Sponsoring Committee: Susan B. Neuman, Ed.D., Chairperson
Carol Scheffner Hammer, Ph.D.
Michael J. Kieffer, Ed.D.
Yuuko Uchikoshi, Ed.D.

THE PROMISE OF EDUCATIONAL MEDIA FOR DUAL LANGUAGE LEARNERS' L1 AND L2 VOCABULARY DEVELOPMENT

Kevin M. Wong

Literacy Education
Department of Teaching and Learning

This dissertation research was conducted as part of award R305A150143 from the Institute of Education Sciences, U.S. Department of Education to New York University. The views expressed are those of the author.

Submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in the
Steinhardt School of Culture, Education, and Human Development
New York University
2019

ACKNOWLEDGMENTS

> "One of the sayings in our country is *Ubuntu* – the essence of being human. *Ubuntu* speaks particularly about the fact that you can't exist as a human being in isolation. It speaks about our interconnectedness. You can't be human all by yourself, and when you have this quality – *Ubuntu* – you are known for your generosity. We think of ourselves far too frequently as just individuals, separated from one another, whereas you are connected and what you do affects the whole world. When you do well, it spreads out; it is for the whole of humanity."
>
> – *Desmond Tutu*, Human Rights Activist, Nobel Laureate, Theologian

When I think about how I got here, I think about the communities of people who have stood by me, encouraged me, and believed in me on this journey. Being in community with others has helped me remember that life is so much larger than myself. Walking with others through the highest of highs and the lowest of lows, I am grateful for the people mentioned below who have served as pillars in my life, grounding me and propelling me forward. *Ubuntu*, a South African proverb, says that *I am because we are*. Indeed, this dissertation is ours and the doors that this degree opens are not for myself, but for us; for humanity.

When Amy and I decided to pursue graduate degrees, I knew I was leaving behind a profession I held dear to me; a profession that made me feel alive as I engaged with young minds and partnered with families, communities, and colleagues as an elementary school teacher in Hong Kong. To my family at Pui Kiu Primary School – 連校長 Mr. Marco Lin, my principal, Vince Wong, 鄭貫虹, 黃清洪, colleagues in the English Department who trusted me, and countless others who challenged me to teach better – thank you. To the 148 children I had the privilege of teaching in my six years as a school teacher – thank you.
人人學習，互相關懷，不斷反思，追求卓越！

Fueling my motivation to pursue this doctoral degree are the Nepali children I volunteered with in Hong Kong at Inner City Ministries. Working with the children (Eliza, Alan and Aaron Gurung, in particular), and gaining recognition in the education sector as a teacher in Hong Kong, I felt a pressing on my heart – a deep conviction – to pursue my doctorate so that my voice might be louder. Although a bittersweet decision as this would result in us leaving Hong Kong, we were deeply supported by our community – Leora and Jeff Caylor, Jonathan and

Flora Cheung, Flo Chiu, Eric and Katie Farmer, Cheryl and João Fonseca, Amanda Fung, Brett and Shannon Hilliard, Kimi and Michi Hu, Wing Kong, Marcus and Farah Kroese, Tyler Kusunoki, Jon and Merryl Lau, Kevin and Christine Lau, Lincoln Lau, Mike and Kat Lau, Edmond Li, Christy and Ben Liang, Shirley Man, Sarah Ng, Martin and Kitty Radford, Caroline Simick, Ebson and Tryfina Simick, Carolina Tam, Helen and Jesse Taylor, Tania Tsang, Tim and Carrie Woo, Leo Zen.

New York City was an incredible place to pursue my graduate degrees. More incredible than the city was the community of people who came around us to form deep, authentic relationships. To the following people: thank you for walking alongside us and for opening up your hearts and homes to make New York City feel like home. I am because we are.

Redeemer: Sarah and Joe Guy Collier, Nadia Danford, David and Kelly Janke, Jim and Merrit Holmberg, Ashley Jones, Karen and Michael Markham, Megan McElrath, Daniel Tees.

Hope West Side: Funmi Adewale, Paul Chang, Hope Chang, Gerard Gutierrez, Faith Leonard, Joy Lee, Mike and Jeanne Park, Hannah Park, Elias Popa, Joonbo Rhie, Connie Ryu, Liz Tobias, Xan Voon.

Monroe College: Anne Lillis, Allison May, Susie Metscher, Jill Weinberg, and all the students I had the privilege of working with.

NYU Cohort: Sandra Ajaps, Ashley Fallon, Scott and Sharon Grapin, Ali and Augie Haas, Adrienne Nguyen, Johanna and Adam Tramantano – the best cohort one could ask for.

NYU Doc Students: Nicole Deschene, Jinjoo Han, Frannie Hogan, Karis Jones, Noor Jones-Bey, Dana Karin, Kenny Logan, Jia-Lin Liu, Hui-Ling Malone, Lilly Padía, Rachel Traxler, Chris Van Booven, Andrew Weaver.

Members of the Literacy Lab: Hailey Breitenfeld, Estee Carter, Katie Danielson, Katelyn Fletcher, Rachel Flynn, Jillian Knapczyk, Naomi Moland, Maya Portillo, Krystina Raymond, Preeti Samudra, Jordan Spoon, Eleni Zgourou.

Faculty and colleagues: Sarah Beck, Carol Benson, Natalie Brito, Kevin Carroll, Maryrose Cordero, Matthew Deroo, Cherelle Hall, Nancy Hall, Robin Harvey, Erina Iwasaki, Tanya Kaefer, David Kirkland, Icy Lee, Okhee Lee, Pauline Mak, Terrie Mitchell, Ben Moorhouse, Shondel Nero, Erin O'Connor, Kongji Qin, Jennifer Ruocco, Zhongfeng Tian, Heather Woodley.

Other people who made New York City home: Daniel Chang, Matt and Jenny Jordan, Michelle and Brendan Jou, Simon Lim and Jodi Frankel, Stephen and Sharon MacArthur, Matt and Tatiana Mahoney, Colin Miller and Jeff Harps, Chris Mowery-Bell, Eunice Ok and Michael Jung, Sarah Shearin, Kinsen and Louise Siu, Jeanne Su and Bob Insley, Mel and Brady Rish, Whitney Adair and Matt Swoboda, Anh-Thu Tran, Nathan and Elise Vickery, Katie Yip.

And then, of course, to those who helped me complete this dissertation:

Research Assistants: Randy Casanave, Juan "Susan" Du, Zachary Levin-Epstein, Jia "Serene" Liu, Morissa McQuide, Jessica Moskowitz, Jianan "Jackie" Qiao, Shimeng "Annie" Weng. This dissertation could not have happened without each of you.

Funding Institutions: Institute of Education Sciences, Television Academy Mister Rogers Memorial Scholarship, The International Research Foundation for English Language Education.

School Sites: The children, parents, teachers, and education directors at the 14 different schools where data was collected.

Dissertation Committee: Carol Scheffner Hammer, Michael Kieffer, Yuuko Uchikoshi – thank you for taking the time to invest in me as an emerging scholar; for your careful, honest, fair, and professional reviews of the multiple iterations of this dissertation; and for the important work that you each contribute to the field of language and literacy development.

Susan Neuman: Thank you for seeing the potential in me and investing in me as an academic; for treating me as a colleague from the very first day and valuing my thoughts and ideas; for never settling for less than perfect – although this meant countless drafts of my work, I am better because of it; for your candor, your ambition, your time, your heart for children; for loving dogs and food as much as me in the greatest city in the world; and possibly most important of all, for always learning. Thank you.

And last, but not least – to my family.

Mom and 爸爸, Bonnie and Neal – Thank you for never doubting for a second that I would pursue a Ph.D., and more importantly, for always believing I would do good in this life. Your unconditional love, ardent optimism, collective wisdom, and unwavering commitment to family provided me with an upbringing that I wouldn't change for the world. Thank you for loving me, Amy, Kaleia, Cuzco and for your continued presence and role in our lives. I love you and praise God for you.

Karen and James Tsai, Lindsay Tsai, Holden Tamchin, Cecelia Beting, thank you for your unconditional support. Your steady confidence in me, your encouraging words, and the assurance that I am always accepted and always enough for you gave me the strength to not only complete this dissertation, but to enjoy (almost) every minute of it. I am because we are.

Kaleia Noelle, my first born, and any future children we might have: Thank you for being. You are a gift from above and I pray that you know this truth for the entirety of your life. You are beautiful, you are valuable, you are worthy, you are loved, you are enough. I love you.

Amy – I don't even know where to begin. There is absolutely no way I would have completed this degree without you; it is our degree to be used for others; for those God places in our lives. Thank you for being the person I get to do life with, for thinking the world of me (even when it is undeserved), for being the object of my love and affection, and for sharing your humanity with me, which is inextricably bound with my own humanity and continually shapes who I am.

> "To be loved but not known is comforting but superficial. To be known and not loved is our greatest fear. But to be fully known and truly loved is, well, a lot like being loved by God. It is what we need more than anything. It liberates us from pretense, humbles us out of our self-righteousness, and fortifies us for any difficulty life can throw at us" (Keller, 2011).

Thank you for knowing me and loving me fully. I love you.

To God, the Author and Creator of my life: this dissertation is for you. May your will be done. *For we are God's workmanship, created in Christ Jesus to do good works, which God prepared in advance for us to do.* – Ephesians 2:10

TABLE OF CONTENTS

continued

continued

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Technology is ubiquitous in the lives of young children. In the United States, preschoolers are spending an average of two hours or more on screen per day (Rideout, 2014), watching media programs that are purportedly educational (Fenstermacher et al., 2010). Over the past ten years, the American Academy of Pediatrics (AAP) has addressed this hike in media usage by issuing a policy statement that recommends against television exposure to children under the age of two. The AAP recently revised their position to recommend children as early as 18 months of age to be exposed to high-quality programming when co-viewing with a parent (2016). Similar conditions apply to preschoolers between the ages of 2-5 years old with a maximum recommended screen time of one hour per day. Despite these revisions, national surveys of media consumption in the United States report that 73% of 2-4 year-olds watch almost double the recommended amount of television every day for an average of 1.9 hours per day (Common Sense Media, 2013). Moreover, the AAP's recommendations do not provide concrete examples of what co-viewing might look like in practice, and refer to "high-quality programming" without explicit guidelines for the instructional contexts that might promote high-quality literacy development for vulnerable populations like Dual Language Learners (DLLs). Still, educational programs

have the potential to expose DLLs to rich English word learning experiences (Silverman & Hines, 2009), which are critical for the overall literacy development of children who often enter schools with less English vocabulary knowledge than their English-speaking counterparts (Hindman & Wasik, 2015).

To teach words to young children, a meta-analysis found that using educational media as an instructional tool was associated with significant gains in vocabulary knowledge (Marulis & Neuman, 2013). These positive developments in vocabulary learning are also reported in DLL classrooms when teachers provide multimedia-rich instruction to young learners (Silverman & Hines, 2009; Verhallen, Bus, & de Jong, 2006), though the specific attributes of effective media instruction remain largely unknown. More recently, research has explored the potential for socially-contingent learning on screen (Strouse, Troseth, O'Doherty, & Saylor, 2018), investigating how social-communicative cues on screen and in person might enhance story comprehension in preschoolers. Still, scholars have yet to examine how specific mechanisms in educational media might influence early literacy development in DLLs.

In my thesis, I present three related papers that collectively investigated the instructional supports on screen and in the media viewing context that influenced English and heritage language vocabulary knowledge in DLLs. In study 1, I examined how specific pedagogical approaches used in educational media might benefit DLLs. Specifically, I aimed to understand how ostensive (definitional) cues and attention-directing cues (Neuman, Wong, Flynn, & Kaefer,

2019) might influence L2 vocabulary learning among DLLs with varying English language skills. Shifting my attention from instructional approaches to the learning context, my second paper investigated how the overall instructional context for vocabulary learning (i.e., when programs adopt a participatory, narrative, or expository approach to teaching) influenced L2 vocabulary in DLLs. In my third study, I turned to the linguistic context of educational media, examining how the language of instruction in children's programming helped DLLs maintain two languages. I also considered how home language supports engaged viewers with varying levels of L1 and L2 proficiency. Findings from these three studies provided an understanding of how various contexts for learning on screens might affect DLL early literacy development.

