, and hand raising, discussions were taken to the next level.

On the other hand, asynchronous platforms such as Flipgrid for easy student products, forced interaction, eliminate pressures of English learners to produce immediately. When designed effectively, prompts targeted all four language domains simultaneously (listening, speaking, reading, writing). Some of the downsides were delayed feedback and a type of active learning at a passive pace. Important staff

comments were, “Flipgrid is a great way to foster and nurture language development”. “The shy introvert students who often get overshadowed by the outspoken students were able to blossom using Flipgrid (when no one was watching).” EL students can complete fluency drills and reflect on previous work through the tangible evidence on Flipgrid, thereby increase their self-confidence, spiraling previous skills and content. “They hear themselves speak and fix their spelling, pronunciation, tone, or accuracy,” a teacher explained.

Pedagogical Strategies

One of the more intriguing codes identified was the affect virtual learning environments had on pedagogical strategies. Teachers from the study were shell-shocked from having to implement necessary changes from teacher-centered approaches to learner-centered approaches. This was despite having previous professional development on flipped classroom models and inquiry-based instruction. Many teachers struggled with how teaching theories transcended across virtual settings. Teachers had difficulty in first visualizing what teaching was supposed to look like online. Then they had even more difficulty executing it effectively. It was after multiple sessions of professional development, training, and experience, teacher prowess became evident in how they approached teaching methods within the virtual format. Teachers identified how guided or whole group instruction was best met through Google Meets with infinite scaffolding. One teacher stated, “The *present* feature allowed me to show students’ academic videos just like if we were in the classroom.” They deciphered how to use partnering Google tools such as Docs, Sheets, and Slides within Meets to push students to work cooperatively and collaboratively, and increase interactions between teacher to student

and student to student. They also realized the possibilities of inquiry based, research, and reflective approaches when assigning independent work on Flipgrid. These strategies were already being implemented in face-to-face instructional settings, but teachers had difficulty performing their theories in virtual contexts. Some had dabbled in electronic assignments prior to the pandemic, but not to the extent they were now obligated to do, and many panicked at the mere thought. Those that finally discerned opportunities found other factors such as autonomy/control over learning and socio-technical environment restraints impeding their approaches.

Instructional Design Reference

Throughout the design-based research cycles, the researcher observed several references to the ID process. When designing the program, the need to modify class times was evident. The difficulty was adhering to the regulations required by the state and the realities of what was occurring in the virtual curriculum. The state made little acquiescence to the on-going crises in the lives of students and teachers, keeping curriculum requirements at all-time highs. This resulted in the pressure to produce and helter-skelter participation from students. Class times were increased and additional sessions were added to the school day, but ultimately did not garner much enthusiasm from the students who really needed the additional time. Teachers suggested future interventions should create scaffolded training cycles to model new platform integrations with third party applications into virtual platforms. “Too many resources [and strategies] were presented to us and were expected to be used,” a teacher commented. Some went unused or used ineffectively as a result.

Professional Development and Training Reference

A major code throughout the study was the need for more professional development and training time, to not only become accustomed to the platforms and the on-going changes, but also systematically identify and explore each strategy in depth. For educators, the overwhelming consensus was being bombarded with so much professional development and educational technology resources that it was impossible to do them justice. This is evident in the high number of district trainings made available for teachers, and those through the RSSP initiative (Author, 2021; Cicero). Many teachers selected both *too much* and *too little training*, and in the open-ended comments expressed a frustration at being unable to establish confidence among all the resources available. As for not having enough time to master, it wasn't for a lack of study. Teachers and staff participated in over 450 sessions of professional development and training on various platforms and virtual learning strategies to improve engagement. This does not include all the hours spent "off-the-clock", troubleshooting, learning through trial and error, and personal research. They complained of having to attend mandatory trainings that did not meet the individual needs of their technology proficiency and/or were specific to their understanding of bridging pedagogy to the virtual platforms. One response asked for trainings to offer examples of using the tools in action across grade levels and language proficiency standards. One exasperated teacher discussed the gap between theory and practical implementation.

> It's easier said than done. The tools they showed us looked great on paper, but in action not so much. Some teachers struggled with never having more than ten. Others struggled with a Google Meets full of over twenty kids. Microphones on

> and off, background distractions like dogs barking or dress code issues, or kids just leaving their cameras to show the ceiling fan. You name it we saw it. Like you try to do an effective lesson with an elephant in the room.

Autonomy/ Control over Learning

The pandemic altered teacher epistemology by forcing teachers to transition from teacher-centered to learner-centered instruction. Those that stubbornly resisted found themselves with limited engagement or control over student participation and influence on their performance. Even in the synchronous sessions, the student had to initiate participation by joining the virtual class. The presence of the teacher on camera does not have the same effects as it would in person. Many teachers voiced this as a major concern. For students who did not have parental support because their guardians work or are tending to multiple siblings, have language barriers, or lack the technology affluence to assist, the students had additional challenges to overcome. One interesting statement from a teacher was comparing the situation to a séance. The teacher used a virtual wheel of names to garner student interest and fairly provide opportunities to respond.

> When some students were called, it was like, 'Are you there Juan? Juan, can you hear me?' It was as if I was conducting a séance, trying to get my kids to participate sometimes. This is one of the downsides of virtual learning. Not being in close proximity with students. We lose control of key physical cues to get students back on task.

While this statement brings a chuckle, it clearly denotes the dissatisfaction of control over learning and limitations on the socio-technical environment. Classroom management took on a whole new meaning, and tools did not always provide the resources to support the

new normal. *Socio-technical environment restraints* and *pedagogical struggle* were identified as the most requested themes.

Socio-technical Environment Restraints

One of the largest factors identified within the teacher survey, DBR cycles, student products, and research observations, was the socio-technical environment restraints. Some of the prominent advantages of digital tool and virtual learning were unfelt due to these conditions. While the campus/district provided technical support over the phone, special hotlines, and in-person support, the constant updates, malfunctioning equipment, and other technical aspects of implementing a 1:1, virtual program overwhelmed the system. Logistically, providing technology devices for every single student, teacher, and staff, and keeping them in working order is daunting. Two elementary campuses share an information technology technician between them. In addition, while each school has two dedicated instructional technology teachers, they play other primary roles on campus as well. This proved to be a challenge as there were so many who suddenly needed support. The physical movement of electronic devices, in between diagnostics and repairs, not to mention the paperwork and scanning of each item inventoried, caused a toll on all personnel involved with the mobile learning devices.

Another related issue was regarding the inequitable internet connectivity. At the onset of the school year, district surveys were sent to parents to identify households without internet. Some parents misunderstood, believing the internet (hotspot) from their cellphones, served as internet for the household. Once parents realized this was insufficient data for schoolwork and live sessions, there was not enough MiFis to distribute. Then, once the campus had enough to distribute, it was identified the data

plans on the MiFis were inadequate. This caused frustration for all parties, with lagging videos, camera inoperability, and inability to attend all sessions or submit assignments. Students with limited data plans, especially households with multiple users hindering bandwidth, and rural students this not only posed as an inconvenience, but an additional challenge. While the district provided buses with Wi-Fi, students had to stay nearby (approximately a one-block radius). This resulted in students staying for one live session and mostly completing work asynchronously. To make matters worse, these rural locations often had unstable connectivity. Some comments from teachers include:

- "The network would often lose connection, as would students."
- "Connectivity was an issue with every program. Teachers and students needed additional time to address the prompt. Teachers and students were not aware of the settings and how to adjust them."
- "Connectivity issues, screening freezing, sound interference, lagging of videos or presentation."
- "Some parents did not know how to use Flipgrid, which prevented some student from participating and learning".
- "Some days, technology just does not work. There are often times when students have issues at home and I try to help them, which interrupts lesson delivery."

Another major concern focused on the lack of parental support. Some parents were unable or unwilling to assist their children because they had to work; they were too many siblings to be able to monitor them all simultaneously; they were dealing with other issues such as finances, illness, death in the family; they did not perceive the virtual

program as the same as they would have in a brick-and-mortar school (as a required priority). This is not to say there were no dedicated parents. On the contrary, throughout the DBR study, there were parents and grandparents who went above and beyond balancing home and work, health and education. There were parents who showed up to the campus as many as ten times in the year to interchange equipment, collect paper versions of assignments, and attend drive-by parades for incentives to support their child and make the best they could of the academic year. Unfortunately, collectively, this was not the reality for many students. Countless students were thrusted into roles they were unprepared for with undeveloped technical skills. Students had to suddenly not only formulate 21st century tech expertise, but also the maturity, and internal motivation for digital, long-distance education. Normally, this is a task reserved for older, returning students who may work full time and are motivated to take online courses (Moore, et. al., p. 17). One teacher summed up the situation,

> Being dependent on technology is always a risk. When network issues arise or the program fails, it is always a struggle. Some students had difficulty with the internet being stable. Others lacked the support at home to maneuver what they could not. Some students did not have the discipline to do work on their own asynchronously. Some didn't have anyone to push them to produce as they would at school.

Undoubtedly, teachers and students were dealing with all kinds of internal and external issues.

Pedagogical Struggles

The final factor identified was the on-going pedagogical struggles for teachers, moving from the majority of ingrained teacher centered processes towards learner-centered approaches more conducive to virtual learning environments. The quality of any education system regardless of the method (brick and mortar, hybrid, virtual) is dependent on the balance of appropriate teaching methods, qualified educators, tools and materials, assessment practices, and support (Moore, et. al., 2012). In the midst of the almost overnight transition from 100% in person to 100% virtual and a fluctuation of the two, it is no wonder there were difficulties. Whereas teachers had experience in tech-based tools, they did not have the urgency to adopt them with fidelity. Then when schools had to incorporate these very tools on a daily basis, many teachers were unqualified and the resulting growing pains were a natural byproduct.

Once they moved past the technical aspects of conducting virtual class, the teachers struggled with how to engage students. Activities sometimes took longer due to the technology. Teachers were working overtime to organize their Google Classrooms, Flipgrids, and decorate their Bitmoji Google Slides to help students look forward to lessons. Best practices and tasks were learned the hard way as it was challenging to get into depth on what options and features were available and what actually worked. One teacher stated, “Activities on third party applications were provided but not explained ahead of time.” One strategy that improved this problem was having teachers observe other teachers in action. During several sessions the researcher witnessed teachers learn about new updates to tools through teacher-to-teacher informal observations. They watched how the tool was utilized and were able to enhance their future sessions. It is

clear that all the while, teachers were juggling, strategizing to meet the demands and pressures from health authorities, state standards, their own morals, they remained committed to their students.

From Codes to Themes

After synthesizing codes from the data collection, codes were extended into themes to assist with interpretations of the contextual and pedagogical factors within the virtual learning experience in developing language proficiency (Saldana, 2013, p. 175). Saldana (2013) purports themes reflect what occurred and why, identifying underlying conditions, patterns of behavior, detailed descriptions within the surrounding organization and that manifested the phenomenon in question (Belotto, 2018, p. 2624-2626; Dey, 1993, p. 33; p. 176). Coding was concluded when the researcher arrived at theoretical saturation (Castleberry, et. al., 2018, p. 403). Themes were constructed as complete sentences that elaborate on the researchers' interpretations of the design-based research study based on logical connections between codes and conceptual frameworks (Dey, 1993, p. 54; Saldana, 2013, p. 181).

The researcher conducted an internal negotiation between the teacher and student intentions and motivations for their behavior, language development, and expectations within the DBR cycles (Dey, 1993, p. 38). This includes the overall process of changes over time, characteristics of interaction between circumstances of the pandemic, actions taken by all stakeholders, and consequences to the efficacy of the DBR cycles to enhance the sustainability of interventions (Dey, 1993, p. 38). The researcher was able to gain understanding of the interactive mobile technology on second language acquisition through first-person experiences and contexts to conceptualize the data (Castleberry &

Nolen, 2018, p. 401). Peel (2020) purports as long as the researcher is conscious of bias and conducts strategies to mitigate these effects such as triangulation and feedback from participants, the thematic approach merits an active role of the qualitative research (Peel, 2020, p. 3). Thematic analysis penetrates into the pedagogy and context of the DBR cycles and makes the transferability to theoretical frameworks possible. Critics argue that the researcher's role may impede results due to biases; however, Peel argues (2020), comprehensive descriptions with concrete examples, such as the observation journals, student products, and participant feedback from the DBR study act as a validity filter for acceptance of the findings. The reasoning being, "the recorded information was an accurate reflection of the reality that existed at that time" of the DBR cycle (Lochmiller, 2021; Peel, 2020, p. 294-295). In addition, the themes identified may act as rich descriptions for future researchers with a segue to assimilate between the a priori codes and specific theoretical frameworks (Lochmiller, 2021, p. 2031; Peel, 2020, p. 12).
The research questions were addressed through the thematic interpretations identified in the data.

Themes

1. Second language acquisition concepts and strategies are transferable to virtual platforms and may benefit all students.
2. Virtual platforms offer the opportunity for SLA development and SLA.
3. Instructional design should be at the forefront when establishing learning formats with ample time for concise pedagogy and educational technology integration via learning cycles and professional development training.

4. Professional development training should be provided by level of proficiency in educational technology.
5. Educational technology applications are often intended to target higher levels of integrational models than in actual practice.
6. Socio-technical environment restraints affect the effectiveness of the edtech tools and the pedagogical practices.
7. Autonomy/ control of learning changes with the type of educational technology, and each has its own specific socio-technical environment restraints.
8. Pedagogy is pedagogy, regardless of the teaching environment.
9. Good teaching strategies should transfer to virtual environments; however,
10. Socio-technical restraints impede common, traditional teaching strategies.