Background

In this dissertation study, I draw from Cummins' (1979) Interdependence Hypothesis to understand how children might learn English as an additional language. Cummins' theory asserts that DLLs are able to use their home language to support L2 learning due, in part, to the interrelationship between the two languages. More specifically, a DLL's competency in their L1 directly influences their competency in the L2 (Cummins, 1979; Genesee, Lindholm-Leary, Saunders, & Christian, 2005; Proctor, Harring, & Silverman, 2017). I examined language competency through L1 and L2 vocabulary knowledge, which are foundational for DLLs who enter schools with considerably less English vocabulary knowledge than their peers. These children are often at risk for

encountering challenges in their educational careers given the importance of vocabulary in overall literacy development (Halle, Hair, Wandner, McNamara, & Chien, 2012; Han, 2012).

Cummins' theory relates to my proposed dissertation study in two ways. First, it argues that the proficiency of a child's L1 influences their proficiency in the L2, which relates to my study on the language of instruction in educational media. Second, it recognizes that children have varying levels of L2 (English) baseline proficiency, which likely influences the process of L2 vocabulary learning. In my dissertation, I used a continuous measure of English language proficiency and home language proficiency to capture these variations in dual language proficiency. Understanding how educational media can provide supports for DLLs with different baseline levels of L1 and L2 proficiency will help us better meet the needs of this fast-growing population in the United States.

To teach vocabulary in a new language, scholars are beginning to assemble a set of instructional strategies that promote L2 vocabulary learning in DLLs (Buysse, Peisner-Feinberg, Páez, Hammer, & Knowles, 2014; Carlo et al., 2004; Collins, 2010; Lugo-Neris, Jackson, & Goldstein, 2010). Used in a variety of classrooms and contexts, these strategies include using clear and direct definitions of the vocabulary word (Carlo et al., 2004; Lugo-Neris et al., 2010); strategic use of a child's mother tongue or L1 in the classroom to provide vocabulary input that is comprehensible (Collins, 2010; Goldenberg, 2013; Lugo-Neris et al., 2010; Slavin, Madden, Calderón, Chamberlain, & Hennessy, 2011); visual supports or

imagery to scaffold comprehension of auditory labels (Paivio, 1986; Silverman & Hines, 2009; Takanishi & Le Menestrel, 2017); use of interaction and engagement with vocabulary words (Buysse et al., 2014; Hammer et al., 2014; Restrepo, Morgan, & Thompson, 2013); and repetition or repeated viewings to provide multiple opportunities of input (Carlo et al., 2004; Collins, 2010; Lugo-Neris et al., 2010). Taken together, these instructional supports have the potential to provide young children with a high-quality educational media viewing experience.

In today's digital age, multimedia has the potential to serve as a platform for vocabulary learning among young DLLs (Paivio, 1986; Silverman & Hines, 2009; Uchikoshi, 2006; Verhallen et al., 2006). Through media, young DLLs can access a breadth of vocabulary words, while potentially gaining a deeper understanding of words through repeated viewings and rich screen-based instructional supports (Neuman et al., 2019).

In light of the limited research on English and heritage language vocabulary learning for DLLs on screen, I conducted a three-part dissertation that examined pedagogical supports, instructional contexts, and home language supports as mechanisms that might facilitate vocabulary acquisition and comprehension for DLLs on screen. I also sought to examine how the effects of these screen-based conditions on vocabulary learning might differ by children's L2 language skills. The following research questions guided this dissertation:

1 a. To what extent do screen-based pedagogical supports affect vocabulary learning in young DLLs?

b. How do effects of screen-based pedagogical supports on vocabulary learning differ by children's L2 language skills?

2 a. To what extent do certain genres (participatory, narrative, expository) affect vocabulary learning in young DLLs?

b. How do effects of genres on vocabulary learning differ by children's L2 language skills?

3 a. To what extent do DLLs learn L1 and L2 vocabulary through educational media?

b. How do the language of instruction and language of definitions in a child's L1 or L2 affect L1 and L2 vocabulary learning in DLLs? How might this vary according to a child's dominant language?

c. How do the language of instruction and language of definitions support longer-term retention of vocabulary knowledge in the L1 and L2?

Methods

To address these research questions, I used primary data collection with a multi-methods research design. Methods used in this design provided information about distinct aspects of the relationship between screen media and the early literacy outcomes of DLLs. They also allowed me to interpret research findings

through triangulated measurement with convergent validity (Brewer & Hunter, 2006). Methods included:

1. Experimental manipulation: Experimental methods allowed me to draw conclusions about the malleability of instructional supports on screen and in the media context. The dosage of instruction was short 1-3-minute video clips that allowed me to carefully control children's exposure to video programs. Through experimental manipulation of vocabulary words, repetitions, imagery, and screen-based supports on screen, I was able to make inferences about the relationship between the type of support and educational outcomes. It also provided valuable information on the feasibility of utilizing pedagogically supportive educational media to facilitate vocabulary in authentic home and school settings.
2. Within-subjects design: In a within-subjects research design, participants are exposed to all conditions in random sequences and serve as their own control. They control for between-subject variability, reduce error and increase power to detect potential differences between conditions, and minimize threats to internal validity.

These methods were applied to each of the three studies. In other words, I used both experimental manipulation and a within-subjects design to answer each of my research questions.

Research Sites and Sample

Research was conducted in Head Start programs and school day preschool programs located in the northeast region of the United States. The schools served 3 to 5-year-old children from low-income communities who qualified for free and reduced lunch. Moreover, children came from racially and linguistically diverse backgrounds. The most common languages other than English spoken in my samples included Spanish, Haitian Creole, and Mandarin. The number of children included in the sample of each study varied according to research design and power analysis (Study 1, $N = 51$; Study 2, $N = 50$; Study 3, $N = 87$). Aligned with the Institutional Review Board's ethical norms of conducting research with human subjects, data collection did not commence until informed consent was attained from all participants (i.e., parents or caregivers) and assent was given from each student participant prior to their participation in any part of the study.

Analysis

I analyzed my data using quantitative statistical analyses. My dependent variables in all three studies was vocabulary learning, captured with different measures related to word identification and word meaning. Independent variables included screen-based pedagogical supports (study 1), instructional contexts for word learning (study 2), and language of instruction and language of definitions (study 3). I used Repeated Measures Analysis of Variance (ANOVA) and Repeated Measures Analysis of Covariance (ANCOVA) with these independent variables as the within-subjects factor. To investigate differences by language

proficiency, I used children's PPVT scores or home language environment scores in my analyses to account for language differences. I also used age in months as a covariate in analyses to account for developmental differences.

Summary

In an age where "screen time" is in the everyday discourse of families, educators, health care providers, and policymakers, it is clear that the quantity of media consumption will only continue to escalate. In light of this, my dissertation sought to examine what "quality" screen time might look like, and how it can be strategically used to cultivate vocabulary knowledge in English and the heritage language for dual language populations. Although a number of researchers are taking an interest in understanding how children learn from screens, my proposed study addresses gaps in the literature by offering key stakeholders in education with (1) a fine-grained understanding of the mechanisms and supports on screen that might promote early literacy development in DLLs; (2) a substantiated response to blanket policy statements on what 'high-quality programming' might look like in early childhood educational media; and (3) a nuanced understanding of how English and heritage language proficiency in DLLs might affect screen-based learning and literacy development in early childhood. Ultimately, I hope that my dissertation provides a clearer understanding of how multimedia environments can enhance children's vocabulary development in their L1 and L2, as educational media has the potential to address the diverse linguistic needs of

children in today's society and help cultivate future generations of bilingual speakers.

CHAPTER II

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Theoretical Framework

The proposed study draws on two media-based theoretical assumptions that suggest educational media may be an appropriate platform for DLLs to learn vocabulary in a new language. These theories include dual-coding theory and a theory of synergy.

Dual-coding theory

Dual-coding theory (Paivio, 1986, 2008) is a theory of cognition, which asserts that the formation of mental images facilitates learning. When information is processed in the brain, activity occurs in two distinct subsystems – a verbal system specialized in processing language, and a nonverbal system specialized in nonlinguistic imagery. When information is simultaneously transmitted through verbal and nonverbal channels, dual-coding theory proposes that nonverbal information can help young children comprehend unfamiliar languages like vocabulary and complex grammar. Inversely, verbal information may help children process information that is presented in unfamiliar images. In other words, information is represented more fully in memory when it is coded through two channels instead of one.

Dual-coding theory may be particularly applicable for DLL populations who are learning vocabulary words in a new language. When DLLs process information through two channels rather than one, they might benefit from an additional or compensatory scaffold that supports L2 vocabulary learning. Aligned with the extant literature on language learning, DLLs benefit from clear and explicit definitions of words (Carlo et al., 2004) and visual images that scaffold their understanding of vocabulary words in a new language (Gersten & Baker, 2000). Providing linguistically diverse children with both verbal and nonverbal input may, therefore, lead to stronger mental representations of information, which can influence comprehension and provide greater information recall (Mayer, 1997). Moreover, dually-coded scaffolds may facilitate the transfer from children's L1 to L2 (Cummins, 1979) as media has the potential to draw children's attention to specific language learning experiences in a child's L1.

The benefits of dual-coding for DLLs is investigated in a promising study conducted by Wong and Samudra (in press) on 43 preschool-aged DLLs from predominantly native Spanish-speaking households. In this study, children watched six video clips from *Sesame Street* on a Tobii eye-tracking machine. Three of the videos taught English vocabulary words with visual-auditory congruence (dual-coding condition) where a visual representation of the vocabulary word occurred simultaneous to an auditory label on screen. In the other condition – the visual-auditory incongruence (non dual-coding) condition, children watched three clips where the visual and auditory labels occurred at

different points. Using a within-subjects design, researchers reported a main effect for dual-coding as visual-auditory congruence better supported vocabulary learning in DLLs than visual-auditory incongruence, F (1, 38) = 6.07, p = .018. A significant interaction between dual-coding condition and parental L2 ability also suggested that dual-coding was particularly beneficial for DLLs with low L2 exposure in the home (p = .014).

In sum, dual-coding theory appears to support the notion that DLLs can learn from screens. Educational media are able to provide dynamic visual and auditory sources of input that serve as scaffolds for DLLs who may have limited experience with the language at home. When these verbal or auditory inputs are aligned with children's linguistic proficiency levels, it might better facilitate the transfer from L1 to L2 (Cummins, 1979). Moreover, educational media may serve as a powerful tool to equip these learners with vocabulary knowledge in a new language.

Theory of synergy

Neuman's (1997; 2014) theory of synergy argues that multimedia presentations have the potential to provide children with powerful learning experiences on screen. She posits that when children are exposed to multiple media presentations, there is a critical synergy among them that provides children with robust representations of content and deepens understanding. This synergistic input is particularly relevant in today's society as media is pervasive in

the everyday lives of children who can watch educational cartoons on smartphone devices, tablets, computers, televisions, and an array of other media.

Like dual-coding, Neuman's theory of synergy may be particularly applicable to DLLs. When children learn a new language, repetition or repeated exposure to critical information provides learners with a deeper understanding of content (Carlo et al., 2004; Takanishi & Le Menestrel, 2017). Single presentations of new content offer children one-shot opportunities to acquire information, but DLLs benefit from additional scaffolds that cultivate a robust understanding of new words. Through multimedia, DLLs have the opportunity to develop a fuller picture of new vocabulary as the content is presented multiple times and in multiple formats. These synergistic channels of input have the opportunity to facilitate the transfer from children's L1 to L2 (Cummins, 1979) by providing viewers with multiple presentations of language according to their L1 proficiency levels.