Design Based Research Intervention-ADIE

The COVID-19 pandemic was in full effect between July 2020 to May 2021. State and local agencies issued mask mandates, scaled back reopening of businesses, and held mass vaccine distribution drives as COVID-19 cases and hospitalizations fluctuated (Alvarado & Gross, 2020; Author, 2019). While virus cases reaching an all-time high between November 2020 and February 2021, the political battle of whether schools posed a high risk of spreading the virus continued (Alvarado & Gross, 2020; Author, 2019). In the education field, specifically the participating school district and campus, curriculum and instruction coordinators and instructional technologists scrambled to create standardized schedules, scope and sequence, and lesson templates for virtual environments. However, the Texas Education Agency expectations were fluid throughout the pandemic year, with ongoing changes to adapt to situational pressures from national

debates on how to mitigate the spread of the virus (Alvarado, et. al. 2020). These changes put stress from top to bottom, overwhelming those on the frontline-teachers and students (Alvarado, et. al. 2020). This phenomenon was evident throughout the design-based research intervention. Each cycle and the corresponding results are described below.

Cycle 1

Cycle 1 took place approximately between July through September 2020. During this time, the participating school district conducted one hundred thirty-five training sessions for teachers, librarians, instructional technologists, substitutes, instructional aides, and administration to improve the transition of virtual learning than the previous years' experience. The district also provided thirty trainings to parents and students to develop technology affluence. The culmination of which are both evident in the various technology hub websites the district arranged for each user: teacher, instructional tech, parent and student. Each is a one-stop shop for help with the facilitation of virtual instruction and support is just a click away. This background knowledge is important to note, because it provides the context for which the design-based research began.

Analysis. In the first stage, when the scope and sequence, daily schedules, and lesson plans were being outlined, it was clear the students would be lacking the traditional SLA opportunities that accompany the sociocultural aspect of school. After reviewing past and current literature on SLA and consultations with content experts from the bilingual department, the campus initiated a plan to conduct virtual interventions for students. This plan was founded on a pilot study from the previous year with small group pullouts. The feedback from the pilot study was considered for the next phase.

According to the initial district schedule, students were to be logged in to their device at 7:45 am for morning announcements and varying schedules by grade levels ensued. These guidelines were set based on state requirements for live, synchronous time and independent, asynchronous time. During each school day, 2nd and 3rd grade were scheduled to have a total of 150 intermittent synchronous minutes, in between a total of 180 asynchronous minutes (Author, 2020). 4th and 5th grade were scheduled to have a total of 180 intermittent synchronous minutes, in between a total of 210 asynchronous minutes (Author, 2020). All grade levels had the option for a 45 minute live physical education (PE), music, library, or counseling class. The students who were unable to attend would be able to view the recording for PE, and conduct activities for the other classes asynchronously. There was also an extra live tutorial hour for those students who qualified and accepted invitations to participate. All grade levels had a one-hour break for lunch and hygiene in the middle of the day, and a 45-minute break at dismissal time. Moreover, the design-based research study tasks were integrated within the regular school day in both live and independent sessions.

Design Plan. Intervention plans were based on required state standards, in conjunction with instructional minute guidelines. Curriculum specialists and teachers collaborated to develop scope and sequence outlines and lesson templates for virtual learning contexts. Within these lesson templates, specific lessons targeting the ELPS were embedded. Recommended tasks and platform procedures for both synchronous and asynchronous activities were provided. Furthermore, teacher and student equipment were disseminated to facilitate virtual learning for those that requested it. The school district purchased new touch-screen Chromebooks for second through fourth grade. However,

these devices were backordered; thankfully, there was enough existing inventory to provide a device for all students who requested.

Implementation. At the onset of the implementation phase, students who participated were provided with Chromebook. Approximately, 340 Chromebooks were issued throughout the course of the design-based research cycles. In addition, approximately 67 MiFis were distributed to students who qualified for internet assistance as per the district policy (oldest sibling in the family, no stable internet connection, and subject to availability-first come, first serve). This was in addition to school buses equipped with T-Mobile Wi-Fi available at certain neighborhoods from 7:00 am to 8:00 pm, Monday through Friday, and extended free Wi-Fi access in all campus parking lots.

Teachers provided whole and small group synchronous Google Meets to complete a variety of tasks throughout the school day. At this time, approximately between 6-8% of students were on-campus. This number would fluctuate based on the number of quarantines following district-required procedures. The rest of the student population attended sessions from home, parent workplace, daycare, or other location outside of the school building. A limit of ten students to a classroom was part of the district procedures. Regardless of the modality, all students were required to login to the Chromebook or a personal device with internet to access lessons. Teachers were on 3-week rotation cycles with a minimum of one teacher on campus for three weeks. Depending on the number of students on campus, the teachers rotated and instructed from home.

Teachers also established asynchronous tasks on Flipgrid as aligned to the suggested guidelines and templates to format ELPS skills. Between three to five, researcher observations were conducted per week of instructional days during this cycle

totaling to 20 observations. While the cycle itself was three months, only 28 were school days with student instruction taking place.

Evaluation. In reflecting on this cycle, the major issues affecting intervention success were technology support and internet problems. Being that it was the first months of school, the parents, students, and teachers faced challenges in establishing their virtual classroom procedures and beginning instructional tasks. Equipment distribution for 2nd-5th grade students was scheduled for three consecutive days. Nevertheless, some parents were unable to attend due to quarantine. As a result, the distribution of devices lasted throughout August into September with parents driving up to school whenever they could. The first three weeks, the researcher, teachers, and staff were primarily providing tech support via phone calls or school message system helping parents and students troubleshoot devices or provide more in-depth instructions on how to navigate virtual learning platforms. Many lessons were cut short and teachers could be seen working tirelessly at all hours to make contact with lost students and parents. Within the first two weeks, it became clear the MiFi data restrictions of 2 GB was insufficient to provide internet access for a household of two or more siblings. It was also identified that several school buses with WiFi had internet issues, especially in rural areas with limited cellular service. To mitigate these issues, the campus provided two devices for multiple siblings, and the school district began the process to purchase additional buses and add several service providers (Verizon, Spectrum) to increase internet accessibility. Device exchange occurred throughout the month as students and parents settled into the new normal.

Synchronous Sessions through Google Meets. Students were noticeably distracted at home, and many were not visible as their cameras remained off for the

duration of class. Several sessions had issues with audio not working properly on the student side and glitches with internet connectivity and links not opening. Many teachers consistently had to troubleshoot repeatedly during sessions delving into instructional time and impeding lesson efficacy. Moreover, students quickly grasped the chat feature and displayed a preference to participate this way. At several sessions, the chat became a distraction and teacher frustrations ensued a need to control the facilitation. Also, the microphone button on the bottom of the Google Meets platform with the *hang up* button right next to it would prove an issue. Multiple users would accidentally exit the session and have to reenter. For teachers this proved an additional stress because they would lose moderator rights to the recording and limited controls at the time. Teacher recordings of the lessons were essential to post for students unable to attend live sessions. Feedback from teachers indicated they were searching for tools to capture student progress and participation for accountability. Some students would participate orally, others only through chat, and others not at all, making language proficiency analysis difficult. Towards the last days of cycle 1, new features were pushed out including automatic attendance reports with time stamps for groups with five or more and improvements to background blur. This would help with facilitation of live classes by taking automatic attendance and determining student duration for class. In addition, the blur feature assisted in removing distractions at home and provided an alternative to keeping cameras off.

Asynchronous Sessions through Flipgrid. For asynchronous Flipgrid activities, it was difficult to track the count of student responses within each specific cycle. The program provides data only of the total responses and the date of the last response.

Moreover, students were posting even after due dates so even though assignments were available within the first cycle dates, some posted during other cycles. However, 16 tasks were posted in the first cycle. ELPS score analysis on Flipgrid revealed a clear need for teachers to provide examples and feedback to explain the rubric for different language proficiency scores. Most student responses were superficial and lacked depth to answer questions despite scaffolded tasks such as sentence stems and video prompts. Students liked the filters and stickers on Flipgrid to embellish their video, and demonstrated an affluence for the platform features. However, the content and language development using the tool was not evident beyond *beginner* or *intermediate* scores.

Observations demonstrated a recurring code of socio-technical restraints and pedagogical struggles. Teacher, student, and parent frustrations were evident throughout the first cycle. Glitches with device software, internet connectivity, and how to utilize basic programs proved the majority of issues. Teachers spent an overwhelming amount of time as technical support resulting in limited instructional time. Multiple observations indicated issues with students turning on cameras. District coordinators identified cameras on during live sessions as a best practice for virtual learning. This would allow the teacher to visualize facial cues and determine if the student is on task. Teachers would redirect students who did not have the camera on, but many ignored the requests and teachers continued with the lessons. Another observation included assignments submitted at *odd* hours, with many submitting long after the 'normal' 3 pm school day ended.

Cycle 2

Cycle 2 occurred approximately between October 2020 to January 2021. The participating campus reflected on the shortcomings of the design-based research cycles

and influenced on pressure from the school district to improve, initiated additional measures and procedures in the next phase.

Analysis. The school district continued with sixty professional development training sessions for teachers, librarians, instructional technologists, substitutes, instructional aides, and administration to improve the implementation of virtual learning and regulate platform updates. In addition, with state government funds through the Resilient Schools Support Program (RSSP), the district purchased professional development consultations with Ed Direction by Cicero, the technical assistance organization selected by TEA (Author, 2021; Cicero). Beginning around December 2020, the consultations provided coaching, professional learning, and performance assessment analysis specifically tailored for the district population to evaluate effectiveness of remote learning models and support improvements (Author, 2021; Cicero). The partnership resulted in the creation of a virtual instruction best practice guide website with tools and resources for teachers and coaches. Strategies include reflection templates, maps to establish relationships with students online, increasing engagement, social-emotional support, and much more (Author, 2021; Cicero). The teachers were to incorporate these strategies and provide feedback into their weekly professional learning communities (PLCs) and grade level meetings.

Moreover, with over eighty presentations, videos, documents and other resources, the RSSP website clearly offers a plethora of resources for teachers to improve virtual learning environments and subsequent instructional strategies. According to Ed Direction data, there was an overall 23% increase in proficiency (in teacher virtual learning strategies and student work submission) from December 2020 to April 2021 in the entire

school district after over two hundred modules disseminated. However, information is not readily available for what assessments Ed Direction utilized to measure this success. This information is included only to provide contextual factors surrounding the design-based research study, so exploring this data further was not necessary. Furthermore, while the type of SLA opportunities remained the same, additional strategies were incorporated as new features and upgrades were added to platforms, and observations and feedback from cycle 1 were considered.

Design Plan. The ELPS tasks developed were maintained in format with integrated activities to target SLA skills. However, additional platform procedures were offered for Google Meets when the breakout rooms option became readily available on multiple devices and users. Teachers utilized breakout rooms to help facilitate class discussions for smaller groups. The rooms would improve with the weeks progressing adding a *clock* for timekeeping, a *help* button to notify the teacher, and automatic option to return to main call. The upgrade to a virtual *hand raise* option also launched during this time. These improvements were incorporated into the SLA tasks for teachers to use as strategies for input and output.

Implementation. The new breakout rooms and corresponding features allowed shy students to participate in a lower-affective filter setting, and decrease distractions overall. Teachers also often created individual breakout rooms for each student for online assessments. In isolating students, the teacher minimized interruptions and maximized individual sessions.

Cycle 2 consisted of 69 instructional days in which 35 observations were conducted. Additional mass Chromebook device distribution/exchanges were completed

to upgrade 2nd-4th student devices in two days. In addition, exchanges were completed throughout the months as parents struggled to find an opportunity to visit the school. Furthermore, additional MiFi units were issued to qualifying students and upgraded for others through state grant funds. These units contained unlimited data plans, and with school buses with additional WIFI service providers, internet connectivity overall improved for participants. At this time, there were between 10-12% of students on campus. However, due to COVID-19 upticks within the local community a two-week period of virtual only instruction ensued. During this period, the campus participated in an asynchronous day, as part of a state approved waiver the school district opted in.

Evaluation. In reflecting on this portion of cycle 2, the major issues affecting intervention success was engagement. Students had already become accustomed to the routines of virtual learning. However, distractions at home and cameras remaining on continued to be an issue. While there were still technical support issues, improvements and upgrades to platforms assisted in the facilitation of more effective instruction. The student motivation and participation however, was lacking. The social aspects of school such as recess, lunch, and comradery were noticeably missing from virtual learning, despite the multiple opportunities to discuss and build relationships.

Synchronous Sessions through Google Meets. At this point, a clear distinction between students who were engaged consistently participated and language skill development was evident. Teachers had determined the same students who were not participating in live sessions, were collectively not submitting assignments with fidelity. Nonetheless, those that did attend displayed consistently improved skills. Features that improved the Google Meets experience tremendously were the breakout rooms with

timer, hand raise button, quick access controls, troubleshooting and performance indicators, and background replacement options. Teachers now had the options to control the virtual classroom setting similarly to face-to-face by closing the chat, forcing students to knock when joining, and discussing in small groups or providing smaller testing sessions within the same Meets. In addition, the built-in technical support the platform provided now offered different options for streaming to improve communication, provided real-time CPU data on usage and performance, and internet connectivity speeds. This assisted in taking some of the load off teachers who were able to focus on instruction.

Asynchronous Sessions through Flipgrid. For asynchronous Flipgrid activities, students continued to post after due dates. Thirty-nine tasks were posted in the second cycle. ELPS score analysis on Flipgrid demonstrated students increase of language skill development. Several shy students who would remain silent, kept their cameras off, or only participated in the chat for Google Meets had Flipgrid submissions that exhibited their skills. Many used the blur feature or enlarged emoji stickers to hide their face during the videos. Students who were more confident benefited from the updated options including the whiteboard, screen recorder and 10-minute time limit increase. During several observations of students completing these tasks (physically in-person students), the immersive reader option was utilized. Students who had reading difficulties, dyslexia, or were recent immigrants and English learners benefited from the prompts being read to them. In this phase, the content and language development using the Flipgrid platform was showing a wider range of student products between *beginner* and *advanced* scores. It

is noted, some of the *beginner* scores were the result of technical glitches such as limited connectivity and videos not uploaded or processed correctly.