There are two propositions underlying Neuman's theory of synergy. The first is that there are qualitative differences in the content of each medium's messages, which uniquely impact the way that learners view content and process it. To illustrate these differences, Meringoff (1980) conducted a study that looked at digital and live versions of storybooks. Children ($N = 48$) were randomly assigned to one medium condition (i.e., digital or live) and independently presented with the story. Findings demonstrated that children were more likely to recall story vocabulary when read to in print and recalled more story actions when

read to on screen. According to this first assumption, the differential impact of each medium can be explained by the differences in presentation modes, cognitive demands, the pacing of information, and the level of interactivity offered by the medium (Neuman, 1997, 2014).

The second proposition of the synergy principle is that the skills acquired from media help children construct meaning and generate inferences in new contexts. In other words, children can benefit from multiple media presentations. For example, a book may explain what a tornado looks like, while a video dynamically projects an image of a tornado in motion. Different features of media such as sound effects, subtitles, and zoom shots make actions more relevant, which cater to children with varying physical, perceptual, and cognitive skills. As children engage with multiple media, they acquire specific content from each medium and respond to each medium's strengths and limitations. In essence, the more input, the better, particularly if it is aligned with a child's dominant language to facilitate the transfer from L1 to L2 (Cummins, 1979).

Drawing from both theories, educational screen media has the potential to support DLLs' vocabulary acquisition by offering multiple representations of information on the same topic. This means that watching educational media may facilitate learning by developing a relatively multidimensional and extensive understanding of new words and their meanings. Moreover, affordances of media demonstrate the potential to orient attention (Salomon, 1981), reduce cognitive demands (Sharp et al., 1995), and motivate knowledge-seeking (Kamil, Intrator,

& Kim, 2000). Together, this suggests that educational screen media may be a powerful mechanism for cultivating vocabulary development for DLLs in the early childhood years. Still, less is known about the differential effects of media on early literacy development among DLLs and non-DLLs, and whether this is dependent on the media content or viewing contexts.

Review of Literature

To better understand the promise of educational media for Dual Language Learners' vocabulary development, this literature review seeks to examine two different bodies of knowledge: (a) learning vocabulary in a new language and (b) using educational media to support vocabulary learning in preschoolers. After reviewing each body of literature, I present limitations and then discuss how their convergence illuminates the potential of media for young DLLs. In light of this, I conclude with the aims of the proposed study and research questions.

Learning Vocabulary in a New Language

Dual Language Learners, children who are exposed to two languages in early childhood, are currently the fastest growing population in schools in the United States (Capps, 2015; Connor, Cohn, Gonzalez-Barrerra, & Oates, 2013). At the same time, DLLs are performing strikingly below their monolingual peers in English literacy and vocabulary development (Carnoy & Garcia, 2017). Entering schools with less English vocabulary knowledge than their classmates, DLLs are at risk for encountering challenges in their long-term educational trajectory (Halle et al., 2012; Han, 2012). Moreover, a synthesis of research on the

language and literacy development of DLL populations demonstrates that many DLL families in the United States also come from low-income households (Hammer et al., 2014). This may add complexity to DLLs' language development as children from low-income contexts are often not afforded the same opportunities as children from middle- and high-income households that provide them with the academic language – in either their first or second languages – and experiences that are valued in schools (Carter & Welner, 2013). At the same time, when DLLs enter schools, their specific educational and linguistic needs are often unmet as schools do not have teachers that are prepared to teach linguistically diverse students. Without educators who can speak the language(s) of children in their classrooms or who have a foundational understanding of second language development, DLLs face many challenges as they navigate a new and unfamiliar language environment. Because vocabulary knowledge is critical for supporting later reading development and comprehension (Hindman & Wasik, 2015), focusing on opportunities for vocabulary development in a new language may be central to understanding how to best support the DLL population.

L2 Development in Dual Language Learners

When children learn a new language, they often draw from their first language (L1) to support language learning in a second language (L2). This process is referred to as cross-linguistic transfer. Cummins (1979; 1981) hypothesizes a theory of linguistic transfer whereby a child's initial language proficiency in their L1 and their motivation to learn a new language influence the

success of linguistic transfer. When children have a certain degree of proficiency in their L1 (i.e., beyond a basic threshold), they can draw from this linguistic foundation to learn a second language. The premise is that when learning a language, learners develop metalinguistic awareness that can be applied to a partner language, which facilitates the process of cross-linguistic transfer.

Scholars continue to use Cummins' theory of linguistic interdependence, but extend his theory to indicate that transfer may not be unidirectional from the L1 to the L2 (Proctor et al., 2017). Proctor and colleagues (2010), for example, propose an *interdependence continuum* whereby the strength of cross-linguistic transfer depends on both the specific languages used (e.g., Chinese or Spanish) and the linguistic skills needed (e.g., oral language or orthography). Moreover, the cross-linguistic strength may also depend on a learner's background knowledge as vocabulary knowledge is represented by concepts associated with a word label (Stahl & Nagy, 2007). If, for example, a child learning a second language required a vocabulary label for a concept that they already knew, language would transfer more readily than if a child required a vocabulary label for an entirely new concept.

In other words, language transfer can vary according to a learner's familiarity with word knowledge and language background. Nation (1990) describes this phenomenon as a learning burden: the amount of effort required to learn a word in a new language. He argues that when learners are familiar with the patterns and knowledge behind a word, the learning burden will be lighter, and

vice versa. These patterns stem from a child's proficiency in their first language, exposure to languages, and prior knowledge of the target language (Nation, 2013). On the one hand, learners whose first language follows a regular spelling pattern, has similar sounds and grammatical patterns, helpful cognates, and comparable collocations as the second language exhibits a relatively light burden. De Groot (2006) provided students with translation pairs that included a Dutch word (L1) and nonwords ("L2" target vocabulary) that varied by phonotactical typicality, where half were phonotactically typical in Dutch and the others were atypical. Findings indicated that words that were more phonotactically typical were more readily learned by students. Thus, learners whose first language is not related to the second language will experience a heavier learning burden (de Groot, 2006). Investigating the relationship between a learner's L1 and L2 vocabulary development, Hamada and Coda (2008) examined the influence of English L2 learners' vocabulary development from Korean, which uses a different alphabetic system as English, and Chinese, which uses a non-alphabetic character system. Researchers found that school-aged students with a greater orthographic distance (i.e., Chinese language background) were less likely to retain semantic information than those that were closer in orthographic distance (i.e., Korean language background).

Extending this principle of learning burdens, Cummins (2007) asserts that a number of other factors can influence the process of cross-linguistic transfer. In specific sociolinguistic and educational contexts, children learning a new

language experience the (1) transfer of conceptual elements (e.g., understanding the concept of evaporation); (2) transfer of metacognitive and metalinguistic strategies (e.g., using graphic organizers); (3) transfer of pragmatic aspects of language use (e.g., confidence to use the L2 in specific contexts); (4) transfer of specific linguistic elements (e.g., knowledge of the meaning of *bio* in *biology*); and (5) transfer of phonological awareness (i.e., the knowledge of how words are composed of distinct sounds). Taken together, instruction is most efficient when teachers consider the similarities and differences between students' L1 and L2 proficiencies and understand how languages are interdependent.

Beyond linguistic interdependence, another important distinction in language learning is the difference between a learner's receptive and expressive knowledge of a vocabulary word. Receptive vocabulary knowledge involves receiving language input through listening or reading and then trying to comprehend it. Expressive or productive vocabulary knowledge requires learners to produce language forms through speaking and writing to communicate a message to others. Both receptive and productive skills require learners to understand the semantic meaning behind words, but word form and word usage are particularly important for productive language skills (Nation, 2013). Essentially, when learners perceive the form of a word while listening or reading it (i.e. receptively), they retrieve its meaning through recognition and recall (Schmitt, 2010). Likewise, when learners want to express a meaning through speaking or writing (i.e., productively), they need to produce the appropriate

spoken or written form of the word in a specific context.

Between the two, receptive language skills tend to be easier for DLLs to use than expressive language skills (Uchikoshi, 2014). In a study examining first and second language vocabulary growth rates of Spanish-speaking and Cantonese-speaking DLLs in transitional bilingual and mainstream schools, Uchikoshi (2014) found that over the course of three years, kindergartners from both language groups maintained similar English receptive vocabulary levels, but differed in their expressive vocabulary knowledge. Cantonese-speaking children maintained higher English expressive scores for all three years than their Spanish-speaking counterparts, introducing the importance of examining a child's home language to understand L2 vocabulary development.

Therefore, knowing a word in a first or second language is a multifaceted process that involves various aspects of word knowledge. At the most general level, knowing a word requires learners to understand the form, meaning, and use of a word. Table 1 provides a model that emphasizes these parts and examines what receptive and productive knowledge might look like in each domain.

Table 1

What is Involved in Knowing a Word (Nation, 2001; 2013)

Form	spoken	R	What does the word sound like?
		P	How is the word pronounced?
	written	R	What does the word look like?
		P	How is the word written and spelled?
	word parts	R	What parts are recognizable in this word?
		P	What word parts are needed to express the meaning?
Meaning	form and meaning	R	What meaning does this word form signal?
		P	What word form can be used to express this meaning?
	concept and referents	R	What is included in the concept?
		P	What items can the concept refer to?
	associations	R	What other words does this make us think of?
		P	What other words could we use instead of this one?
Use	grammatical functions	R	In what patterns does the word occur?
		P	In what patterns must we use this word?
	collocations	R	What words or types of words occur with this one?
		P	What words or types of words must we use with this one?
	constraints on use (register, frequency…)	R	Where when, and how often would we expect to meet this word?
		P	Where, when, and how often can we use this word?

Note: R = receptive knowledge, P = productive knowledge

Moreover, Table 1 demonstrates that the terms receptive vocabulary and productive vocabulary apply to language knowledge and use in a variety of ways. Thus, when scholars examine a learner's receptive vocabulary, this could refer to a word's form, meaning, or use, and might also involve how children listen and/or read in a new language.

Still, DLLs benefit from consistent exposure to languages (Cha & Goldenberg, 2015; Hammer et al., 2014; Hammer, Lawrence, & Miccio, 2008; Quiroz, Snow, & Zhao, 2010; Thordardottir, 2011). Children's bilingual vocabulary development is closely related to the breadth of vocabulary words that they are exposed to in each language, as well as the frequency of encountering these vocabularies in each language in the home, school, or community context. Cha and Goldenberg (2015) examined the influence of young children's bilingual home language environments on their Spanish and English oral proficiencies. With data from a sample of 1,400 kindergartners, they found that home environments with high levels of Spanish were associated with additive English-Spanish bilingualism and home environments with high levels of English were associated with subtractive bilingualism. Scholars agree that DLLs exposed to two languages are able to distinguish between the two languages in early childhood, demonstrating an awareness of two phonological systems, grammars, and vocabularies (Kovács & Mehler, 2009). Despite this simultaneous development of language, recent, large-sample studies have found marked

differences in the English vocabulary sizes of preschool children where DLLs from non-English-speaking households have less English vocabulary knowledge than non-DLLs from English-speaking households (Bialystok & Feng, 2011; Hammer et al., 2014). While evidence from monolingual children suggests that the rate of language development is related to the amount of speech children hear (Hoff, 2006), studies that examined the influence of first and second language input in bilingual infants at home (Hoff et al., 2012) and preschoolers at home and at school (Hammer et al., 2008) have found that L1 and L2 vocabulary development are related to the relative amount of input in each language.

One explanation is that DLLs who are exposed to two languages at home are likely to hear less of each language than monolingual children who only hear one. This, however, is challenging to generalize because a bilingual child could possibly receive more input in two separate languages than a monolingual child could receive in one (De Houwer, 2009). Still, on average, a monolingual English-speaking household is likely to expose their children to more English than English-bilingual households (Hammer et al., 2014). In sum, the amount of language exposure and language used by individuals on a daily basis is likely to affect bilingual vocabulary development at all ages. In particular, young DLLs with daily input and output in two languages are likely to gain proficiency in bilingual language performance (Bedore, Peña, Griffin, & Hixon, 2016). Documenting the bilingual language development and trajectories of children from the age of 4.5 to 12 years old, Mancilla-Martinez and Lesaux (2011)

confirmed that consistent language exposure was associated with advantages in their command of that language. Children exposed mostly to English exhibited the highest and most consistent levels of English vocabulary through the age of 12 years old, and using Spanish in the home did not necessarily interfere with English vocabulary development.

Reconceptualizing the way that languages exist in DLLs and are expressed by bilingual learners, García (2011) presents a notion of dynamic bilingualism, which moves away from the belief that multilingualism consists of parallel monolingualisms. Instead of compartmentalizing languages into distinct parts, dynamic bilingualism asserts that bilingual speakers access multilingual speech from one system (García & Woodley, 2013). From a vocabulary standpoint, this could suggest that DLLs who speak two languages might have a conceptual understanding of the vocabulary referent in this multilingual system, to which children can place two overlapping labels, one in each language. It could also suggest that while DLLs might understand one concept (e.g., mug) in their L1 and not their L2, they could also understand another concept (e.g., stapler) in their L2 and not their L1. Estimating DLLs' vocabulary knowledge combined across their two languages is referred to as their conceptual vocabularies (Pearson, Fernandez, Lewedeg, & Oller, 1997). Defined as the number of vocabulary concepts known in their two languages, studies demonstrate that the difference between monolingual and bilingual learners' conceptual vocabularies are the same (Junker & Stockman, 2002; Lundén & Silvén, 2011). Simultaneously, Hoff and

colleagues (Core, Hoff, Rumiche, & Señor, 2013) argue that conceptual vocabularies may not be as predictive of a DLL's vocabulary knowledge as their total vocabulary. The total vocabulary, defined as the sum of all vocabulary words known in the L1 *and* the L2, recognizes that in some cases, the concept or meaning of a vocabulary word may differ by language.

In practice, when bilinguals use language from their multilingual system, a process otherwise known as *translanguaging* (Creese & Blackledge, 2010; García, 2011; García & Wei, 2014), bilingual speakers use the multiple discursive practices that they naturally engage in every day to communicate fluidly across linguistic planes. Consistent with Cummins' (2000) common underlying proficiency theory that claims languages are not distinct entities, education scholars argue that translanguaging should be used as a pedagogical approach to allow multilingual students to use their languages to make sense of their learning. When students are empowered with access to their linguistic repertoire, learning becomes more meaningful (Creese & Blackledge, 2010; García, Flores, & Woodley, 2012; Woodley, 2015).

In this proposed study, educational media may serve as a platform that facilitates language transfer depending on the languages represented on screen, the languages spoken by the viewer (i.e., oral language), the concepts conveyed through vocabulary words, and the DLLs' varying levels of proficiency in each language.

Instructional Supports for L2 Vocabulary Development in DLLs

Although there is much to learn, studies are beginning to amass a set of instructional strategies that seem to promote vocabulary learning in DLLs (Buysse et al., 2014; Collins, 2010; Lugo-Neris et al., 2010; Takanishi & Le Menestrel, 2017). These strategies have been examined in a variety of contexts with DLLs from varying linguistic backgrounds. Recognizing vocabulary knowledge is central to literacy development in young DLLs, the following represents a growing consensus of best practices for dual language vocabulary instruction.

Studies provide evidence that DLLs are able to learn L2 vocabulary words when they are presented with clear and direct definitions (Carlo et al., 2004; Lugo-Neris et al., 2010). Moreover, studies suggest that rich explanations of these word meanings in either the L1 or L2 greatly benefit dual language vocabulary learning (Collins, 2010; Crevecoeur, Coyne, & McCoach, 2014; Lugo-Neris et al., 2010). Collins (2010) investigated the effects of a series of variables, including rich explanations, on DLLs' sophisticated vocabulary learning from storybook reading. In her study, rich definitions consisted of pointing to the illustration of the target word; providing a general definition of the word; providing a synonym; making a gesture of the word when applicable; and using the word in a context different from that of the book. Assigning 80 preschoolers to experimental (stories with rich explanations) and control (stories without explanations) conditions, she found that rich explanations made significant contributions to L2 word learning from stories. Likewise, Crevecoeur and colleagues (2014) recently conducted an

18-week vocabulary storybook intervention with DLL and non-DLL kindergarteners, finding that when participants were provided with student-friendly definitions of target words, anchor pictures, multiple exposures, and systematic review of the words, DLLs were likely to perform equally well on posttest target word and general receptive vocabulary measures as their non-DLL counterparts. In sum, findings from current research suggest that direct and explicit instructional supports may provide DLLs with a foundational understanding of new words, which can serve as scaffolds. Scaffolds are critical in dual language development because they reflect students' zones of proximal development and guide learners towards deeper understandings of new words (Vygotsky, 1980).

Another potential scaffold in dual language learning is the use of a child's mother tongue or L1 in classroom instruction (Durán, Roseth, & Hoffman, 2010; Durán, Roseth, Hoffman, & Robertshaw, 2013; Durán, Roseth, & Hoffman, 2015) and vocabulary teaching (Collins, 2010; Farver, Lonigan, & Eppe, 2009; Gutiérrez-Clellen, Simon-Cereijido, & Sweet, 2012; Lugo-Neris et al., 2010; Méndez, Crais, Castro, & Kainz, 2015). In 2000, Gersten and Baker stressed the importance of strategically using a child's native language to support second language vocabulary development. Substantiating Cummins' (1979) theory of linguistic interdependence, Collins (2010) and Lugo-Neris et al. (2010) found that explaining vocabulary words in the L1 and initial L2 vocabulary levels contributed to DLL L2 vocabulary development. More specifically, Lugo-Neris

and colleagues (2010) conducted a vocabulary intervention with 22 Spanish-English bilingual children who received a shared storybook reading in two conditions. In one condition, the book was read entirely in English (L2) with vocabulary words explained in the target language. Children were asked to repeat the vocabulary word in English and were then given three semantic features of the word in English. In the experimental condition, all aspects of the shared storybook reading experience were the same except that semantic explanations of the words were provided in Spanish (L1). Findings revealed that children performed significantly better in English expressive vocabulary measures than those without the mother tongue supports. Children in *both* conditions, however, benefited in English vocabulary naming and receptive vocabulary knowledge measures. Moreover, initial language proficiency in a child's L1 and L2 was associated with L2 vocabulary gains where those with higher language proficiency benefited more than those with lower language proficiency. This suggests that when children draw from their full linguistic repertoire, they are likely to learn words in a new language.

While consensus on how to *strategically* use a home language in instruction remains unclear, researchers demonstrate the benefits of providing children with rich explanations of challenging words in their native language (Farver et al., 2009; Gersten & Baker, 2000; Méndez et al., 2015; Uchikoshi & Maniates, 2010). Moreover, using vocabulary approaches that are culturally and linguistically relevant to the background experiences of DLLs does demonstrate

positive gains in L2 vocabulary learning. For example, Méndez and colleagues (2015) recently examined the role of language in vocabulary instruction to promote English vocabulary in preschool-aged Latino DLLs ($N = 42$). Children were assigned to treatment and control condition where vocabulary instruction was presented in English or used a bilingual modality. Adults presented 30 English words in small-group shared readings 3 times a week for 5 weeks. Children who received vocabulary instruction in the bilingual modality had significantly higher posttest scores, adding to the literature on the importance of using a child's mother tongue or L1 in the classroom.

Visual supports, which include visual representations of vocabulary words, illustrations, demonstrations, or multimedia, can serve as essential scaffolds for dual language vocabulary learning. The need for visuals is apparent in a number of successful interventions in early childhood settings, suggesting that visuals provide DLLs with the supports needed to make core content comprehensible (Leacox & Jackson, 2014; Silverman & Hines, 2009; Takanishi & Le Menestrel, 2017). Silverman and Hines (2009) compared DLL and non-DLL populations to understand how traditional and multimedia-enhanced vocabulary instruction differentially affected learners. Multimedia-enhanced instruction involved short, 5-minute video clips that were topically related to the storybooks and provided rich visual representations of target words. Findings demonstrated that these visual representations scaffolded vocabulary instruction for DLLs, providing them with significant gains in vocabulary knowledge that

were unique to the DLL population. Similarly, using a within-subjects design on 24 Spanish-speaking preschoolers and kindergarteners, Leacox and Jackson (2014) used technology-enhanced e-books that pictured target words on one side of the screen and provided a short definition of the word in Spanish when clicked. These pictures appeared three times for each target word throughout the e-book, and yielded more word learning gains than in the control, adult storybook reading condition. Studies like these argue that having access to the meaning of new words through visual scaffolds helps reinforce vocabulary concepts, deepen vocabulary knowledge and support oral language development in young DLLs (Gersten & Baker, 2000; Leacox & Jackson, 2014; Silverman & Hines, 2009; Takanishi & Le Menestrel, 2017).

Studies are also beginning to show that when DLLs interact and engage with new vocabulary words, they are likely to learn them as well (Buysse et al., 2014; Hammer et al., 2014; Restrepo et al., 2013). A study by Restrepo and colleagues (2013) created a vocabulary intervention for 202 young DLLs with language impairments that repeatedly used dialogic reading and hands-on activities for children to interact with new words. These interactive activities included story retelling, predicting, writing vocabulary words, and story acting. Research assistants engaged children in dialogic reading by pointing to words in sets of pictures or objects, producing words and definitions through questioning in a script, and using words in sentences through scripted play. Children with language impairments were assigned to one of four conditions: bilingual

vocabulary, English-only vocabulary, bilingual mathematics, English-only mathematics. A control group of 54 typically developing DLLs received no intervention at all. Results indicated that children in the bilingual vocabulary condition demonstrated significantly higher gains in receptive and expressive Spanish and conceptual vocabulary than all other groups. There were no significant differences in English vocabulary between the two vocabulary conditions. Moreover, compared to the control group, researchers noted that the hands-on activities and dialogic reading embedded in the vocabulary intervention facilitated vocabulary acquisition. These activities provided learners with a variety of semantically rich contexts as well as multiple L1 and L2 opportunities to practice the new target words and establish semantic associations. Each activity scaffolded learning by providing challenging experiences for DLLs to apply and use the new words they had learned.

Finally, repetition or repeated practice is a commonly used instructional tool that may also facilitate vocabulary learning in DLLs. Studies show that frequent exposure to vocabulary words has the potential to provide DLLs with multiple representations of words that reinforce core concepts over time (Carlo et al., 2004; Collins, 2010; Lugo-Neris, 2010). Learners should encounter target words multiple times, in diverse contexts, and with varying tasks required of learners (Beck, McKeown, & Omanson, 1987). In a study conducted by Carlo and colleagues (2004), researchers created a vocabulary intervention to enhance fifth-graders' academic vocabulary. The intervention used general-purpose academic

words (Beck et al., 1987) and engaging texts (Wigfield & Guthrie, 2000) that teach words in meaningful contexts (Nation, 2001). Texts were available in Spanish to support comprehension for bilingual learners and focused on word depth, polysemy, morphological structure, cross-language relationships, spelling, and pronunciation. Importantly, the intervention introduced vocabulary words to learners repeatedly, recycling words with each text and theme to expose children to them with high frequency. Children in the intervention group demonstrated greater growth in word knowledge, understanding multiple meanings, and reading comprehension compared to the control group. Moreover, components of the intervention collectively scaffolded vocabulary learning for monolingual and bilingual fifth-graders. In line with the literature, this study suggests that repetition may be an important scaffold for L2 vocabulary learning because words are revisited over consecutive days and across content areas, with opportunities for DLLs to apply their vocabulary knowledge in a variety of contexts (Carlo et al., 2004; Takanishi & Le Menestrel, 2017).