Observations demonstrated recurring codes of *socio-technical restraints* and *pedagogical struggles*. At this time, the majority of participants demonstrated affluence in maneuvering instructional programs. However, several students were collectively failing to appear to live sessions. After receiving parent phone calls, more logged in, but remained with their camera and microphone off for the duration of the live session. Teachers began to complain of a lack of engagement, and stakeholders held refresher sessions to remind them of the plethora of resources to promote student participation and engagement. In addition, teachers were instructed to increase live sessions and keep students logged in. The reasoning being they were more likely to rejoin if they remained *on*.

Another observational code was regarding *autonomy/control over learning*. Teachers were limited in how the virtual platforms facilitated instruction. They were dependent on what features and tools were available. For example, many teachers requested the ability to mute all students during a synchronous session. This was not available at the time. These constraints hindered the teacher's ability to control the learning and affect the socio-technical environment.

Cycle 3

Cycle 3 took place approximately between February to May 2021. During this time a total of 60 training sessions for teachers, librarians, instructional technologists, substitutes, instructional aides, and administration were conducted to improve the implementation of virtual learning and synchronize platform updates.

Analysis. The participating campus conducted a final reflection on the shortcomings of the design-based research cycles and with continued pressure to improve, altered procedures in the last phase. The ELPS tasks developed were sustained in format with integrated SLA activities. However, additional virtual platform procedures were offered for Google Meets and Flipgrid. Google Meets added the background blur and virtual replacement feature for all users. Flipgrid added screen recording and audio (voiceover) only options to its platform. These improvements were incorporated into the SLA tasks for teachers to use as strategies for input and output.

Design Plan. The ELPS tasks developed were maintained in format with integrated activities to target SLA skills. Enhanced platform tools were offered for Google Meets when the *mute all, end for all,* and *scheduled break out room* options became readily available across all devices and users. These improvements were incorporated into the SLA tasks for teachers to enhance facilitation of discussions during live sessions.

The Google Meets noise cancellation and background replacement tools improved synchronous activities by minimizing distractions and offering virtual students alternatives to staying muted or keeping their camera off. Flipgrid added more third-party application integrations in the disco library, which offers teachers numerous templates and topic prompts to diversify activities. Adding more multidisciplinary tasks with prompts that are relatable to students while targeting their SLA input and output skills helped promote responses.

Implementation. Cycle 3 consisted of seventy-seven school days. However, intermittent state testing windows including TELPAS and STAAR resulted in only 45

observations. During this period, Winter Storm Uri caused three days of school closures, and affected many teachers and students' lives for over a week with limited power, internet connectivity, and food shortages. In addition, the school district participated in two asynchronous days as part of a state opt-in program. Similarly, a sudden change in state requirements altered fund reimbursement to be based on the face-to face student percentage in the October snapshot (10% for participating district). In an effort to meet these expectations and obtain funding, the district created an accelerated instruction plan to target students with truancy issues or failing/borderline grades. The plan was designed to proactively prevent student retention or attendance of summer school for necessary credit recovery. While this plan did not directly affect the design-based research study cycles, it increased student on campus presence to a total of 28%. Additionally, a portion of these students were part of an accelerated instruction plan and participated in strictly face-to-face instruction, in which the teacher would not conduct synchronous virtual meetings, but instead use the whiteboard or document camera to instruct. Students still completed assignments virtually via Flipgrid and Google Classroom. The rest of the teacher's students were regrouped to other teachers within the grade level. Finally, at the conclusion of the study, device pick up for Chromebooks and MiFi's consisted of 4 days for 2nd-4th grade students. Fifth graders were to keep their device for when they return to middle school in the following school year.

Evaluation. Reflecting on this phase of cycle 3, the significant concerns affecting intervention success was how to sustain student engagement and provide effective use of technology via platforms. Technical support issues had hit a plateau, with continued improvements and upgrades to platforms. The facilitation of more effective instruction

enabled teachers to focus on enhancing lessons to integrate third-party integrations within platforms. Some of these tasks were intended to target the lost social aspects of school and provide more choices and options for students to build relationships. One key component was teachers no longer kept Google Meets live session open at all times. Instead, teachers invited students to attend optional power hour sessions, similar to office hours, to target specific skills by spiraling topics or reteaching by request. These purposeful sessions would prove more effective than everyone staying *on* in a live session.

Synchronous Sessions through Google Meets. At this final cycle, students who were engaged and consistently participated in various activities in which language skill development was evident. Teachers utilized new *polls* and *Q&A* tools in additional to the chat to keep students engaged and interchange feedback. They had students present their screens and pinning feature to display student work. Students were experts at changing their backgrounds, sometimes to the point where it would become a distraction. Teachers provided links to third party applications such as Google Forms, Kahoot, Flocabulary, Nearpod, and Read and Write Chrome extensions to obtain informal assessments, conduct group work in real-time, and maintain sustainability of learning.

Asynchronous Sessions through Flipgrid. Thirty-two tasks were posted in the last cycle for the asynchronous Flipgrid activities. It was noticed students continued to post after due dates. In addition, certain topics had more student submissions. Topics with a video scaffolding the prompt versus topics with a text prompt or picture only had more responses. ELPS score analysis on Flipgrid demonstrated students increase of language skill development. Several student videos had comments or student responses via video

format. Many had multiple view counts in which it was evident students were interested in seeing their product. In doing so, reflecting on their submission and learning how to improve future submissions. In this final phase, the content and language development using the Flipgrid platform was showing scores between *beginner* and *advanced high* scores. Similar to the previous cycle, some of the *beginner* scores were due to technical glitches where limited connectivity prevented videos from loading or processing correctly.

Observations demonstrated continued recurring codes of *socio-technical restraints* and *autonomy/control over learning*. Updates to virtual platforms allowed teachers with new abilities to better facilitate instructional. While, troubleshooting overall diminished, towards the end of the study, as students were asked to submit electronic devices, issues emerged. Numerous devices were submitted broken, incomplete, and lacking a charger. Several were not submitted at all, and following recommendations, it became necessary to develop additional policies and protocols for device collection, including fees for damaged devices and lost accessories, and measures for unreturned items. This meant the establishment of documentation, lists, and additional practices to shut down unreturned equipment, attempts to retrieve items through the campus' truancy officer and police officer, and account them as lost devices. Approximately, 12 items were not returned and the campus would have to compensate for them with school funds.

Nonetheless, a new code of *pedagogical strategies* versus *pedagogical struggles* emerged. At this phase, teachers were finally in sync to follow the design plan and implementation through their synchronous and asynchronous sessions. Teachers demonstrated mastery in integrating various SLA strategies and highlighting educational

technology advantages within their lessons. This is not to say there were never any effective lessons prior to this cycle. However, holistically, the interventions displayed such improvements, by the increase of student products and participation, the depth and complexity of those products and language proficiency demonstrated during live sessions.

TELPAS Scores

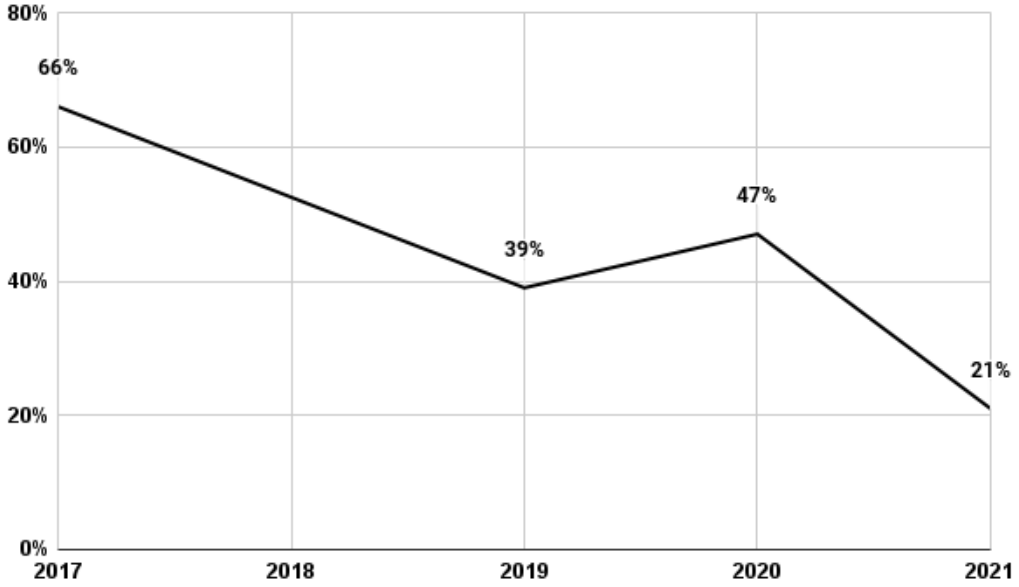
Observations based on campus overall TELPAS scores from baseline year 2016 to 2021 depict the fluctuation in English language proficiency status (ELP) according to state standards (Anonymous, 2021; TEA, 2020). Figures 21 through 23 display trends indicating the effect from the 2018 TELPAS assessment changes denoted in the sudden dip in scores, and the most recent decrease due to the pandemic.

While there is still a limited amount of data within a multiple-faceted field, there is enough available to construct assumptions on this matter. It has been concluded the format change from teacher holistic observation within the *listening* and *speaking* domains to online testing played a large factor in the decrease of scores. Students who were unfamiliar with the task of answering questions utilizing a speaker-headphone set combination, had difficulty responding to demonstrate their true abilities in English proficiency, especially in the listening and speaking modalities. In 2019, the Texas Education Agency had the passing standard at 42%; however, after several school districts appealed the standard due to the modification of format, the standard was amended and reduced to 36% passing rate (TEA, 2019). In the following excerpt from the TELPAS Validity Evidence Based on the Consequences of Testing (Proficiency-Level Trends) report, TEA describes this phenomenon:

In 2018, the reading test was redesigned and the listening and speaking tests changed from a holistic rating to an online test. The composite rating was also changed in 2018, moving to an equally weighted calculation instead of having higher weights for reading and writing. With these changes the percentage of students at higher TELPAS proficiency levels decreased in 2018, most notably for the listening and speaking tests. This also affected the TELPAS composite rating. (TEA, 2019, p. 1).

Figure 21

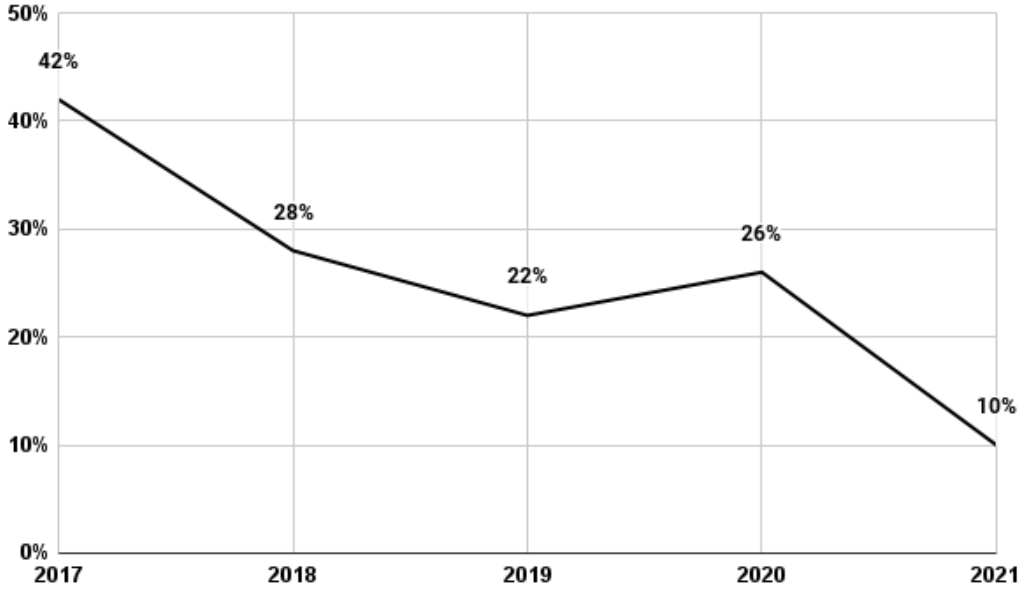
TELPAS Campus English Language Proficiency Scores. 1 Level Progression



Note. No data available for 2018 due to changes in the assessment (Anonymous, 2021).

Figure 22

TELPAS Advanced High Rating Percentages

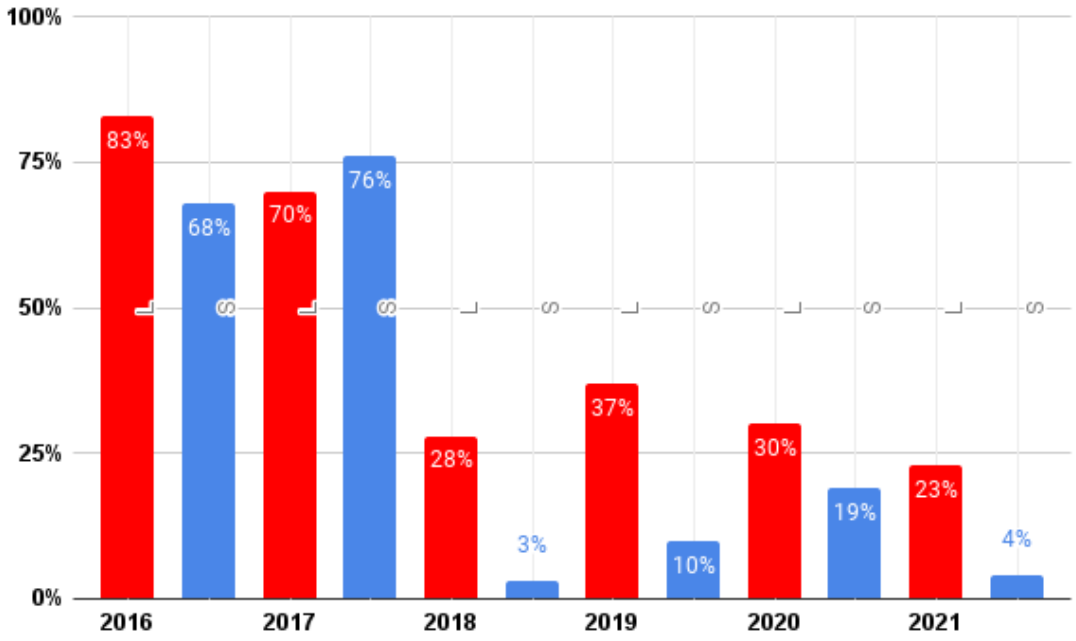


Note. (Anonymous, 2021).