Language of Instruction to Support L1 and L2 Vocabulary Development

One of the longest debated issues in the field of bilingual education is whether or not educators should use a child's home language in instruction (Goldenberg, 2013). Proponents of home language instruction advocate for teaching academic and content skills (e.g., mathematics or science) using the home language (e.g., Spanish in the United States) in a school environment where the home language is otherwise not used (e.g., English in the United States).

Providing children with opportunities to learn content in their home language facilitates home language maintenance, promotes bilingualism, and provides children with a solid language and literacy foundation in their home language to support academic skill development in a new language (Cummins, 1991; García, 2011). Opponents of home language integration, on the other hand, argue that minimizing exposure to the target language of school delays children's second language development and does not set them up for success in a school system that does not privilege the home language (e.g., English in the United States). Because school systems in the United States prepare children for English-speaking universities and the English-speaking workforce, debates surrounding bilingual education are often framed with English language outcomes as the main goal. Yet, one uncontested benefit of bilingual education programs is home language maintenance or dual language literacy development.

Meta-analyses in the past two decades reveal that when DLLs learn to read in their home languages, their reading skills in English largely show significant gains. These studies generally conclude that using the home language in reading instruction better prepares children to read in English compared to DLLs who learn to read in English immersion environments without home language instruction (August, Shanahan, & Escamilla, 2009; Greene, 1997; Lindholm-Leary, 2001; Slavin et al., 2011; Takanishi & Le Menestrel, 2017). Despite these findings, however, Goldenberg (2013) notes that the effect sizes of these meta-analyses are relatively small. In other words, while bilingual education or home

language instruction might show gains in the English language outcomes of DLLs, these gains are generally 12 to 15 percentile points higher than children in control conditions. On the one hand, these percentile points are important steps for bilingual education as children do not only demonstrate gains in the English language, but also develop literacy in their home language. On the other hand, considering the costs required to train and implement high-quality bilingual education programs in schools, opponents of bilingual education may not consider 12 to 15 percentile points a worthwhile tradeoff.

Still, the United States has seen a proliferation of dual-language programs or two-way immersion schools, with numbers growing from approximately 260 programs in the year 2000 to an estimated 2,000 programs in 2011 (Wilson, 2011). Two-way programs, defined as classrooms that include students from two different language backgrounds learning in and through both languages, provide instruction in two languages. Although dual-language programs were initially designed for language minority speakers to acquire English, these programs now extend to native English speaking students with the goal of becoming bilingual, bi-literate individuals. In two-way programs, the language of instruction is alternated in different ways. First, co-teachers might speak different languages and adopt the 'one teacher, one language' model. Second, language of instruction might be broken down by time where languages are alternated by days (e.g., Monday in English, Tuesday in Mandarin) or within the day (e.g., mornings in English, afternoons in Mandarin). Third, programs might provide language of

instruction by subject where English may be used to teach mathematics, and Spanish used to teach social studies. The ultimate purpose is for children to be equally exposed to both languages and required to use these languages in different contexts.

An additional consideration of dual-language education is duration: How long should children be placed in dual-language education programs? To promote long-term bilingualism in schools, literature advocates for schools to adopt additive programs that maintain two languages consistently throughout a child's years of schooling, rather than adopting subtractive models that transition children from their home language to an English-only environment (Menken & Kleyn, 2010). This means that schools should consider additive bilingual programs that maintain instruction in two languages for at least six years, despite many programs around the world transitioning to subtractive models after four years of schooling (Benson & Wong, 2015, 2019; Heugh, 2012; Heugh, Benson, Yohannes, & Bogale, 2012; Thomas & Collier, 1997, 2002; Walter & Davis, 2005).

With these findings, the language of instruction debate is relevant to multimedia environments. Presented with opportunities to be immersed and engaged with educational programs that use specific languages, media has the potential to provide young viewers with ample exposure to a target language. One of the affordances of media programs is that specific episodes can be viewed recurrently, offering children repeated exposure to a target language, and using

prior knowledge from earlier viewings to scaffold understanding of the content and language on screen. Theorizing how children learn best from screens, Mayer (2002) presents 12 principles of multimedia learning, asserting that specific principles on screen (e.g., modality, temporal contiguity, image) reduce the cognitive load required to process new information on screen (see Figure 1 for Mayer's principles). While these principles holistically examine how viewers approach content on screen, they do not take into consideration the language of instruction. Yet, if the language of instruction aligns with the dominant language of children, the cognitive load required to process the content of screens is also reduced. As such, future studies may consider the role that the language of instruction plays in multimedia contexts.

Principle	Purpose
Coherence Principle	People learn better when extraneous words, pictures and sounds are excluded rather than included.
Signaling Principle	People learn better when cues that highlight the organization of the essential material are added.
Redundancy Principle	People learn better from graphics and narration than from graphics, narration and on-screen text.
Spatial Contiguity Principle	People learn better when corresponding words and pictures are presented simultaneously rather than successively.
Segmenting Principle	People learn better from a multimedia lesson is presented in user-paced segments rather than as a continuous unit.
Pre-training Principle	People learn better from a multimedia lesson when they know the names and characteristics of the main concepts.
Modality Principle	People learn better from graphics and narrations than from animation and on-screen text.
Multimedia Principle	People learn better from words and pictures than from words alone.
Personalization Principle	People learn better from multimedia lessons when words are in conversational style rather than formal style.
Voice Principle	People learn better when the narration in multimedia lessons is spoken in a friendly human voice rather than a machine voice.
Image Principle	People do not necessarily learn better from a multimedia lesson when the speaker's image is added to the screen.

Figure 1. Mayer's (2002) 12 principles of multimedia learning

Educational Media Supports for Vocabulary Learning

Many scholars agree that multimedia is an appropriate platform to provide L2 vocabulary instruction to DLLs (Silverman & Hines, 2009; Uchikoshi, 2006; Verhallen et al., 2006; Wong & Neuman, 2019). Media can serve as an opportunistic vehicle that delivers lessons in early literacy to far-reaching households. It also provides unique opportunities for young learners to repeatedly watch educational programs in a variety of informal contexts, reinforcing lessons learned with each viewing. The following section reviews the literature of learning vocabulary from media, beginning with studies conducted on monolingual learners and concluding with the more recent literature on Dual Language Learners.

Instructional Supports for Vocabulary Development in Educational Media

Monolingual learners and educational media. From as early as 1988, researchers have investigated the effects of television watching on vocabulary learning for children. In one seminal study, Rice and Woodsmall (1988) explored the relationship between vocabulary learning and television viewing by honing in on how learning was influenced by the children's age, their vocabulary level, and the type of words introduced on television. In an experimental setting, children viewed a 15-minute educational television program with 20 novel words that were taught with a voiceover. Results demonstrated that children in the experimental group responded better than the control group in recalling words related to objects, actions, and attributes. Aligned with Paivio's (1986) dual-coding theory,

findings from this study affirm that videos with added 'verbal supports' like the voiceover in this experiment may be conducive to vocabulary learning in young children.

In another study, Rice, Huston, Truglio, and Wright (1990) examined the effects of viewing television at home on the vocabulary development of young children. In two cohorts of preschool children aged 3 (N = 160) and 5 (N = 166), researchers collected five sets of weekly diaries over the course of two years, documenting their television viewing habits. Findings demonstrated that the frequency of *Sesame Street* viewing was associated with higher scores on a receptive vocabulary measure and that the word gains were stronger for the younger cohort of children. These two early studies are necessary because they showed that television could be educational with the ability to facilitate vocabulary learning regardless of parent education, family size, child gender and parental attitudes. Secondly, researchers speculated that vocabulary gains were favorable due to *Sesame Street's* use of formats and production techniques that elicit viewer participation and mental activity. Like Neuman's (1997) theory of synergy suggests, these studies support the proposition that specific attention-drawing techniques on screen such as voiceovers, songs or subtitles, may enhance how well children can learn vocabulary from screens.

Shifting to the current landscape of literature, scholars continue to investigate how to best support children's vocabulary development through media. In a recent meta-analysis, Marulis and Neuman (2013) analyzed 67 studies

on early intervention work in vocabulary development to determine the pedagogical features associated with the greatest effects on vocabulary learning. They reported an overall average effect size of .88, representing vocabulary gains of nearly one standard deviation. Findings from a subsequent narrative analysis demonstrated that exposing preschool-aged children to educational media supports was one of the most effective instructional tools because it successfully combined explicit and implicit instruction and provided multiple opportunities to learn words in isolated and meaningful contexts.

Nonetheless, though researchers establish the potential of learning vocabulary from media, not all educational media are created equal. Content analyses of educational programs for children aged 0-4 years old reveal marked differences in educational value between programs (Linebarger, Brey, Fenstermacher, & Barr, 2017; Vaala et al., 2010; Wong & Neuman, 2019). Vaala and colleagues (2010) explored language-promoting teaching strategies in 58 DVDs for children under the age of three-years-old. They found that when the producers of DVDs made claims that content would enhance the language skills of viewers, programs were more likely to have verbal labels of new vocabulary content, onscreen print, and video-enhancing production techniques such as sound effects and audience elicitation. Episodes from the other programs were less likely to have these features.

More recently, Wong and Neuman (2019) carefully examined the screen-based pedagogical supports for vocabulary development in educational media

programs that catered to DLLs. Although many programs claim to teach specific early literacy skills like alphabet/letter sound knowledge and vocabulary development, Wong and Neuman conducted a content analysis to examine *how* they might do so, moving beyond educational claims to actual pedagogical practices. Selecting five bilingual programs that featured bilingual main characters and consistently incorporated both English and a partner language in the narrative, researchers found that the most prevalent screen-based pedagogical supports used to teach L1 and L2 vocabulary included repetitions, visual supports, and demonstrations. However, there were noteworthy differences in the types of supports by program and language.

Despite these differences, research continues to investigate the specific mechanisms that drive learning from screens. More specifically, researchers are interested in the influence that production techniques used in educational screen media might have on children's viewing behaviors (Flynn, Wong, Neuman, & Kaefer, 2019; Huston & Wright, 1983; Kirkorian & Anderson, 2008). Production techniques, also known as formal features, include the use editing techniques (e.g., zooming and pacing) and character features (e.g., cartoons, muppets, or humans) that guide children's attention to specific areas of a screen where they are rewarded with important, entertaining, and/or comprehensible content (Huston & Wright, 1983).

Importantly, these rewards are not necessarily for educational purposes. Formal features may successfully capture children's attention, but do not

intentionally differentiate between what is educationally relevant and what might be a source of entertainment (Kirkorian & Anderson, 2008). Rather than indicating to viewers when a learning experience is about to occur on screen, or when information presented on screen is particularly important, children's attention and receptivity to media programs may be an opportunity lost. Extending this research to examine features that might uniquely direct children's attention towards educational content, recent studies are investigating *screen-based pedagogical supports* that intentionally elicit children's attention and convey pedagogical intent. Like formal features, screen-based pedagogical supports engage children in sustained visual attention. Attention, however, is linked to pedagogical content, helping children develop an extensive understanding of new words and their meanings (Danielson, Wong, & Neuman, 2019; Neuman et al., 2019; Wong & Neuman, 2019).

Dual Language Learners and educational media. Shifting attention from studies conducted with monolingual learners, scholars are beginning to examine how children from linguistically diverse backgrounds might learn vocabulary in a new language from educational media. While some studies work specifically with DLL populations, other scholars use a mixed sample of DLLs and non-DLLs and use English language proficiency to understand any differential effects that media might have on children's learning. In a two-part study, Neuman and colleagues (2019) examined the landscape of literacy-related streamed videos and the features that supported vocabulary learning on screen. After identifying specific

screen-based pedagogical cues, the team used eye-tracking technology to investigate whether these pedagogical supports predicted children's ability to identify vocabulary taught on screen. Many of these children came from linguistically diverse backgrounds, speaking Spanish or Haitian Creole at home.

Using a weighted sample of 200 episodes from an original corpus of 4,565 episodes, the research team identified two major categories of pedagogical supports: ostensive and attention-directing cues. Ostensive cues provided the meaning of vocabulary words through definitions, multiple exemplars, and repetition. Referred to as 'direct teaching' by video producers (Lesser, 1972), ostensive cues make the learning goal salient to the viewer by telling and showing it to them, often with repetition. On the other hand, attention-directing cues helped direct children's attention toward the target word. Unlike formal features, these cues were strategically used to support vocabulary learning on screen. For example, when teaching the word 'cactus,' an image of a cactus might appear on screen followed by a chiming sound effect to draw children's attention to the educational content on screen.

In this mixed sample of DLLs and non-DLLs, eye-tracking data demonstrated that children looked more at the overall screen when ostensive cues were presented. As children were looking on the screen, attention-directing cues drew children's attention to vocabulary learning experiences, which predicted word identification. Running another analysis using the English language proficiency of children, measured by the PPVT-IV (Dunn & Dunn, 2007),

researchers found no main effect for the type of cue, but did find that children with higher PPVT scores were more likely to benefit from the attention-directing cues than ostensive cues. In contrast, there were no differences in cue type for children with lower PPVT scores. This suggests that children with higher receptive language skills in English were able to use attention-directing cues more effectively to identify words than children with lower English language skills. Although the sample in this study did not consist entirely of DLLs, findings do suggest that media might have a differential impact on children with varying levels of English language proficiency. Like monolingual speakers of English, DLLs also come to schools with varying levels of English language proficiency (Luk & Bialystok, 2013).

Nonetheless, multimedia-enriched instruction that uses video with sound effects, visual effects, and other attention-directing cues is associated with vocabulary gains in young DLLs (Silverman & Hines, 2009; Verhallen, Bus, & de Jong, 2006). Silverman and Hines (2009) conducted a study that examined multimedia instruction on vocabulary outcomes in DLL and non-DLL preschoolers. They compared traditional (verbal input) and multimedia-enhanced vocabulary instruction (verbal/nonverbal input) with a total of 85 students and eight teachers. Students underwent two intervention conditions: one with multimedia and one without. These interventions were implemented as 45-minute scripted lessons, three days a week for 12 weeks. Before and following the intervention, students were assessed on knowledge of target words from the

intervention, general vocabulary knowledge, and knowledge of science concepts taught in the intervention. Results showed that there was no added benefit for monolingual students who participated in the multimedia intervention. On the other hand, there was a positive effect on the vocabulary gains of DLLs in both the target words and general vocabulary knowledge assessments. The authors suggest that in the bilingual classrooms, the multimedia-enhanced intervention contributed towards closing the gap between DLL and non-DLL students in target words and general vocabulary. Moreover, multimedia clips may be an effective way of integrating technology into the classroom with short, focused clips of vocabulary instruction for children to learn from.

Similarly, Verhallen and colleagues (2006) investigated the influence of multimedia features on L2 reading progress in kindergarteners. Children spoke Dutch as a second language in the Netherlands. Researchers compared kindergarteners in a control group who read a static book, with children in an experimental group who watched a copy of the same book on a computer that contained zoom shots and other multimedia effects (e.g., sound). Substantiating Neuman's (1997) theory of synergy, researchers found that attention-directing cues facilitated gains in L2 comprehension and L2 vocabulary in the experimental group. Together, these studies suggest that educational media may be an opportunistic platform to develop L2 vocabulary and comprehension in young DLLs, which can, in turn, lay a foundation for literacy development in two languages (Uccelli & Páez, 2007).

Moreover, considering the environment in which DLLs view and learn from educational media, Uchikoshi (2006) investigated the impact of home and school viewings on vocabulary growth. She recruited 150 Spanish-English bilingual kindergarteners who watched *Between the Lions*, an educational television program that emphasized literacy skills, or *Arthur*, another educational program that emphasized problem-solving and decision-making skills more than literacy. For three days a week over the course of one school year, bilingual kindergarteners were assigned to watch either *Arthur*, *Between the Lions* or no video in school. Similar to a study on monolingual students (Linebarger, Kosanic, Greenwood, & Doku, 2004), Uchikoshi found that educational media was not associated with vocabulary learning in school settings. However, she did find that there was a relationship between vocabulary scores and home viewings whereby students who watched *Arthur* at home improved in their expressive vocabulary, while those who watched *Between the Lions* at home improved in both expressive and receptive vocabulary.

Although the studies mentioned may show a positive trend in the use of multimedia to enhance vocabulary development among emergent bilinguals, the most recent and relevant study implemented by Silverman (2013) yields different results. In her article, Silverman conducted two studies on the role of video in vocabulary learning in kindergarten classrooms with a mix of monolingual and bilingual students in each class. In the first study, Silverman compared the effect of video viewing and listening to books (non-video viewing) on vocabulary

learning ($N = 78$). Contrary to the Verhallen et al. (2006) study, there was no significant difference in vocabulary learning between the two groups. In light of these results, Silverman couches her findings with a few limitations that include the small-scale and quasi-experimental nature of the study. The second study ($N = 89$) compared the effect of repeated video viewing and single video viewing on vocabulary learning. Interestingly, while there was no difference between the two groups on the receptive vocabulary measure, children in the repeated viewing group yielded higher gains on the expressive vocabulary measure. Silverman found that expressive vocabulary was better learned through media than receptive vocabulary, reinforcing the need to capture vocabulary knowledge with varying methods (Silverman, 2013; Uchikoshi, 2006).

Contexts for Vocabulary Learning in Media

This review of the literature has thus far examined the specific on-screen supports that might enhance vocabulary learning in young children. The next section examines how instructional contexts on screen might also promote vocabulary learning, focusing on the genres of pedagogical supports on screen.

Educational media shows great promise in providing DLLs with viewing experiences that promote vocabulary learning in a new language. Despite this promise, few studies have examined how these vocabulary words are contextualized in the structure of a story. When children view educational media, they learn about words that are presented in distinct contexts. In a study by Clifford, Gunter, and McAleer (1995), educational programs were labeled *drama*,

factual, or *entertainment*, which presented learning opportunities in ways that were unique to each context. Linebarger and Piotrowski (2010) describe these genre differences in media as macrostructures that deliver content to children in different ways. Using Clifford and colleagues' (1995) study as an example, "drama" would refer to a narrative macrostructure with a clear setting, character, climax, and resolution; On the other hand, "factual" would be an expository macrostructure designed to present information using strategies like cause and effect. Examining the influence of macrostructure, Linebarger and Piotrowski (2010) found differential effects on vocabulary gains and comprehension with low-income elementary-aged students. Unsurprisingly, the narrative macrostructure yielded significantly higher results in vocabulary and comprehension than the expository macrostructure. The authors suggested that narrative macrostructures might be less cognitively demanding because they reflect the everyday narrative-dominant experiences that children are immersed in.

Still, if children view media and learn vocabulary words within a narrative macrostructure, one could argue that it is more cognitively demanding to discern new words that are tossed between characters in dialogue as they are heavily contextualized within a narrative storyline. This might be particularly challenging for DLLs who need to process the same vocabulary learning presentations as non-DLLs in addition to the demands of speech unrelated to vocabulary words in a new language. At the same time, supports within the narrative microstructure

could potentially provide DLLs with topic-centered visual imagery and straightforward presentations of learning. In sum, it appears that the contexts for learning are not created equal on screen as some may facilitate word learning better than others for specific populations (Beck, McKeown, & McCaslin, 1983; Neuman, Flynn, Wong, & Kaefer, under review).

Consequently, an analysis of episode is a more fine-grained strategy to understand how a different context might affect word learning. A review of the literature demonstrates that researchers have used a variety of programs that provide learning experiences in a range of instructional contexts (Anderson et al., 2000; Larson & Rahn, 2015; Vaala et al., 2010). Each context shows promise in providing DLLs with rich vocabulary learning opportunities. First, Vaala and colleagues (2010) taught children vocabulary words using a narrative context. Researches provided an ostensive cue or definition of a target word as it was embedded within a narrative structure. *Martha Speaks* is an example of this context where target words are repeated throughout an episode, and the definitions are revealed in back-and-forth conversations between people. Conceivably, narrative contexts could provide DLLs with a robust understanding of new words as they are presented multiple times in contextualized and meaningful situations.

Researchers have also selected videos that adopt an expository context, which uniquely directs children's attention to a specific vocabulary word (Larson & Rahn, 2015; Linebarger, Kosanic, Greenwood, & Doku, 2004). DLLs might

benefit from words taught in this context because it makes explicit the learning opportunity and is not embedded within a conversation like the narrative context. Larson and Rahn (2015) conducted a content analysis of vocabulary learning experiences on Sesame Street's *Word on the Street* program, a program that exemplifies an expository approach. Researchers used five vocabulary instructional strategies to code 96 episodes and found that exposing children to a word, using examples, and providing non-examples were the most salient supports in these programs. These are examples of expository supports because a muppet appears at the beginning of the program to explicitly introduce a new vocabulary word (i.e., the word on the street). The muppet also interviews people in the community to provide specific examples or synonyms of the word and also features the word through scaffolds of imagery and onscreen print.

A final context for vocabulary learning is participatory, which engages directly with the audience in the educational context (Anderson et al., 2000; Strouse, Troseth, O'Doherty, & Saylor, 2018). In the participatory context, characters use social communicative cues to speak directly to viewers, often facing the camera and directing their eyes to the lens to engage the audience in eye contact. Asking a question about a vocabulary word (e.g., "Choose the salt shaker"), the character pauses to wait for the viewer to respond to the screen in a covert or overt manner. Prominent examples of this context include *Blue's Clues, Bubble Guppies,* and *Dora the Explorer.* DLLs might benefit from participatory contexts because they mimic real-life conversations that can attract and direct

children's attention towards relevant or salient information. Exaggerated prosody, establishing joint attention, or eliciting a response from viewers are all methods to help children focus on new word and content related to word meanings (Csibra & Gergely, 2006, 2009).

Nevertheless, although researchers use programs in a variety of contexts, there is a dearth of evidence on how these different contexts might affect word learning. In a small-scale study, Krcmar and Cingel (2017) compared a participatory model where characters spoke directly to children with a third-party joint attention model where children overheard two characters speaking to one another. Working with 2 to 3-year-old children, researchers found that participatory cues more effectively taught children the label *toma* to a new object than with third-party joint attention. This recent study suggests that the context may affect word learning. Still, direct comparisons between contexts have not been examined, particularly with DLL populations who might benefit from additional or compensatory scaffolds inherent in a particular context.

Limitations of Prior Work and Purpose of the Proposed Study

This literature review examined two very distinct fields of scholarship that converge to illuminate the potential of educational media for promoting L1 and L2 vocabulary to DLLs. The first corpus of work investigates how DLLs learn vocabulary in a new language and presents instructional supports that are substantiated by empirical studies. These studies elucidate best practices for vocabulary presentation in the classroom but do not turn to educational media as a

potential means for teaching vocabulary in a new language. Yet, national and international trends demonstrate that young children are on smart devices more than ever before, suggesting that media could be a powerful source of vocabulary instruction, particularly in the preschool years.

The second corpus of literature recognizes the potential of educational media to deliver high-quality instructional supports that might promote vocabulary in young learners. Through a series of content analyses and empirical studies that examine the effectiveness of screen-based pedagogical approaches on vocabulary learning, researchers in education, applied psychology, and media are beginning to identify the mechanisms that make learning from screens so powerful. Still, there is a dearth of studies that apply these principles of screen-based supports to DLL populations. Despite the increasing linguistic diversity that we currently experience in homes and schools across the nation, research has only begun to examine how educational media might support vocabulary learning in a new language. While some studies make important comparisons between DLL and non-DLL populations, media research has yet to draw from the literature in L2 vocabulary instruction to design programs that uniquely impact children learning a new language. Moreover, drawing from theories of language transfer that recognize the importance of using children's languages as a resource in vocabulary instruction (Ruiz, 1984), educational media has the potential to incorporate multiple languages to teach children new words.