In 2019, the campus began piloting the IMT interventions and the scores indicated positive trends towards language development as students increased confidence in utilizing recording tools such as Flipgrid, Google Slides, and Screencastify, specifically for the *listening* and *speaking* domains. However, when implementing 100% in virtual contexts and learning models during the pandemic, there was a decrease in overall progression, though more so in the *speaking* domain.

Figure 23

TELPAS 2nd-5th Listening and Speaking Advanced High Rating Percentages



Note. (Anonymous, 2021).

With no control group that did not participate in any instruction, it is difficult to theorize on what the outcomes might have been if there had been no interventions at all. Would students have scored the same? Or lower? Much current literature is focused on learning loss due to the pandemic as preliminary data demonstrates an overall decrease of academic development as compared to pre-pandemic years (Engzell, Frey, & Verhagen, 2021; Kaffenberger, 2021; TEA, 2021). Nonetheless, it is observed that although students undoubtedly spent more time in virtual contexts and were participating in activities that could have enhanced or at least maintained their language development in online formats, it was not reflected in the TELPAS assessments. It is important to note, these assessments were required to be administered on campus, and with the on-going social-emotional and health concerns, students may not have performed at peak levels. The majority of

students tested in small groups with multiple CDC guidelines and health precautions, including allowing the students to be physically picked up as soon as the test was completed. This could also be a factor is students feeling motivated to finish the test and not necessarily putting their best effort. Moreover, despite these results, utilizing the tools within in-person learning contexts can help reduce learning loss effects through the creation of short remediation cycles that follow the DBR approach, which are specific to the students' language development level. Additionally, establishing more long-term implementation plans for continued development to build on what skills students did master using the IMT tools and continue the progress that was being made pre-pandemic (Kaffenberger, 2021; TEA, 2021).

The results are further addressed by research question below.

Research Question 1

During virtual learning, how can educational technology (screencasting/ video conferencing platforms) support English language acquisition using the Vygotsky social constructivist and Krashen model of comprehensible input (O'Rourke & Stickler, 2017; Sanz, Levy, Blin, & Barr, 2016; Gallagher & Fazio, 2019; Wu, Hsieh, & Yang, 2017)?

The design-based research study identified how the Vygotsky social constructivist and Krashen model of comprehensible input allowed the educational technology, specifically screencasting/ video conferencing platforms, such as Google Meets and Flipgrid, to support English language development. Through the systematic instructional design approach of this DBR program, these models provided authentic and practical guidelines for instruction with clear expectations and goals. As it is, the various socio-technical difficulties within the study impeded lesson effectiveness. Without these

models as a framework to revert to, teachers would have had a haphazard adoption of tools and missed opportunities to maximize instructional practices. Instead, since the teachers were already familiar with the SLA frameworks, the transition to virtual contexts was easier. However, not all aspects of Krashen and Vygotsky's language learning theories proved as effective in virtual contexts when compared to in-person learning.

Research Question 1A

How do the Vygotsky social constructivist and Krashen model of comprehensible input theoretical frameworks support instructional design for English learners?

The Vygotsky social constructivist and Krashen model of comprehensible input theoretical frameworks support instructional designers to establish pedagogical protocols and materials to optimize second language development, especially in virtual settings. In this design-based research study, the frameworks provided guidelines for how to incorporate activities that were challenging enough to engage students, but not arduous to overwhelm. Teachers and technology tools focused on supporting the individual English learner's language development to achieve their next level, allowing for a more personalized experience. In the study, the models testified how second language acquisition concepts and strategies were transferable to virtual platforms and may benefit all students. Observations identified the extra time, repetition, and opportunities for reflection via divergent tech tools provided the infrastructure to scaffold at the comprehensible input level for English learners to acquire new language skills by making connections to prior knowledge. For example, over twenty-five observations identified extra time, repetition, and opportunities for reflection in synchronous classes in which the teacher provided students with an inquiry prompt, exit ticket question, or open-ended

discussion post. These students were observed to have provided improved formulated responses due to the Krashen and Vygotsky theoretical frameworks put into practice. In addition, based on the teacher survey responses, students' motivation was increased, while their affective filter was decreased, allowing the second language development to be demonstrated.

The study identified how virtual platforms overall offer the opportunity for SLA; however, it is important to note these platform interventions were designed based on the foundational theoretical frameworks of Vygotsky and Krashen. Therefore, it is logical to consider their direct effect on instructional design. For this reason, the second language acquisition concepts and strategies were not only transferable to virtual platforms, but they benefitted all student language development, regardless of language proficiency.

Nonetheless, the data demonstrated how Stephen Krashen's and Lev Vygotsky's language learning theories should be modified to adapt to virtual contexts. Krashen argues key elements for language learning to occur including motivation, confidence, low affective filter, and sociability (Krashen, 2008; Lai, et.al, 2019). Vygotsky claims language learning occurs through socialization and mental internalization (Castrillon, 2017). The study identified virtual learning models may provide a platform to foster language development through these learning theories, however, not all elements are practically obtainable in all modes. In fact, depending on the mode (synchronous or asynchronous), there were specific principles of each theory that were inapplicable. For example, the scaffolding and zone of proximal development strategies that promote increased confidence and mental internalization were the portion of the theories that worked effectively. Most observations and teacher survey responses indicated a dire need

to differentiate for students, especially in synchronous activities. Use of various multimedia and visuals, including instructional videos, audio links, and graphic organizers was seen in observational walk throughs. These strategies would provide the best alternative within the virtual contexts due to the lack of physical materials.

However, as the synchronous modes had limitations on how students could demonstrate engagement and participate consistently. For example, only one speaker is able to be heard efficiently without sound feedback, and the rest on mute in order to hear effectively, dependence on camera on, chat sometimes off topic, etc. As such, several Krashen and Vygotsky strategies were rendered useless at times, with a hit or miss effect. The observations revealed increased language development among virtual classes that had established procedures and protocols for discussions, in which the teacher provided rubrics and sentence stems for differentiation and accountability. In addition, those that utilized the features and tools of the platform effectively, such as the chat, screen share, breakout rooms, etc., saw the most meaningful conversations. For instance, the affective filter having a large effect on student engagement through fluctuating motivation, anxiety levels, and physical isolation. Also, the limitations on activities to address multiple intelligences and learning styles as virtual was the only method available. Students who would prefer to utilize hands-on activities often did not have the resources to retrieve materials in print or purchase items. Nonetheless, videos and virtual simulations offered an alternative amidst the circumstances, the DBR study demonstrated it is an effective tool when utilized within an array of other tools. Finally, the physical, socio-cultural limitations such as some students not attending live sessions, passive engagement, limited monitoring during sessions due to cameras off or internet instability, and overall lack of

exposure to different interactions and situations that otherwise would have occurred at school, did not reinforce natural language development.

On the other hand, for the asynchronous activities, the affective filter was much lower. Effective use of multimedia and visuals including graphic organizers were seen in observational walk-throughs of the asynchronous assignments and student products submitted. These resources allowed students the foundation to formulate their responses. As students were submitting videos on Flipgrid, their confidence in the knowledge of not having anyone immediately pressure them for a response was evident. Over thirty observations identified many students had submitted more than one entry to multiple prompts. Several shy students had alternatives to hide their face and these options allowed students to express themselves with detail.

Nonetheless, the limited error correction also had its negative side. Inconsistent feedback due to time restraints and numerous responses left many students without purposeful critiques on how to improve their responses or products. Based on student response observations and teacher survey feedback, those students who commented and reviewed their posts and the posts of others maximized the potential of the Krashen and Vygotsky theoretical frameworks by engaging in the language development process naturally. Moreover, those teachers which set specific guidelines for reviewing, commenting/replying to posts, and consistently reinforced these expectations had the most language development observed.

Research Question 1B

How do the Vygotsky social constructivist and Krashen model of comprehensible input theoretical frameworks work in the virtual learning implementation context?

Specifically for the virtual learning implementation context, the Vygotsky social constructivist and Krashen model of comprehensible input theoretical frameworks support instructional designers to create and utilize sound pedagogical conventions, exercises, and tools to maximize second language development. For example, the Meets program helped student develop language skills synchronously by using extra time, repetition, and various input and output opportunities. The use of features including chat, comments, breakout rooms facilitated the development of SLA because of their practices through the lens of the Vygotsky and Krashen models. Third-party integrations such as Nearpod and Google Slides offered interactive visualizations, cooperative learning possibilities, and Google Forms, Kahoot, and Quizizz provided flexible assessment options. Additionally, Flipgrid asynchronously offered the opportunity for reflection with special features such as an audio-video prompts, digital whiteboard, immersive reader, blur, and stickers, to lower anxiety levels, and allow English learners to scaffold at their zone of proximal development level to acquire new language skills by building on background knowledge. Furthermore, options to provide teacher feedback to students remotely were endless. Similar to Istenic (2021), video feedback was more personal, while text-based feedback was more convenient (p. 119).

Nevertheless, the virtual context affected certain elements of Krashen and Vygotsky theoretical frameworks such as fluctuating student motivations, affective filters, and sociability opportunities, and accountability for mental internalization

(Castrillon, 2017; Krashen, 2008; Lai, et.al, 2019). Depending on the modality, there were both advantages and disadvantages towards portions of the theories as described in RQ1A. The process of animating the Krashen and Vygotsky theoretical frameworks into virtual contexts identified the need to target desired objectives for specific modalities: synchronous and asynchronous. However, in both forms, having a repertoire of strategies and tools increases the potential for language development, as was observed in student participation, and noted in the survey responses. Based on observations and teacher survey data, the teachers who remained stagnant in their teaching methods (i.e., Google Slides and videos) saw less engagement over time, resulting in lower attendance, cameras off, and decreased language development. In contrast, the instructors who diversified their educational tools and strategies (i.e., Kahoot, breakout rooms, Nearpod, Flipgrid scavenger hunts, etc.) saw more consistent engagement and attendance, cameras on, and increased language development.

Research Question 2

What implications do preferred options and features of screencasting and video conferencing software mean towards different types of interaction platforms (synchronous vs. asynchronous) (Kear, Chetwynd, Williams, & Donelan, 2012; O'Rourke & Stickler, 2017; Sanz, et. al., 2016)?

Observations and results indicated clear preferences towards features and tools that matched student needs, objectives, and skills. In this sense, the predilections depended on the selected platform, student abilities, and socio-technical restraints of that time. For asynchronous platforms such as the Flipgrid program, the preferred tools allowed the user multiple options to submit student products via screensharing, audio,

and video, offer customizations such as backgrounds or embellishments. Given the asynchronous nature of activities is done at students' chosen time, the flexibility for notifications and data collection including date/time stamps is beneficial for teachers. The platform that has high compatibility and integration to other platforms (app-smash), provides teachers with customization settings, templates, and assessment reports, and offers technical support were top requested features (Figure 24 provides an overview).

For synchronous platforms such as Google Meets having program tools such as chat, screenshare recording, and digital rooms were the preferred features. In addition, several options related to virtual classroom management including automatic mute/unmute or mute lock, virtual hand raising, and limitations on screen share were demanded by teachers to facilitate lessons. Finally, user tech support for connectivity and data collection such as attendance were also features requested and favored by users (Figure 25 demonstrates a summary).

Specifically for language development, teachers utilized breakout rooms to help facilitate class discussions for smaller groups. An integrated *clock* for timekeeping, a *hand raise* and *help* button to notify the teacher, and automatic options to return to main call launched later were improvements that allowed shy students to participate in a lower-affective filter setting, and decrease distractions overall. Teachers also often created individual breakout rooms for each student for online assessments. By isolating students, the teacher was able to minimize interruptions and students was able to quietly raise their virtual hand for assistance. In addition, the *mute all* feature improved the flow of class discussions as well by eliminating the sound feedback when multiple microphones stayed on.