In response, the overarching goal of this proposed dissertation is to understand how educational media can be optimized for the DLL population. Previous studies examine how educational media might facilitate vocabulary learning in young children, focusing on specific pedagogical supports on screen (e.g., using repetition and visual representations) that might promote learning. However, this has not been examined with dual language viewers despite the theories of language learning that suggest media might provide DLLs with specific visual, auditory, and linguistic scaffolds to teach vocabulary words in a new language. In this dissertation, I approach these limitations in the research from three different perspectives, investigating how the specific screen-based pedagogical supports, the instructional contexts for vocabulary learning, and the language of instruction on screen might influence vocabulary learning among DLLs. The following research questions guide the dissertation:

1 a. To what extent do screen-based pedagogical supports affect vocabulary learning in young DLLs?

b. How do effects of screen-based pedagogical supports on vocabulary learning differ by children's L2 language skills?

2 a. To what extent do certain genres (participatory, narrative, expository) affect vocabulary learning in young DLLs?

b. How do effects of genres on vocabulary learning differ by children's L2 language skills?

3 a. To what extent do DLLs learn L1 and L2 vocabulary through educational media?

b. How do the language of instruction and language of definitions in a child's L1 or L2 affect L1 and L2 vocabulary learning in DLLs? How might this vary according to a child's dominant language?

c. How do the language of instruction and language of definitions support longer-term retention of vocabulary knowledge in the L1 and L2?

CHAPTER III

SCREEN-BASED PEDAGOGICAL SUPPORTS STUDY

Research Questions

The purpose of this first study is to examine how specific pedagogical approaches used in educational media might facilitate L2 vocabulary learning in preschool-aged DLLs. I use ostensive (definitional) and attention-directing pedagogical supports to understand the extent to which screen supports might influence vocabulary learning among DLLs with differing levels of exposure to the English language. The research questions guiding this study are:

1. To what extent do screen-based pedagogical supports affect L2 vocabulary learning in young DLLs?
2. How do effects of screen-based pedagogical supports on vocabulary learning differ by children's exposure to English (L2)?

Method

Research Design

I used a within-subjects design to examine how screen-based pedagogical supports affect L2 vocabulary learning in young DLLs. In a within-subjects design, each participant received all conditions (4: definitions, repetitions, visual effects, and sound effects) and served as their own control. In this study, the

within-subjects variable was the pedagogical support used to teach a vocabulary word. I selected a within-subjects design for a number of reasons. First, I was able to control for between-subjects variability because students received all conditions. This helped reduce error and increase power to detect potential differences between conditions. It also allowed me to conduct the study with a smaller sample of children. A G*Power analysis indicated a sample size of 45 children would allow me to detect a small effect of .15 at an alpha level of .05 and power of .80 (Faul, Erdfelder, Lang, & Buchner, 2007). Second, by adopting a within-subjects design, threats of a carry-over effect were minimized because twelve different video clips were examined. Lastly, using a within-subjects design helped account for significant threats to internal validity because participants served as their own controls.

Children were presented with all four conditions in this within-subjects design, with three videos in each condition. Children, therefore, viewed a total of twelve video clips. To account for order effects and fatigue, pedagogical support conditions were counterbalanced and placed into three different sequences. Each sequence contained three blocks of videos to allow for short stretch breaks and to minimize fatigue. Each block of videos included one of four pedagogical conditions. Children were then systematically assigned to a set of three sequences of videos in counterbalanced fashion. Children were assessed on the vocabulary words after each block of videos.

An assumption underlying a within-subjects design in the current study is that all aspects of the video stimuli are equivalent with the exception of the pedagogical support. To make video clips comparable to one other, I controlled for the following criteria: video length, word selection, and word repetitions. These are described in greater detail in the "Video Stimuli" section.

Sample

The sample consisted of four- to five-year-old children from 12 classrooms in two Head Start preschools in the northeast region of the United States. All children in these centers qualified for free and reduced lunch. To be eligible for this study, children needed to be dual-language learners (DLLs), defined as children from households where a language other than English is spoken. The majority of DLLs in the two Head Start preschools come from households where Spanish- or Haitian-Creole are spoken. With the help of the education director and teachers from these two classrooms, 55 children were specifically invited to participate in the study as they met the eligibility criteria. Parents were given English-Spanish bilingual consent forms, of which 53 (96.4%) provided consent. After an expressive vocabulary screening measure, two participants were not included in the study because they knew vocabulary words used in the study. The final sample consisted of 51 children (45.1% female) with an average age of 55.39 months (SD = 6.48). Moreover, 75.5% of the sample

came from Spanish-speaking households and 24.5% came from households that spoke Haitian-Creole. Household income was not collected.

To examine children's English language proficiency, the Peabody Picture Vocabulary Test (PPVT-IV) was administered as a pretest. The PPVT measures general receptive vocabulary knowledge; the average standard PPVT score of children in the sample was 82.76 (SD = 13.0), indicating the English vocabulary of the sample was approximately one standard deviation below the monolingual norm. In addition to the PPVT pretest, a Language Environment Questionnaire (LEQ) was provided to parents on the original consent form. The LEQ was adapted from the Alberta Language Environment Questionnaire (Paradis, 2011) and a bilingual questionnaire developed by Luk and Bialystok (2013). The purpose of the LEQ was to better understand the English (L2) language environment of the home. It consisted of questions that asked parents to rate children's exposure to English on a five-point scale from 0% exposure to 100% exposure. It also asked parents to self-report their English language proficiency on a five-point scale, and surveyed the language and literacy activities (e.g., reading, singing, watching TV) that children engaged in at home in English. The maximum score on the LEQ was 4. The English composite score of the sample was 2.5 (SD = 1.4), indicating children came from households where English was not consistently spoken or used.

In addition, the LEQ was used as a screening measure for children who had an emergent level of English (L2) as they would unlikely comprehend

English video clips with vocabulary words that were presented and defined entirely in English. Children were screened before consent forms were handed out as teachers used the LEQ to identify children who were eligible for the study. From the 12 classrooms at the two Head Start centers that served approximately 180 children, only 53 (29.4%) of the students were invited by teachers to participate in the study as they were screened by age, home language, and language environment. Children with IEPs were also not included in the study.

Table 2

Descriptive Statistics and Demographics of Full Sample (N = 51)

Variable	Characteristic
Female	45.1%
Age (months)	55.39 (6.48)
Age Span	48-64
Home Language	
Spanish	74.5%
Haitian Creole	25.5%
PPVT Standard Score	82.76 (13.0)
Language Environment Questionnaire (max = 4)	2.5 (1.4)

Measures

In this study, both standardized measures and researcher-developed measures were used to assess children's vocabulary knowledge. The following two pretests were used to collect a baseline measure of children's receptive language in English, and to serve as a screening tool for children in the study.

Peabody Picture Vocabulary Test-IV *(PPVT-IV; Dunn & Dunn, 2007).* The PPVT was used as a pretest to serve as a baseline measure for general English receptive vocabulary knowledge. It is an individually administered, norm-referenced test designed to measure receptive vocabulary knowledge. Children point to one of four images in an assessment book, which contains three foils. Reliability of the standardized assessment ranges from .91-.94. Participants' raw scores were converted to standardized scores according to each participant's age in months.

The PPVT assesses children's receptive picture vocabulary, but standardizes scores with normative samples of monolingual English speakers. While some studies adopt the Test de Vocabulario en Imágenes Peabody (Dunn, Padilla, Lugo, & Dunn, 1986) to standardize scores against Spanish-speaker norms, some scholars note that we have yet to find the most linguistically appropriate measures to assess the vocabulary of bilingual children (Leacox & Jackson, 2014). Meanwhile, a number of large-scale studies show that the English PPVT is a good predictor of academic skills for preschool-aged children whose

primary languages are Spanish or English (Burchinal, Field, López, Howes, & Pianta, 2012; Howes et al., 2008; Lugo-Neris et al., 2010).

Vocabulary screening measure. Prior to the study, each eligible child was administered an expressive vocabulary screening measure to determine whether they could participate in the study. The expressive vocabulary measure was a 20-item researcher-created assessment that included images of the 12 vocabulary words in the study. Eight picture foils were also included in the screening measure. Assessors showed children a picture of the vocabulary word on screen and asked them in English, "What is this?" Children's answers were noted. If participants knew any of the vocabulary words, they were not invited to participate in the study. In total, two children (3.8% of the sample that provided consent) were screened out of the study.

The following posttest measures were used to assess children's target word learning: a vocabulary in-context posttest, and a vocabulary in new context posttest. The two contexts for vocabulary knowledge are designed to reflect the incremental nature of vocabulary learning (Nagy, Anderson, & Herman, 1987; Nagy & Herman, 1987). Nagy and his colleagues argue that words are learned on a continuum from simple vocabulary knowledge to greater word understanding. Based on this research, I aimed to capture word learning in a simple vocabulary knowledge task of vocabulary in their original video context (in-context) and words in a new and unfamiliar environment (new-context). Cronbach's alpha for

the two measures were α =.61 for the vocabulary in-context measure, and α =.60 for the vocabulary in-new-context measure, indicating a moderate level of reliability. These researcher-created measures were also piloted before the study.

Vocabulary In-Context Measure. The receptive vocabulary in-context measure asked children to point to one of three images to identify vocabulary words based on their labels. To represent vocabulary words in their original video context, images included screenshot images from *Sesame Street* video clips with distractors from the same clip that were thematically related to the target word. For example, assessors would ask children to "Point to *grater*," which included screenshot images from the program of a grater, a mixing bowl, and a chef.

Vocabulary In-New-Context Measure. Similar to the in-context measure, the new-context vocabulary measure was a receptive vocabulary assessment. The new-context measure asked children to point to one of three images on screen. To represent vocabulary words in a new and unfamiliar context, images were real-life representations of the vocabulary words, with thematically related distractors of the target word. For example, assessors would ask children to "Point to *grater*," which included a photograph of a chef holding a grater, a chef holding a mixer, and a chef holding a spatula. Together with the vocabulary in-context measure, there were 24-vocabulary items with each vocabulary word assessed two times.

Video Stimuli

Videos were selected from *Sesame Street*, an educational children's program that equips young children with early literacy skills. *Sesame Street* was chosen because it includes explicit vocabulary learning episodes where the intent of specific segments is to provide viewers with rich vocabulary instruction. This program was selected from a content analysis of all preschool children's programming available on streamed platforms that provide opportunities for vocabulary learning (Danielson, Wong, & Neuman, 2019). In the content analysis, Danielson and colleagues identified eleven screen-based pedagogical supports that were used to strategically support vocabulary learning in a weighted sample of 200 episodes. In the current study, I used the four most prevalent screen-based pedagogical supports identified by Danielson and colleagues: clear and explicit definitions; repetition of target words; visual effects; and sound effects. While the content analysis examined pedagogical supports used in the media marketplace for all preschoolers, these pedagogical supports are also consistent with educational media programs marketed to promote L2 vocabulary development among bilingual preschoolers (Wong & Neuman, 2019).

In another content analysis by Neuman, Wong, Flynn, and Kaefer (2019), screen-based pedagogical supports were categorized as attention-directing cues and ostensive cues. Attention-directing cues are supports that intentionally draw children's attention to vocabulary learning episodes on screen. For example, a visual bubble or cloud might appear around the image of a target word, drawing

children's attention to this specific learning experience (i.e., visual effects support). Similarly, a sound effect such as a jingle or a bell could occur as a visual representation of a target word is described on screen (i.e., sound effects support). Ostenive cues, on the other hand, are verbal supports that provide viewers with definitions of vocabulary words through definitions, multiple exemplars, and repetitions. For example, in the middle of a conversation about subways, a character could pause and say, "A *subway* is an underground train" (i.e., explicit definitions support). Likewise, the word "*subway*" could be repeated multiple times between characters in a program to intentionally highlight the word and provide greater exposure of the word to viewers (i.e., repetitions support). The four screen-based pedagogical supports used in the current study are described in more detail in Table 3.