Figure 24

Best Options and Features for Flipgrid

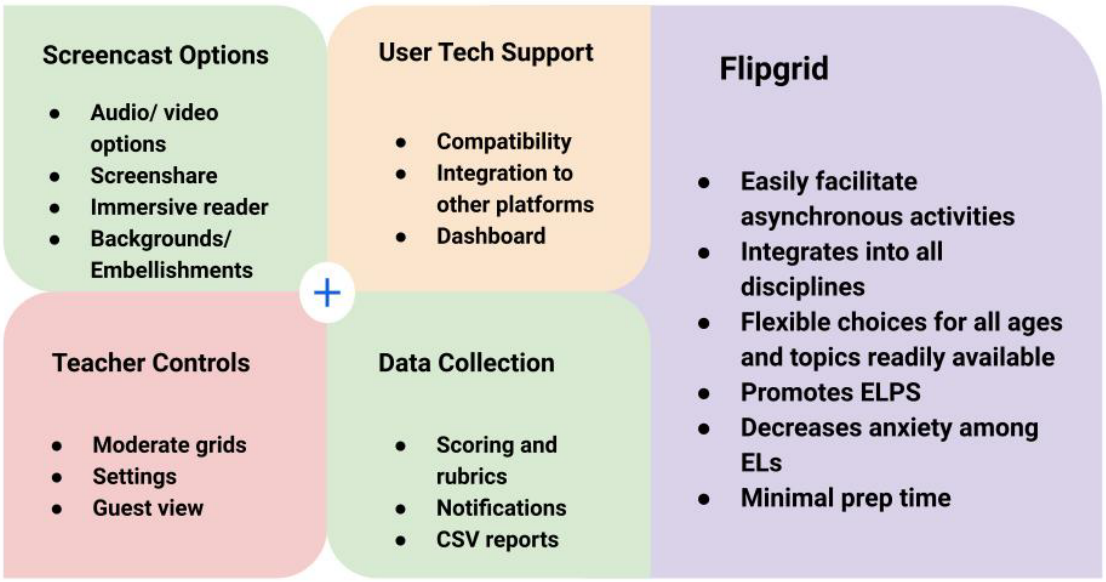
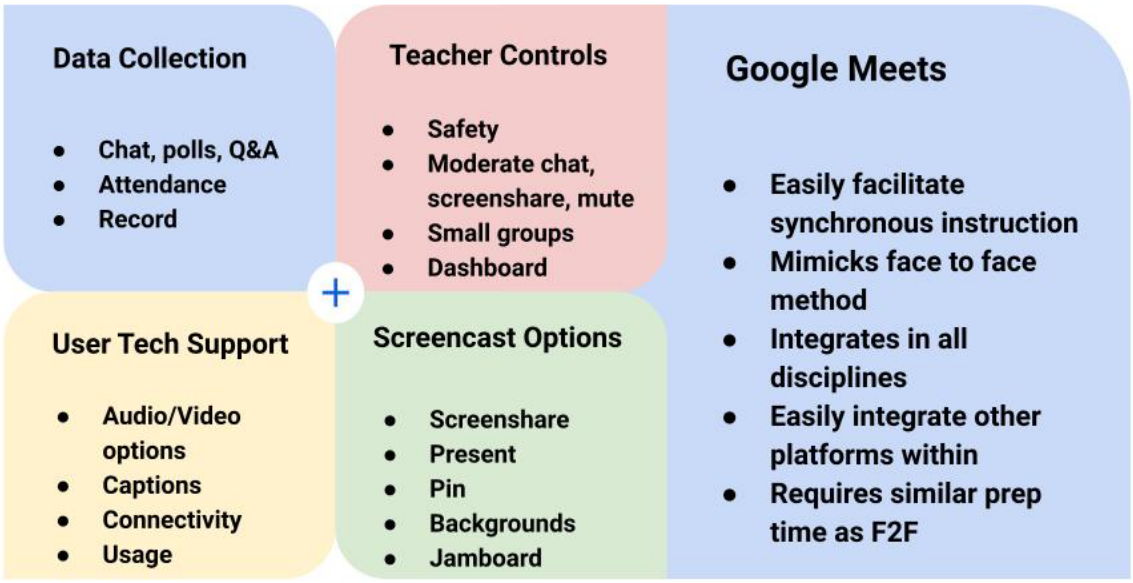


Figure 25

Best Options and Features for Google Meets



Research Question 3

What are some of the challenges, limitations, and advantages of different types of interaction platforms (synchronous and asynchronous) after practical application (Satar, et. al., 2008; Smith, et. al., 2003)?

After practical application, some of the challenges and limitations to synchronous platforms are centered on virtual classroom management (chat and screen lock, mute controls, monitoring of breakout rooms, etc.). Initially, platform features were limited and conditions unfeasible for a K-5 virtual classroom meeting. As the year progressed, more features were added to mitigate these challenges, but teachers still felt there is room for improvement. Furthermore, shortfalls of asynchronous platforms indicate issues related to limitations on building relationships with students and time between feedback, if any at all. Asynchronous programs bestow more responsibility on the student to initiate contact. Then, on the teacher side of things, additional time is needed to review submitted student products. This reflects the importance of established protocols for asynchronous assignments (Beldarrain, 2006; Satar, et. al., 2008; Wang, 2004). While most issues with connectivity could not be immediately solved, challenges will continue with virtual contexts restricted to bandwidth limitations, but platforms are making great strides toward improvements specified by educators.

Moreover, benefits of synchronous platforms correspond to previous studies including the simulation of brick-and-mortar instruction, immediate feedback, and multiple formats to communicate and assess knowledge (Beldarrain, 2006; Satar, et. al., 2008; Wang, 2004). In addition, the self-paced component of asynchronous platforms is an advantage for English learners who benefit from opportunities for deeper reflection

and critical thinking through the flexibility of the response time, besides the various options to submit products to gauge learning (Beldarrain, 2006; Cummins, et. al., 2016; Oztok, et. al., 2003; Smith, et. al., 2003).

Of the two platforms utilized, teachers expressed a preference towards the synchronous program, Google Meets. However, it is important to note based on observations and survey responses the teachers reasoning indicates the selection was related to the teacher predispositions of traditional, face-to-face instruction. They felt the platform was the best alternative because of all the options to communicate, record evidence of learning, and establish relationships with students. Figure 26 summarizes the findings for both virtual platform characteristics and advantages and disadvantages.

Figure 26

Virtual Learning Platform Findings

Characteristic	Asynchronous	Synchronous	Description
Flexibility	✓		• Anytime and anywhere learning • Divergent platforms
Feedback	✓	✓	• Immediate vs delayed • Lack of personal/physical communication
Technical Infrastructure	✓	✓	• Inequities of infrastructure • Digital Divide
Dependent on Self-Efficacy	X		• Time management • Distractions • Opportunity for development
Digital Affluence	X	X	• Digital literacy • Confidence vs anxiety • Opportunity for development
Pedagogical Opportunities	✓	✓	• Innovation and flexible models • Critical skills

Note. Checkmark signifies an advantage, while an x signifies a disadvantage of the platform in question.

Research Question 4

How can these interactive mobile technology software interventions be improved (Cochrane, Cook, Aiello, Christie, Sinfield, Steagall, & Aguayo, 2017; Kim, Suh, & Song, 2015 O'Rourke & Stickler, 2017; Satar, et. al., 2008)?

One improvement for future interactive mobile technology software interventions such as this DBR study is to conduct parent and student training prior to the academic year beginning, as part of registration. Also, the explicit explanation of what constitutes as *internet* for a household, and approximations of how much data is necessary to operationalize the virtual school day, week, and month. These preparations can address potential headaches later in the process.

Within the DBR cycles, it is recommended to assign specific roles to key campus personnel to oversee interventions are conducted with fidelity, provide technical or professional development support, and anticipate avoidable disruptions. For example, establishing a Google Hangout with important stakeholders, or a quick meeting once a month to check progress, regardless of the phase of the cycle. Also, the creation of a *go-to* document to identify points of contact depending on the situation. This eliminates the loss of time, and balances and organizes duties to maximize the performance and support provided.

Another major suggestion for future interventions within virtual contexts is the collaboration of stakeholders with the edtech platforms to be utilized. The partnership could benefit both parties through the proposal of updates, improvements, and program options. The best feedback for edtech platforms was the result of real-world

implementation, and many of the platforms in competition with each other end up imitating each other's best features. In fact, they have to in order to stay relevant.

Platform Updates

In the dissertation proposal, platform updates were not included in the planned data collection. However, the results collected from the survey indicated major concerns centered on the numerous platform updates within all the design-based research cycles. Since these updates modified the interventions in both positive and negative ways, and are crucial to understanding the contextual factors of the study, the researcher investigated each platform updates further. These findings correlate to Dhawan's (2020) study of *strengths, weaknesses*, *opportunities*, and *challenges* (SWOC) analysis for educational technology platforms. The following paragraphs expose the different upgrades for each platform utilized in the study.

Google Meets Updates

Approximately from March 2020 to present day (with more intended for release in the future), there have been over fifty updates for Google Meets, not including those related to the permissions and program controls through the admin console. These admin role updates were not included in the tally as they are not controllable or visible to end users (Google Workspace Team). Of those updates, over thirty-five were regarding tools, features, or settings to improve the facilitation of virtual learning such as viewing options and layouts, noise cancellation, participant controls, and breakout rooms (Google Workspace Team). These upgrades can be investigated by date, product, or topic from the official Google Workspace blog that provides critical information regarding new improvements for consumers (Google Workspace Team). The blog is extremely detailed

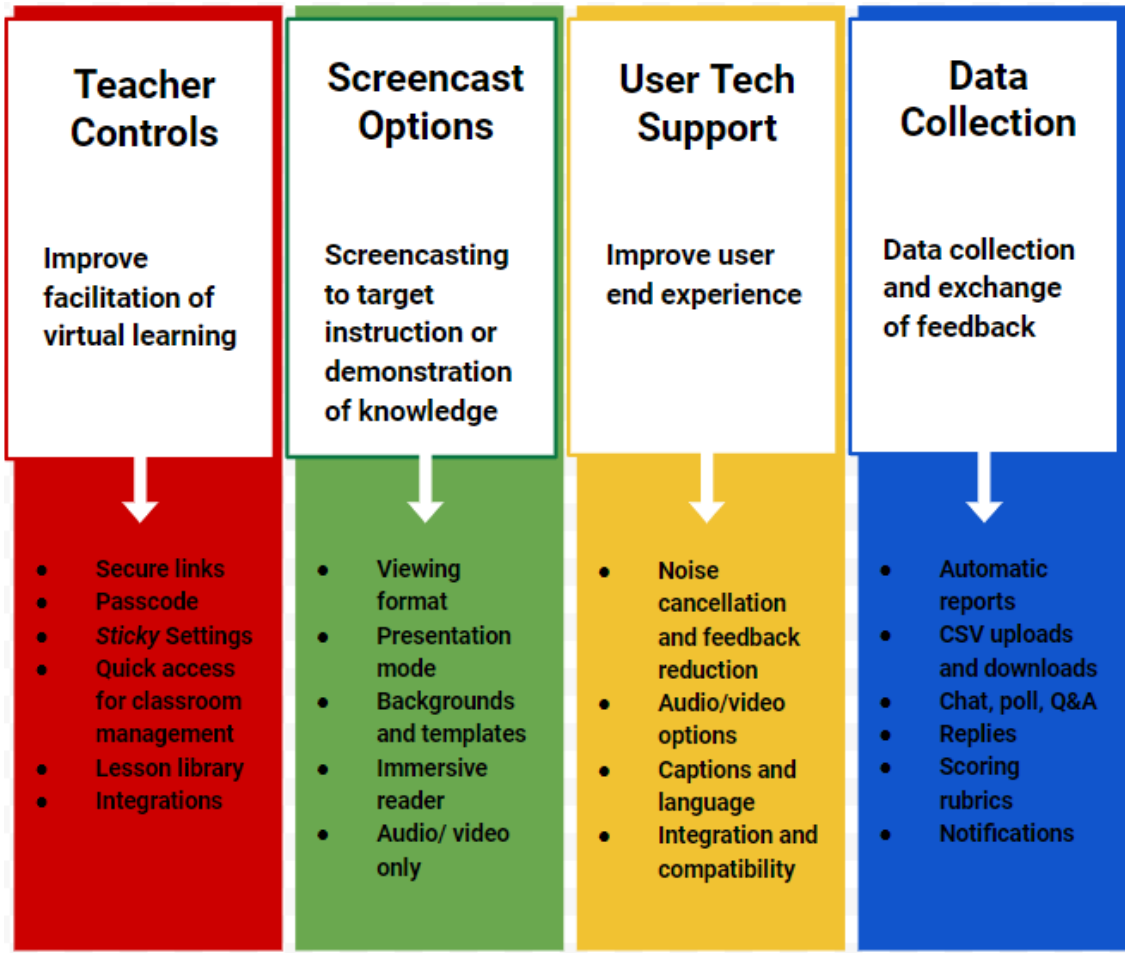
with pictures for each upgrade and a timeline for deployment for different groups of users (i.e., Google for Education, Google for Business, etc.).

Flipgrid Updates

On the other hand, Flipgrid provides information on updates from January 2020 to December 2020, with the understanding there may be more imminent (Microsoft, 2021). In a similar format, the Flipgrid blog posted over fifty updates with more than twenty associated with the facilitation of enhancing platform options for virtual learning including additional camera design (whiteboard, screen sharing, board templates), immersive reader, recording length, and audio voice overs (Microsoft, 2021). The Flipgrid blog provides short lists of updates by month with some linked articles by topic for more information. The topics with linked articles in particular offer videos, pictures and instructions for users. However, not all the updates have detailed information, and there is no deployment schedule. When comparing the two platforms, it is observed Google Meets has more complex upgrades. However, the platform also has more options to offer in general. Figure 27 summarizes updates by four categories identified from the data collection for Google Meets and Flipgrid: *teacher controls, screencast options, user tech support,* and *data collection.*

Figure 27

Platform Updates



Note. Summary of updates for platforms (Google Workspace Team; Microsoft, 2021).

Teacher Controls and Design

For virtual learning, classroom management takes on a completely different appearance. Gone is the ability for the teacher to use proximity control, the power zone, or key body language to keep students on task. Much of the responsibility has transferred to students and/or parents to log onto platforms, turn on their cameras, microphones, and engage in academic tasks. When the pandemic initially hit, online meeting platforms suddenly became the lifeline for educational organizations. As these platforms were not originally designed for education purposes, many teachers found them lacking. As the

year progressed, controls to improve facilitation of virtual learning emerged to specifically target safety, classroom management, and improve collaboration. For Google Meets, the design improvements for safety included private links or passcodes to block knockers (uninvited guests) and bombers and *sticky* settings for teachers such as preferences for quick access, chat, screen sharing, moderation, etc. (Google Workspace Team). To target classroom management, the platform added options for the teacher to *mute all* and *end for all* and added small group opportunities via break out rooms and choices to preschedule (Google Workspace Team). Flipgrid added the disco library that offers hundreds of lesson templates, collections, with partnership integrations with other programs such as *Wonderopolis*. To help facilitate the exchange of assignments, Flipgrid added the Google Classroom sync feature (Microsoft, 2021).

Screencast Options

Another improvement for screencasting options targeted instruction or demonstration of knowledge from Google Meets include the viewing formats of speaker spotlight, pining participants, tiled 16 to 49 people, sidebar view, and different presentation view modes of tab, window, or screen (Google Workspace Team). In addition, for the reduction of distractions Google Meets updated background options of blur, virtual replacements, or pictures (Google Workspace Team). Another major improvement was the integration of *Jamboard*, a virtual whiteboard for teachers and students to work collaboratively within the Meets program (Google Workspace Team). Flipgrid added a digital whiteboard, extended audio/video time limitations, added templates (Venn-diagram, place value chart, etc.), and similar screen options for sharing/viewing a tab, window, or screen (Microsoft, 2021). Later the platform improved

recording options for audio only voice overs and allowed users to edit videos rather than rerecord (Microsoft, 2021).

User Tech Support

Moreover, several upgrades focused on different technology support to improve user end experience. While these may not be directly related to instruction, they affected the overall efficacy of the success of the platforms and consequent design cycles. A constant issue was the quality of communication exchange the virtual platforms offered. With the majority of students at home and many without immediate support from parents, for Google Meets, noise cancellation and feedback reduction were necessary upgrades. In addition, the increase to high quality audio/video and streaming options for teachers and students with varying degrees of internet capacity improved sustainability of student participation (Google Workspace Team). With choices from full high definition 720p, standard definition 360p, standard definition with one camera at a time, or audio only, the user is able to modify settings to stay productive when bandwidth is an issue (Google Workspace Team). Many of the students were utilizing district provided MiFi's, some of which were limited in data, and/or participating in a home with multiple parents or siblings also using the internet, so bandwidth was a concern.

In addition, Google Meet added troubleshooting and help items in their built-in setting to demonstration system load, performance speeds and suggestions for improving CPU usage and connection issues (Google Workspace Team). The platform established a *foyer* where users can wait to join meetings, set their preferred background, camera, and microphone settings, preview participants, and conduct audio/video checks beforehand. Another improvement was the increase in compatibility for multiple devices: android,

IOS, and mobile device versions for those students and teachers unable to connect on a desktop or Chromebook (Google Workspace Team). Moreover, the platform updated their integration capabilities with other Google Workspace programs including Google Calendar, GMail, other non-Google calendar platforms (Google Workspace Team). Finally, Google Meets upgraded options for captions and language supports for second language students to view during live sessions (Google Workspace Team). For Flipgrid, one major improvement was the *immersive reader* that assisted students unable to read text to listen to an audio version (Microsoft, 2021).

Data Collection

The final category comprises updates that target data collection and ease the exchange of feedback between users. One of the best enhancements for teachers were the auto-generated attendance reports. These are sent directly to a teacher's Gmail after the meeting ends with essential participant information including name, timestamp of entrance, and duration of presence (Google Workspace Team). Another groundbreaking advancement was the addition of polls and Q&A options built into the chat feature. Teachers were able to instantly send and receive information during their lessons. Additionally, Google Meets added livestream real time data reports that displays viewers and submits all chat, poll, and Q&A responses with their attendance reports now (Google Workspace Team). For Flipgrid replies to student submissions to offer feedback were improved. Users are able to add detailed titles, attachments, or video replies. Teachers can establish customized scoring rubrics for tasks, specify their notification preference (daily, weekly, monthly emails), and choose to upload CSV files for roster import, or download CSV file of data collection for scores (Microsoft, 2021).

Service Status

Another important topic related to the intervention was regarding service interruptions and related outages. This was also not an intended topic for data collection. Nonetheless, the results collected from the survey indicated indignation on the dependence on functioning service providers within all the design-based research cycles. While this factor is not in the realm of control of the researcher or educational organizations, it is important to disclose them for future studies and interventions in order to prepare for such events.

During the design-based research cycles, there were over six disclosed service outages reported including internet service providers (Verizon, T-Mobile, Spectrum, etc.) and electricity providers (AEP). A major event that resulted in loss of service and affected the interventions was the Texas winter freeze storm Uri. The culmination of lack of power resulted in upheaval for three days and weeks after due to food shortages for students and teachers. Moreover, several platform disruptions occurred throughout the design-based research cycles and are described below.

G Workspace Status Dashboard

The Google Workspace status dashboard is a website which provides real-time product performance information regarding all Google services. The platform used in the study; Google Meets is included. Only products under the corresponding Google service agreements and technical support guides are provided. A color-coded key identifies network or server outages (all users down), or disruptions (some users experience slowness) (Google, 2021). The user is able to search previous weeks up to two months.

From August 2020 to May 2021, there were a total of seventeen outages or disruptions to service that affected users (Google, 2021).

Flipgrid Status Dashboard

Furthermore, the Flipgrid status dashboard provides updated status of all user experiences by device (i.e., browser, Android app, iOS app, etc.). The status is denoted as *operational* if it is in good standing. Users may also search for past disruptions in the incident history to identify monthly issues if applicable. From August 2020 to May 2021, there were a total of ten outages or disruptions to service that affected users. It is noted one of these outages was a scheduled system maintenance that was announced to users (Statuspage, 2021).

Summary

The purpose of this design-based research study was to provide a holistic perspective on the pedagogical and contextual factors of interactive mobile technology on as a means for supporting English learners through second language acquisition. Specifically, the study explored current audio-video conferencing software intervention technology sessions founded on Stephen Krashen's and Lev Vygotsky's language learning theories for 2nd through 5th grade English learners in virtual learning environments. After evaluating three cycles of interventions, and utilizing a teacher survey and researcher observations, the findings suggest screencasting and video conferencing tools can, not only develop language acquisition skills, but also provide English learners with viable alternative options. Chat, audio recordings, video recordings with special filters to cover faces, polls, comments, and numerous other tools educational technology offers reduce anxiety and affective filters to English learners. These findings

coincide with previous computer assisted language learning literature (Oztok, et. al., 2013; Satar, et. al., 2008).

Nonetheless, arguments towards e-learning and CALL include the advantages of increased accessibility, affordability, flexibility, learning pedagogy and policy (Dhawan, 2020; Forbes, et. al., 2015; Farajollahi, et. al., 2010; Swarm, et. al., 2013). While there is much literature to support this statement, it important to conceptualize how the contextual and pedagogical factors can make or break even the best intended instructionally sound learning model. In this design-based research study, the benefits of virtual learning proved to be superficial accolades, especially at the beginning, as the implementation of such virtual platforms exposed a tremendous lack of required infrastructure, training, policies, and equipment. Termed as the 'panacea for the crisis', according to Dhawan (2020), this study demonstrated how virtual learning did solve immediate issues of emergency instruction and a means to continue education during a worldwide disaster. Nonetheless, it was evident in the design-based research cycles, that the best and most effective virtual learning for language development was seen at the end, when both teachers and students had undergone rigorous troubleshooting, training, and identified best practices the hard way, by hit or miss instruction (Bozkurt, et.al, 2020).

It is not surprising in the first cycle the majority of instructional time was spent on providing students and teachers with the necessary hardware, software, and technical support. In survival mode, teachers relied on their experience, focused on basic forms of technology integration and crammed just-in-time training, despite having comprehensive plans of action and lesson templates.

By the second cycle, teachers had grasped the concept of how virtual learning platforms require purposeful intentions and must match educational standards and lesson goals to be more effective. Student products demonstrated the development of language skills and the multiple opportunities available for these products such as chat, comments, digital portfolios, video, audio, etc. (Oztok, et. al., 2013; Satar, et. al., 2008). The students on the other hand, began to become disengaged with the monotony of the virtual school day. At first, learning from home was amusing, then the realization on the need for physical contact and limitations of establishing relationships over a webcam became evident. More students returned physically to school, but the learning model remained virtual.

By the last cycle, teachers mastered how to integrate third party apps into the virtual platforms to increase engagement. In this phase, student products demonstrated the development of language skills has the potential to mimic face-to-face instruction. The multiple opportunities available for language proficiency evidence products progressed into third party integrations adding from chat, comments, digital portfolios, video, audio, etc. to online game assessments, video quizzes, and collaborative slides, etc. (Forbes, et. al, 2015; Farajollahi, 2010; Swarm, et. al., 2013). These strategies would prove effective for students who consistently logged in. However, those who did not have adequate support or monitoring at home, were still lacking in participation regardless of the improved platforms, design, and lesson implementation. These students who were categorized as *delinquent* for absences and/or failing grades were asked to return to in-person instruction. This supported theories regarding learning preferences and demonstrated how virtual learning is not a one size all approach or the elixir for all

educational ailments (Oztok, et. al., 2013; Satar, et. al., 2008; Swarm, et. al., 2013). Similar to the rest of the world, the edtech platforms utilized in the study, struggled to play catch-up to the demands and frustrations of educators. This consisted of altering and improving design and facilitation of instruction to meet the needs of individual students and teachers.

Overwhelming survey data responses communicate a consensus that tremendous professional growth towards technology affluence occurred. The majority of teachers put themselves as proficient and characterized themselves as confident in their abilities at the end of the pandemic school year. Interestingly enough, while no one can undervalue the improvement, at the onset of the program, many of the gains they perceive reached the lower stages of effective virtual programs, according to instructional design theories (Bonk, et. al., 2005; Forbes, et. al., 2015; McGee, et. al., 2012). Primarily, teachers focused on what they knew from traditional in-person instruction and tried to embed it into virtual learning models. Not surprisingly, as their confidence levels increased through the design-based cycles, they embraced the potential of these virtual platforms hoping to garner more engagement from lost students. Through on-demand professional learning sessions teachers integrated more third-party applications within their instruction and saw improvements in student products and participation in SLA activities. However, as a whole, there was an accord for the need to narrow the focus, establishing more comprehensive approaches towards virtual platform integrations with the constant updates and changes.

CHAPTER V

Discussion, Implications, and Recommendations

In this chapter, the researcher explicated the results to answer the research questions of the study. Chapter V includes an interpretation of categories from recurring themes extracted from the design-based research study, including implications of the Krashen and Vygotsky language learning theories towards virtual contexts, and recommendations for virtual platforms and design models.

Discussion of Findings

Dey (1993) posits how the heart of qualitative research exists between the interrelated processes of description, classification, and identification of interconnection of phenomena occurring in specific contexts to grasp comprehensive social-cultural importance (p. 31 & 33). The study revealed the COVID-19 pandemic created a domino effect of interconnected phenomenon that in turn altered the context and pedagogy of education. Normal patterns and frameworks of educational practices and models were altered and institutions may never look back. Frankly, it is disappointing it took such a traumatic event to create such changes, but the repercussions are not all unsatisfactory. The pandemic may be the catalyst the educational system needed to match 21st century educational technology to teaching and learning practices, and put inclusive instructional design on the forefront of programs, benefiting students from all demographics.

For this study, based on state guidelines, each grade level was required to complete 3 hours and 45 minutes of synchronous virtual lessons and 2 hours and minutes of asynchronous tasks for regular instruction. However, during asynchronous times, the teachers and staff were directed to complete interventions for small groups. These

interventions could have been with struggling students or advanced students. In addition, teachers and staff provided afterschool tutorials for 1 to 2 hours, two or three times a week. For some students this meant being *live* for over 5 hours a day, and somewhat removed the asynchronous activities. As time went by less students would stay logged on for all live sessions. In some cases, teachers were asked to remain in their Google Meet live sessions all day, except for lunch break, so students would be more inclined to stay for all the lessons. This was evident in the screen time or *zoom fatigue* issues reflected in the replication of face-to-face teaching (Trust, et. al., 2021). Unfortunately, the overall experience was not ideal. Teachers and students were overwhelmed at the many digital tools and resources available. They found it difficult to engage students in remote learning, despite all these tools, and struggled to find the *right* ones for their [lesson] (Trust, et. al., 2021, p. 8). This conundrum primarily stemmed from educators attempting to replicate in-person learning strategies for digital environments (Trust, et. al., 2021, p. 8). In addition, previous experiences, training, epistemology, leadership, were also critical factors that posed challenges during the transition to virtual learning (Kaden, 2020, p. 5).

Throughout this DBR experience, interestingly, barriers to technology integration argued by Ertmer (1999) were still evident during the global pandemic (Trust, et. al., 2021, p. 4). Ertmer (1999) described first-order barriers, referring to challenges brought from external resources such as hardware, training, support, and time; and second order barriers, related to internal obstacles such as educator epistemologies on teaching and learning (Trust, et. al., 2021, p. 4). One would have thought 20 years later, there would be

different results. Instead, the experience was parallel as Martinez & Broemmel expressed (2021),

> Approximately 15-16 million students and 300,000-400,000 public school teachers lived in a home without internet access or a digital device; somewhere between 55 and 60 per cent of them lacked both (p. 109).

Work and home spheres were merged with assignments being submitted at 11 o-clock at night, often days after due dates. It was evident teachers were working long hours, and working parents were helping students at later times of the day. The asynchronous activities demonstrated student commitment to submit assignments after *due dates*. However, as the COVID-19 pandemic continues and the future is uncertain, it is clear both educators and families need more opportunities to develop awareness on evaluating the value of edtech tools and training on how to use technology purposefully (Trust, et. al., 2021, p. 10).

Implications

The DBR study supported past research regarding the potential of virtual platforms on developing language proficiency skills. These key takeaways include the known need for investment, time and money to establish necessary infrastructure, educational technology policies and standards, and comprehensive pedagogical frameworks for all parties to be held accountable (Amelia, et.al., 2018; Belderrain, 2006; Bolliger, et.al., 2010; Cummins, et. al., 2018; Dhawan, 2020; Farajollahi, et.al., 2010; Huang, 2014). The pandemic unintendedly emphasized the critical need for stable internet connection beyond school walls, and the realization of domino effects on the inequities of the education system. Teachers demonstrated the development of hard-

earned resiliency, as countless hours were spent mastering emergency virtual learning platforms they had failed to embrace before the pandemic. As education pushes forward, it is necessary to spend more time creating content and enriching pedagogy models to integrate targeted skills effectively, and move beyond lower levels of educational technology integration (Kear, et.al., 2012; Madden, et. al., 2017; Nemeth, et.al., 2013; O'Rourke, et.al., 2017; Park, 2011; Persson, et.al., 2018; Smyth, et.al., 2007; Swarm, et.al, 2013).

Moreover, the DBR study identified specific elements' efficiency, within the Krashen and Vygotsky language learning theories, to depend primarily on the type of modality of virtual learning (synchronous vs. asynchronous). The study further concluded the need for curriculum specialists, instructional designers, and educators seeking to develop second language skills among virtual learners to identify purposeful activities within each mode to maximize the effects of the Krashen and Vygotsky theoretical framework. Based on student participation and products, goals to minimize affective filters and improve confidence in student language development would benefit from interactive mobile technologies that offer students asynchronous tasks. Whereas, instructional objectives that seek to develop second language skills from sociocultural tasks benefit from synchronous platforms. However, in order to maximize efficiency, clear expectations and guidelines should be organized and rehearsed, as limitations existed in the virtual context. The DBR study ascertained increased language development skills amid synchronous virtual contexts that had established systems for deliberations, with clear expectations for accountability and multiple extensions for variation, and consistently utilized features and tools of the platform successfully.

Additionally, the DBR study corroborated how the roles of parents may add to the effectiveness of the virtual learning program. Adverse effects on student participation and success in online learning could partially be attributed to working parents. However, the program model included strong support systems in place, not only for technical or educational issues, but overall community outreach and support, and over time the responses and participation improved. Also, the Vygotsky core values of social pedagogy allowed for the enhanced opportunity to develop relationships amidst the virtual learning platforms and assisted to ameliorate the pressures, anxiety, and other trauma associated with the emergency remote learning experiences that were previously seen at the onset of the pandemic.

Nonetheless, it was observed that students who participated in virtual contexts were not as successful in the TELPAS assessments. However, the on-going social-emotional and health concerns surrounding the testing environment may have affected student performance. Despite these outcomes, the DBR study identified short remediation cycles utilizing the IMT tools within in-person learning contexts can help improve language development through activities, which are specific to the students' language development level. Additionally, the DBR approach can help to establish long-term implementation plans for continued development to progress on skills students did master using the IMT tools that was reflected in the TELPAS assessment scores pre-pandemic (Kaffenberger, 2021; TEA, 2021).

Recommendations

When designing curriculum, stakeholders must identify the best platforms for their intended objectives, matching delivery methods with the ideal tools to garner participation and facilitate instructional outcomes. So which platform is the best? How many should be included? Unfortunately, there is no easy answer. It takes conscientious thought and analysis regarding the goals of the curriculum. Ideally, the suggestion is to have a short list of go-to platforms that teachers and students feel comfortable with, rather than overwhelm them. Less is more, but designers are cautioned to provide enough engaging options to reduce monotony and fatigue. Platforms offer introductory courses on options and features and stakeholders are encouraged to evaluate the pros and cons of each platform prior to purchase and/or adoption.

In addition to the ease of use and features available, stakeholders must evaluate the platform's upgrade schedules, technical support options, and capabilities at providing custom requests or tools. While some glitches are inevitable, the best platforms offer scheduled maintenance with little to no disruption to services. Furthermore, for those unavoidable malfunctions and system issues, platforms that offer notifications and periods of when the disruption will be solved, are those to keep at the top of the list. Platforms that provide additional resources for users when upgrades are imminent beforehand are ideal for smoother transitions and prevent unnecessary teacher and student anxiety (Bozkurt, et.al., 2020, p. 93, 101). Careful regard for ethics and privacy concerns regarding user data and overall surveillance on digital footprints should be evaluated. All these factors are important to consider first before purchasing licenses for large platforms, and then when designing curriculum around them.

Best Practices for Language Acquisition Edtech Programs

The term *best practices* is a popular catchphrase to denote important tactics for maximizing instruction. However, educational research has demonstrated how impactful contextual variables can affect not only whom these best practices are actually for, who are the individuals that decide, and what qualifies them to do so (Carrion, 2021). It is important to note that the best practices identified for this study may benefit all students. Moreover, this design-based research study intended to investigate edtech programs specifically for second language acquisition students and English learner demographics. The practices described below are only *best* when matched with the educational goals of the program, purposeful, learner-centered use of the edtech, and clear guidelines to promote equity and cognitive flexibility with vulnerable student groups including ELs (Carrion, 2021; Sheninger, 2021). This is an entire frame of mind for educational stakeholders when designing virtual or hybrid learning environments.

One of the major best practices for virtual learning include having EL students who attend live sessions participate with the camera *on*. This allows the teacher to visualize facial cues and determine if the student is on task. Teachers would redirect students who did not have the camera on, but many ignored the requests and teachers continued with the lessons. Interestingly, this became a national social debate as it become clear some home environments were not only unconducive to learning, but several students had a variety of personal reasons for not turning on their cameras. According to Castelli & Savary (2021), privacy and appearance concerns such as the physical location of the students, the background, other individuals in the household, other social norms, or weak internet connection (camera appears off due to low

connectivity) prompted students to keep their cameras off. This design-based study had similar results; however, it is crucial to understand the camera is not necessary for learning to occur. The study demonstrated it is beneficial for conducting synchronous activities to maximize instructional goals and having the camera off, diminishes the educational experience for students. That being said, educators are recommended to establish clear expectations from the onset. Instructors should be cognizant of reluctant students by promoting equity and inclusion, addressing potential distractions and the purpose for the camera, to promote engagement, active learning, participation, and accountability (Castelli, et. al., 2021).

Moreover, the other recommendations are interrelated and concentrate on establishing the learner centered, equitable and inclusive environment. Stakeholders should design practical virtual learning schedules to allow cognitive flexible options and increase personalized learning. This includes shorter 20 to 30-minute synchronous sessions with longer 45 to 60-minute asynchronous sessions, and short 5 to 10-minute breaks. The shorter live sessions would prevent students from becoming fatigued, limit cognitive overload, and allow meeting educational minutes, the virtual school day should include synchronous *office hours* or *study rooms* for students to meet with teachers in small groups and target more individualized instruction. Students could be recruited to attend these office hour sessions based on their attendance, grades, or by request. In the longer independent sessions, students should be provided with divergent assignments and tasks that allow demonstration of learning. These activities should be instructionally designed by integrating scaffolded tasks whose concepts are relatable to real-world problems utilizing educational technology's tools and features to match objectives. It is

recommended stakeholders create a checklist for students to visualize completed tasks. These checklists could be done weekly and daily to maximize accountability.

For example, during the first day of the week at a live session on the life cycle of a frog, the teacher read a non-fiction text and had students discuss questions using sentence stems in breakout rooms. For this session, the educational technology best utilized was Google Meets to enhance group discussions and present the text. Following the session, the students had a choice to create a Flipgrid video or audio describing the process or draw an anchor chart and upload a picture after being provided with a template. As an extension, student recorded a video using the animal's perspective to demonstrate language proficiency skills and content concepts. This targeted the language and concept skills at hand, while providing flexibility to the varying preferences and language proficiency of students.

At another live session later in the week, the teacher informally assessed student vocabulary and concepts using a Kahoot quiz during Google Meets. This third-party application easily integrated within any lesson with a link. After, the teacher played a video of how different factors such as pollution, poaching, etc. affect life cycles and environments, and students discussed. Following the session, the students had the choice to record a video for conservation efforts by recording a Flipgrid or draw a propaganda poster. As an extension, the students researched one endangered animal and had the option to create a diorama. This is just one example of how the potential for matching educational technology to meet individualized needs of students is possible. Notice not necessarily all activities utilize technology. This is because some students prefer other

formats. The educational technology should be utilized as an asset, securing the best means of targeting skills.

Platform Updates

Platform updates were included in the data collection because results from the survey indicated major themes concerning their effects within all the design-based research cycles. These upgrades altered the interventions by providing different advantages and disadvantages to virtual learning environments. With over one hundred improvements to tools, features, or settings to improve the facilitation of virtual learning, the contextual factors of the study were affected. Clearly, these updates were crucial to educators conducting virtual instruction because they provided the necessary features to enable students to demonstrate learned skills and teachers to capture them. In fact, most of the updates were based on teacher input, product feedback, and requests gathered from surveys and community outreach (Google; Flipgrid Research Team). Google has monthly outreach sessions that requests input after each training session and events, and requests interviews from individuals. Flipgrid has similar events on Twitter, their own platform, and mass surveys to garner input. This type of product feedback is essential for platforms to stay relevant and continue usage in steep competition from various other organizations. Interestingly, Google Meet originated from another program, Google Hangouts, which was never intended for applications specific to education purposes. The COVID-19 pandemic altered those objectives. All educators agreed the updates were necessary, and expressed a need for continued upgrades. A wish list of future tools and features included the addition of a *nudge* option to notify a student off task, an unmute option, and the ability to monitor all breakout rooms for Google Meets synchronous instruction. For

asynchronous, teachers wished for an automatic grade generator based on a rubric entered to help teachers pinpoint struggling students. However, given the constant influx of changes, both students and teachers often found themselves having to relearn and reteach program procedures and online learning skills to utilize the latest technology effectively. This exacerbated many challenges during an already formidable time. This can be addressed by establishing a set monthly session for all staff and students to review any updates or receive needed training and can be recorded for future reference.

Service Status

There were many factors not within the educational organization's circle of control. Service outages or disruptions are unfortunately a harsh reality when conducting virtual learning. Teachers and entities should have protocols in place to prepare for such events that may impede instruction. Suggestions include keeping extra days in the academic calendar similar to face-to-face environments, which are often called *bad weather days*. In virtual learning contexts, these precautionary days may serve to compensate for service outages. In addition, in such instances, the value of having asynchronous work assigned is evident. In this manner, students who may be the victim of service disruptions have flexible options to submit tasks. In addition, the utilization of several platforms for instruction and communication provides alternatives when one is malfunctioning to keep environments on track. These suggestions do not solve all problems, but they may offer temporary solutions for various challenging situations.

Implications on Theoretical Frameworks

Deductions from the study revealed educational technologies were still only reaching lower levels of integration models, typically serving as substitutes to traditional, face-to-face activities including worksheets, written tests, or lectures (Trust & Whalen, 2021, p. 3). The virtual platforms hosted content transmission and focused on audio-visual (Istenic, 2021). While educators expressed awareness on the value of digital tools, many were not comfortable moving beyond the use of technology from teacher-centered instruction to student-centered methods in which instructional technology is at its most efficient (Trust, et. al., 2021).

Specifically, the virtual context supported the potential of Krashen and Vygotsky language learning theories, under the assumptions the implementation is conducted and received with fidelity (Oztok, et. al., 2013; Satar, et. al., 2008; Swarm, et. al., 2013). Students displayed an increase of language development similar to face-to-face environments through the divergent synchronous and asynchronous activities. However, it is clear the physical proximity of the teacher cannot be replicated in its effectiveness. For some students it is a powerful motivator to participate and engage. For others, the virtual learning platforms provided a haven to mask uncertainties and achieve extensive opportunities to shine without the boundaries of in-person learning (Jarvis, et. al., 2014; Krashen, 2008; Koura et. al., 2017; Rodrigo, et. al., 2004; Stairs-Davenport, et. al., 2018).

Recommendations for Future Research

Design-based Research Studies

One recommendation for future interactive mobile technology software interventions such as this DBR study is to conduct parent and student training prior to the intervention cycles beginning. Also, providing the explicit explanation of what constitutes as *internet* for a household, and clear approximations of how much data is necessary to operationalize the virtual school day, week, and month per student based on their grade and participation. By taking a proactive approach, these preparations can address potential headaches later in the process.

Within the DBR cycles, it is recommended to assign specific roles to key campus personnel to oversee interventions are conducted with fidelity, provide technical or professional development support, and anticipate avoidable disruptions. For example, establishing clear communication methods with important stakeholders, or prescheduling quick meetings once a month to check progress, regardless of the phase of the cycle, will improve transparency and efficiency of the interventions. Moreover, the creation of a *go-to* document allowing the visualization to identify points of contact depending on the situation. This eliminates the loss of time, and balances and organizes duties to maximize the performance and support needed for the intervention to succeed.

The final major suggestion for future interventions within virtual contexts is the collaboration of stakeholders with the edtech platforms chosen for the interventions. Having an established partnership could benefit both parties through the proposal of updates, improvements, and program options. The study revealed the best feedback for the edtech platforms were the result of real-world implementation. Since many of the

platforms are in competition with each other in order to stay relevant, they end up imitating each other's best features. This in turn, improves educational technology integration for all.

Other Related Topics for Exploration

Future research should focus on concepts of self-regulation and self-directed learning strategies as this study indicated a need for these skills to be taught and practiced over time (Edyburn, 2021, p. 114). Research on how to support students that may have underdeveloped self-regulation skills such as elementary school age children, or other special population groups like students with disabilities (Edyburn, 2021). This is also related to the changes in teaching practices and how it impacts teacher and student emotions and motivation. Research on the "high demands, low control" of the virtual setting and how they may affect teaching performance are similar subjects to explore (Owens, et. al., 2021, p. 60). Also, investigating the possible effects of virtual reality as a substitute for proximity control is another possible avenue since it was determined as a major negative factor of virtual learning

Conclusion

In the critical moments, the majority of teachers stuck to what they knew-teacher centered approaches, rather than shifting towards learner centered methods of blended learning (Istenic, 2021, p. 117; Lockee, 2021, p. 19; Trust, et. al., 2021, p. 12). This was partially due to the constant influx of updates from platforms, inconsistent attendance of students needed to master, poor online learning skills, and/ or state expectations required a specific number of live lessons in order to count as instructional minutes. However, replication of in-person environments should not be the goal. Virtual language learning

programs should be created with expectations supported by research and literature of distance education programs with the true flexibility it is supposed to offer students. By the same token, students should qualify, have established self-directed learning skills needed to succeed in virtual programs (Tabor, 2020).

Educators proved to be an essential part of a resilient community and their ability to adapt to changes is testimony to their professional identity (Abaci, et. al., 2021, p. 31-32; Martinez, et. al., 2021, p. 110). There was a reversal change in teacher attitudes towards digital learning priorities. The pandemic made it immediately relevant and highly sought after (Abaci, et. al., 2021, p. 31-32). However, professional development was opportunistic, but the reality is to reach an effective and sustainable implementation of online second language learning, intentional, on-going pedagogical support for implementation has to occur (Abaci, Robertson, Linklater, & McNeill, 2021, p. 30; Gogus, 2021, p. 12). It is a systematic approach from determining goals and objectives and understanding how the platform/tools enhance the learning process, to identifying underlying epistemological factors that influence outcomes, and finally, opportunities for reflection and mentorship to create a holistic professional learning environment (Gogus, 2021; Lockee, 2021; Pebriantika, et.al., 2021). Teachers need to re-think their identity and undergo reflection on new responsibilities and the altered capacities of their profession (Sullivan, 2020, p. 22).

Summary

Effective teaching is founded on similar principles regardless of the instructional model: face-to-face, hybrid, or virtual (Nilson & Goodson, 2018). Instructional strategies that remain at the top of quality educational experiences include systematically well-

designed courses with the technology, in this case, the virtual learning platforms. They should offer rigorous tasks, integrate rich resources, engaging discussions, and specific and authentic feedback from a committed instructor, modeling a close relationship between learners often found in face-to-face classrooms (Nilson, et. al., 2018). However, additional challenges are evident in the development and integration of these best teaching practices within virtual learning contexts. Once the novelty of the virtual learning and learn from home environment wore off, special challenges ensued. Encouraging participation and maintaining high expectations while being sensitive to socioculturally diverse learners was more than difficult. Much of these issues resulted in slower adoptions of placing pedagogy and best teaching practices at the forefront of virtual learning, instead focusing on the edtech platforms themselves to produce learning (Nilson, et. al., 2018).

Nilson & Goodson (2018) discuss the need to begin with teaching and learning principles first and transition to instructional design concepts to end with online learning applications (p. 6). This process was evident in the design-based research cycles at the *Analysis* and *Design* phases with content experts, but failed in the *Implementation* phases until the final stage once teachers collectively improved their epistemology of placing pedagogy and best teaching practices at the foreground. In this final cycle, students had time to develop self-regulated learning skills and teachers were able to match intended learning outcomes with the most appropriate virtual platforms and teaching strategies to develop language skills.

Nonetheless, even though the foundational instructional design model: ADDIE (Analysis, Design, Development, Implement & Evaluate) was based on five original

phases, having the shortened ADIE model with the combined *design and development* stages embedded into *design plan*, was a necessary adjustment. It was simple for teachers to follow but allowed quicker processing times between phases, while maintaining the veracity of the model (Cochrane, et. al., 2017; Kim, et.al, 2015; Roblyer, 2015). The campus was already familiar with the intervention process from previous programs, so it is extrapolated the use of a different model would have further caused negative factors within the design-based research study. The integration of a model that was already familiar assisted in the program consistency as teachers were able to identify the model phases clearly and pinpoint improvements as the cycles continued.

After surviving this year and having experienced both extremes of the spectrum between face-to-face and virtual learning, teachers have finally realized there is a much-needed middle ground of educational technology to support second language acquisition. If interactive mobile technology is utilized with intended purposes, matched to student language proficiency, and preferred modality, and platform tools are integrated with fidelity, then student second language acquisition increases. If the interactive mobile technology is operated as a replication of in-person instruction, without accountability to tool features or participation, little to no language acquisition occurs. While the future is uncertain with the COVID-19 pandemic continuing to plague the education profession, the destiny of teaching and learning has enduring hope in interactive mobile technology.

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APPENDIX A

ELPS Rubric

Name: _____Grade: _____Teacher: _____

2019 TELPAS Ratings:

Listening: ____ Speaking: _____ Reading: _____ Writing: _____ Composite: _____

Read the descriptors for each rating. Place a check in front of each box that best describes your English language ability.

1. BEGINNER	2. INTERMEDIATE	3. ADVANCED	4. ADVANCED HIGH
__Speak, listen, read, write single words or short phrases	__Speak, listen, read, write using simple sentences	__Speak, listen, read, write using academic vocabulary on familiar topics	__speak, listen, read, write in long academic discussions without pausing or repeating
__use and understand memorized or repeated words	__need extra time to think and read, talk, write about your ideas	__May pause or repeat words when speaking, listening, reading or writing	__Communicate effectively using abstract and academic content vocabulary
__not speaking or writing or understanding at all	__use and understand basic vocabulary in everyday conversations	__Use and understand details to explain familiar topics	__use and understand idioms and English sayings
__use and understand only keywords	__Use and understand mostly present tense verbs (is)	__use and understand present, past, and future tenses correctly	__use and understand complex sentences frequently
__say, listen, read, write only practiced sentences	__confuse Spanish and English words sometimes on unfamiliar topics	__say, listen, read, write some compound and complex sentences	__say, listen, read, write like a native English student
__mix up Spanish and English words		__sometimes say, listen, read, write words incorrectly	

Why do you think you scored this?
How can you improve?

APPENDIX B

Technology Intervention Survey Consent

Hello, my name is Sonia Renee' Alvarado and I am a student at Sam Houston State University in the Doctorate of Education, Instructional Systems Design and Technology department. I am conducting a study under the direction of Dr. Melinda Miller to investigate virtual platforms. The purpose of this screencasting and video conferencing technology intervention study is to explore how interactive mobile technology software interventions may support Hispanic, English learner's language proficiency and academic achievement. Your students participated in this campus-based, district-approved initiative to improve language skills by using Google Meets/Flipgrid programs. This study proposes to evaluate how the programs improved their language proficiency. I am asking teachers and staff to complete a survey. The results of the survey will be reported in a dissertation that I will complete as a requirement of my graduate program.

The study will use an electronic staff survey designed to provide views on the program implementation and describe your opinions about virtual platforms. The survey also includes questions about your teaching experience and technology affluence. Identifying this information will help know how to assist future students and teachers. All information obtained in this study is strictly anonymous, recorded without any identifying information that is linked to you. All data will be kept in a password-protected computer. To qualify for this study, you must be over the age of 18 and an educator who utilized the Meets/Flipgrid virtual platforms.

Participation in this school-based study poses minimal risk to participants. No foreseeable risks or discomforts are expected. Your participation is voluntary, and refusal to participate will involve no penalty or loss of benefits. You may discontinue participation at any time without any consequences and any data already collected will be destroyed. There is no compensation or cost to participate in the study. While there are no direct benefits to your participation in this study, it will help educators to design educational technology programs and interventions that best support education. The expected duration to complete the survey is 15 minutes.

Sonia Alvarado may be contacted to answer questions, concerns or complaints about this project or benefits or risks associated with being in this study: sonia.alvarado2@uisd.net or 956-473-2710. If you have any questions regarding your rights as a human subject and participant in this study, or to report research-related problems, you may call the Institutional Review Board at SHSU for information, at (936) 294-4875, or irb@shsu.edu. Thank you

By clicking here, you are agreeing that you read and you fully understand the contents of this document and are willing to take part in this study.

I Agree - Click here to continue- Send participant to ‘Thank you’ page at the conclusion.

I Do Not Agree - Send participant to 'Thank you' page

APPENDIX C

Teacher/ Intervention Staff Survey

Instructions: Please answer the following questions in detail and honesty for program improvement.

Date: _____

Part I.

Years of Teaching Experience: 0-4, 5-9, 10-14, 15-19, 20+

Technology Proficiency: On a scale from 1 to 5, how proficient in technology do you see yourself?

Key: 1-Little to no skill 2-Developing 3-Proficient 4-Above Average 5-Exceeds Expectations

Why?

This year has been a transitory year for educational technology. What factors do you feel contribute to the failure of certain virtual programs? Please check all that apply.

Lack of Training

Too many trainings

Not enough time to master

Too many resources

Lack of engaging resources

Student home situation

Hardware or software problems

Connectivity issues

Other

Part II.

1. Do you think the Meets/Flipgrid programs helped the students develop language skills? Why or why not?

2. Compared to in-person instruction, what are some of the shortfalls of using virtual platforms for language development? Why?
3. What are some of the benefits you found?
4. If/when a student had trouble, what would you do?
5. Describe what are some problems you had? With which aspect of the program? (Technology, network, recording, etc.)
6. Which platform did you prefer-Meets or Flipgrid? Why?
7. What features of the platform helped you facilitate the EL interventions? Why?
8. What features were challenging to use when facilitating the EL intervention? Why?
9. Would you recommend using Meets/Flipgrid? For who or what? Why?
10. What second language learning strategies (building background knowledge, comprehensible input/output, extra processing time, multiple opportunities to respond, scaffolding, zone of proximal development, etc.) did you find most useful? Why?
11. What suggestions do you have to improve the program?

APPENDIX D

Observation Protocol

1. Platform

☐ Flipgrid

☐ Google Meets

2. Number of Participants _____

3. Duration of Observation _____ hour(s) _____minutes

4. Grade Level(s)

☐ 2nd

☐ 3rd

☐ 4th

☐ 5th

5.EL strategy observed:

☐ Scaffolding

☐ Input/ output

☐ Class discussion

☐ Audio/ video submission

☐ Listening/ speaking

☐ Breakout rooms

☐ Direct instruction

☐ Written reflection via chat, post, or submission

☐ App smash (third party integration: e.i. Kahoot, Quizziz, Nearpod, PearDeck, etc.)

6. Observations:

_____

_____

_____

_____

_____

Adapted from DeMonbrun, et. al., 2015; Murray, 1983; Texas Teacher Evaluation & Support System, 2020; & Technology resources checklist*, by University of Illinois at Chicago.*

APPENDIX E

IRB Approval

Date: 6-10-2021

IRB #: IRB-2020-368
Title: Design-based Research for Virtual Learning: A Holistic Perspective on the Pedagogical and Contextual Factors of Interactive Mobile Technology on English Learners
Creation Date: 12-5-2020
End Date:
Status: Approved
Principal Investigator: Sonia Alvarado
Review Board: SHSU IRB
Sponsor:

Study History

Submission Type Initial	**Review Type** Exempt	**Decision** No Human Subjects Research

Key Study Contacts

Member Melinda Miller	**Role** Co-Principal Investigator	**Contact** lls_msm@shsu.edu
Member Sonia Alvarado	**Role** Principal Investigator	**Contact** sra013@shsu.edu
Member Sonia Alvarado	**Role** Primary Contact	**Contact** sra013@shsu.edu

APPENDIX F

District Approval

---------- Forwarded message ---------
From: **Sanjuanita Amador** <sjamador@uisd.net>
Date: Wed, Sep 29, 2021 at 10:16 AM
Subject: Fwd: Permission to Survey
To: Sonia Alvarado <sonia.alvarado2@uisd.net>

Good Morning Ms. Alvarado,

Please be advised that the UISD Survey Committee has approved your request to engage in a study with United ISD.

We wish you well with this endeavor.

Regards,

SanJuanita Llamas-Amador
Family Services Coordinator

VITA

SONIA RENEE' ALVARADO

Education

Doctorate of Education, Sam Houston State University, Huntsville, Texas

Instructional Technology and Systems Design- *Projected: May 2022*

Master of Science, Library, Sam Houston State University, Huntsville, Texas, 2013

Bachelor of Science, Interdisciplinary Studies, Texas A & M International University, Laredo, Texas, 2011

Texas Teacher Certifications and Qualifications

School Librarian, EC-12

Bilingual Generalist-Spanish, EC-6

Professional Experience

Library Media Specialist, Dr. Henry Cuellar Elementary School, Laredo, Texas, 2016-Present

Instructional Technology Teacher, Laredo, Texas, 2013-Present

Elementary Teacher, Abraham Kazen Elementary School, Laredo, Texas, 2011-2015

Conference Presentations

Alvarado, S. R. (2020). *Leveraging g suite for digital learning libraries.* Virtual presentation at Region One ESC, Virtual Fall Media Fair, Laredo, Texas.

Manuscripts

Alvarado, S. R., (2021). Design-based Research for virtual learning: A holistic perspective on the pedagogical and contextual factors of interactive mobile

technology on English learners [Unpublished submitted chapter]. In *Cases on Practical Applications for Remote, Hybrid, and Hyflex Teaching.* IGI Global.

Alvarado, S. R. & Gross, E. (2020). *The transition of face-to-face learning to online education during COVID-19: Applications of poorly understood pedagogy [Unpublished manuscript]*.

Alvarado, S. R. & Song, D. (2019). *Interactive mobile technology and software intervention for English language learners [Unpublished manuscript]*.

Professional Memberships

Texas Library Association

Texas Computer Education Association