A total of 12 video clips were selected from the *Sesame Street* program that taught vocabulary words with visual representations of the words on screen. Each clip taught a vocabulary word using one of the four identified screen-based pedagogical supports; three vocabulary words per pedagogical support. In addition, only *Sesame Street* episodes were used to avoid a program effect as children would likely pay particular attention to programs they preferred.

Video clips were short and comparable in length, averaging 17.33 seconds per clip (SD = 2.77 seconds) (see Table 4). These vocabulary words had a similar level of difficulty according to the Child Language Data Exchange System (CHILDES) database (MacWhinney, 2014). The CHILDES database consists of

more than 5,000 transcriptions of adult-child spoken interactions in home and laboratory settings. With approximately 3,500,000 words in the database, frequency of words can be ordered as a function of age or mean length of utterance. Words selected in this study occurred infrequently in the utterances of 48-month-old children in the CHILDES database, indicating a word is less likely to be in the vocabularies of DLLs, as well as comparable in level of difficulty. Words were also consistent in English-Spanish cognateness with straightforward presentations of words.

When working with young children, Rice and colleagues (1990) selected words from media programs like *Sesame Street* that were conversational, repeated with emphasis, and avoided abstract terminology. Accordingly, I coded vocabulary words from the CHILDES database for level of abstractness (concrete = "clock"; somewhat concrete = "seconds"; abstract = "time") while looking at the visual representations of words on screen, and selected words that were concrete or somewhat concrete. Although challenging to select words that were perfectly comparable to one another, using a within-subjects design and counterbalancing children's exposure to each condition helped account for differences in word difficulty. Videos were also manipulated so that words were repeated three times in the three non-repetition conditions (i.e., explicit definitions, visual effects, and sound effects). In the repetition condition, vocabulary words were repeated six times in the program. Finally, video clips

were piloted in all four conditions prior to the study to ensure they were appropriate for preschoolers in this context.

Table 3

Screen-based Pedagogical Supports

Screen-based Pedagogical Support	Example
Attention-directing support	
Visual Effects	*Murray: What kind of tools are we going to use in the kitchen?* *Chef: We are gonna use a grater.* *[Picture of grater suddenly appears beside chef]*
Sound effects	*Abby: What do you have in your hands, Elmo?* *[Shimmering sound occurs just before Elmo says]* *Elmo: A pumpkin!*
Ostensive support	
Definitions	*Storekeeper: Now dusk is the time of day when it's getting dark outside and it's almost night time.*
Repetitions	*Elmo: What if Elmo was a sports guy? Someone who jumps and runs and throws?* *Curtain: Technically, that's called an athlete Elmo?* *Elmo: Thanks for the info! I'm an athlete!"* *Curtain: Yes, Elmo, some athletes run, some jump, and some athletes throw."*

Table 4

Details of Words Selected for the Study

Screen-based Pedagogical Support	Duration (seconds)	Sesame Street Program (Year Produced)	English Vocabulary Word	CHILDES
Explicit definitions (ostensive)	17	Wild Words and Outdoor Adventures (2011)	Shelter	0
	20	Being Brave (2013)	Comfort	0
	16	Firefly Fun and Buggie Buddies (2010)	Dusk	0
Repetition (ostensive)	20	Friends to the Rescue (2005)	Hurricane	0
	20	Be a Good Sport (2014)	Athlete	0
	20	C is for Cooking (2013)	Whisk	0
Visual effects (attention-directing)	14	Firefly Fun and Buggie Buddies (2010)	Caterpillar	10
	14	Abby in Wonderland (2008)	Key	20
	14	C is for Cooking (2013)	Grater	0
Sound effects (attention-directing)	19	Guess that Shape and Color (2006)	Square	12
	20	P is for Princess (2010)	Pumpkin	17
	14	Letter of the Month Club (2006)	Airplane	16

Procedure

Eligible participants ($N = 51$) were brought to a quiet room to complete the screening measure and PPVT pretest with a trained research assistant. After the PPVT, participants were assigned to one of three counterbalanced sequences of video clips and used headphones to watch the 12 short video clips. After piloting videos with young children, the 12 video clips were broken down into three blocks of four videos (one in each condition) to respond to the attention spans of DLLs in the sample. Children watched a first block of four video clips, followed by the in-context and new-context vocabulary knowledge assessments. After a short break, assessors administered a second and third round of video clips and vocabulary measures. The order of videos and respective measures were counterbalanced to prevent an order effect. Videos and assessments took approximately 25 to 30 minutes to complete per child, including the two short breaks between videos. Children were then returned to their classrooms. All participants provided assent and completed all videos and assessments.

Data Analysis

I conducted the following analyses to determine how screen-based pedagogical supports in educational media affected L2 vocabulary learning in DLLs. For all analyses, I converted posttest raw scores into proportion of items correct for each assessment type (vocabulary in context, vocabulary in new context). Proportions were used so that analyses could be run with each

assessment type as a dependent variable. I also combined the two vocabulary assessments to increase power and detect differences between screen-based pedagogical supports. Prior to analyzing results according to specific research questions, I conducted preliminary analyses to determine whether children developed an understanding of the words from educational media clips, I first computed one-sample *t*-tests against chance values for all vocabulary posttests. Considering children were excluded from the study if they knew any of the vocabulary words in the study, chance values were used to indicate children learned vocabulary words above chance; scores would be at chance if they did not learn words from videos.

To answer my first research question, I first examined whether children developed an understanding of words from media clips by each screen-based pedagogical support. I used one-sample *t*-tests against chance values for the combined vocabulary posttest of each pedagogical support. To better understand the extent to which screen-based pedagogical supports affect vocabulary learning in young DLLs, I then used a repeated measures Analysis of Variance (ANOVA) by condition with the four pedagogical supports as the within-subjects factor to examine how they affect L2 vocabulary learning. The repeated measures ANOVA was run three times using the in-context posttest, new-context posttest, and the combined vocabulary posttest as dependent variables.

To answer my second research question, I investigated children's English language proficiency by using composite scores from the parent-reported

Language Environment Questionnaires. To detect differences by English language environment, I conducted a median split on the LEQ to identify groups that came from households with higher (93.36, SD = 9.57) and lower (64.32, SD = 15.9) levels of English language exposure. I used a 4 x 2 repeated measures ANOVA, with pedagogical supports (4: definitions, repetitions, visual effects, sound effects) as a four-level within-subjects' variable, and English language environment (2: higher, lower) as a 2-level between subjects' variable. Repeated measures ANOVAs were run on each posttest (vocabulary in context posttest, vocabulary in new context posttest, combined vocabulary posttest), which served as dependent variables.

Finally, to better understand the effects of screen-based pedagogical supports on L2 vocabulary learning by children's differing L2 language skills, I examined patterns in the descriptive statistics (means and standard deviations) of outcomes in the two language environment groups. Within each language group, I also used paired-sample *t*-tests between pedagogical conditions to understand how pedagogical supports affected vocabulary learning relative to one another.

Results

In the following results, I answer my research questions that examine (1) the role of screen-based pedagogical supports, and (2) the role of English exposure in the home environment on the L2 vocabulary development of Dual-Language learners. I report results pertaining to each question in the following sections.

L2 Vocabulary Learning from Educational Media

I first conducted preliminary analyses to investigate whether children were able to develop an understanding of vocabulary words in a new language when they viewed educational media clips. There were three measures of vocabulary knowledge: a vocabulary in context posttest, a vocabulary in new context posttest, and a combined vocabulary knowledge posttest. For each of these posttests, an understanding of vocabulary words was defined as children performing statistically significantly above chance level on the posttest. If children performed above chance level, this would indicate that answers were not randomly or unknowingly selected. I conducted one-sample *t*-tests with the chance level at .34 as the comparison value for each of these posttests (see Table 5). Analyses revealed that children were able to develop vocabulary knowledge in all three measures: vocabulary in context posttest, $t(50) = 9.676$, $p < .001$; vocabulary in new context posttest, $t(50) = 8.414$, $p < .001$; and combined vocabulary posttest, $t(21) = 5.078$, $p < .001$.

Table 5

One-Sample t*-tests Against Chance Values for the Full Sample*

Question Type	M	SD	Chance Level	Mean Difference	95% CI for Mean Difference	*t*	*df*	Significance
Vocabulary in context posttest	.62	.20	.34	.28	.22, .34	9.676 *	50	<.001
Vocabulary in new context posttest	.58	.21	.34	.24	.18, .30	8.414 *	50	<.001
Combined vocabulary posttest	.56	.20	.34	.22	.13, .31	5.078 *	21	<.001

Note. * $p < .001$

In this manner, findings indicate that DLLs were able to learn L2 vocabulary words from educational media. More specifically, children were able to accurately identify a vocabulary word in the context that the word was presented, and demonstrated a deeper understanding of the vocabulary word when it appeared in a new and unfamiliar context. After a single viewing of educational media clips from *Sesame Street*, preschool-aged DLLs were able to receptively identify new vocabulary words.

Screen-Based Pedagogical Supports in Educational Media

To understand how each individual screen-based pedagogical support affected L2 vocabulary learning in young DLLs, I used one-sample *t*-tests with chance levels as the comparison value for the combined vocabulary assessment measure (see Table 6). Results were consistent with the overall finding that children learned L2 vocabulary words from educational media. More specifically, findings indicate that children developed vocabulary knowledge in each of the four pedagogical supports, correctly identifying vocabulary words above chance value in the combined vocabulary posttest: explicit definitions support, $t(50) = 5.46$, $p < .001$; repetitions support, $t(50) = 8.42$, $p < .001$; visual effects support, $t(50) = 6.47$, $p < .001$; and sound effects support, $t(50) = 6.46$, $p < .001$. Therefore, preschool-aged DLLs were able to learn L2 vocabulary words with each of the pedagogical supports after single-viewings of educational media.

Examining the descriptive statistics (means and standard deviations) of each screen-based pedagogical support (see Table 6), findings suggest that participants were best able to identify vocabulary words when repetition supports were used on screen (M = .69, SD = .29). Likewise, when media programs used the explicit definitions support, participants were least able to identify vocabulary words (M = .56, SD = .28) relative to the other screen-based pedagogical supports. Running a paired-sample *t*-test, findings indicate a statistically significant relationship between these ostensive pedagogical supports, $t(50) = -2.70$, $p < .009$. In other words, children benefited more from the repetitions

support than the explicit definitions support when learning vocabulary in a new language on screen.

Investigating the two attention-directing supports, participants demonstrated similar vocabulary gains in the visual effects and sound effects support conditions. On the one hand, when visual effects drew children's attention to vocabulary learning episodes, participants were able to identify vocabulary words with an accuracy rate of 63% (SD = 32). On the other hand, when sound effects drew children's attention to vocabulary episodes, participants identified words in posttest measures with an accuracy rate of 61% (SD = 30). Running a paired-sample *t*-test between the two attention-directing supports, there did not appear to be a statistically significant difference, $t(50) = .38$, $p < .705$. While children were able to learn vocabulary words from both attention-directing supports, neither support appeared to be more or less effective at scaffolding L2 vocabulary learning than the other.

Table 6

One-Sample t-*tests Against Chance Values for the Combined Vocabulary Posttest by Screen-Based Pedagogical Support*

Screen-Based Pedagogical Support	M	SD	Chance Level	Mean Difference	95% CI for Mean Difference	*t*	*df*	Significance
Explicit Definitions	.56	.28	.34	.22	.14, .29	5.455*	50	<.001
Repetitions	.69	.29	.34	.35	.26, .43	8.419*	50	<.001
Visual Effects	.63	.32	.34	.29	.20, .38	6.470*	50	<.001
Sound Effects	.61	.30	.34	.27	.18, .35	6.463*	50	<.001

Note. * $p < .001$

Screen-Based Pedagogical Supports and Language Environment

I next investigated how screen-based pedagogical supports affected L2 vocabulary learning in young DLLs, and considered how these effects differed by a child's home language environment. Language environment was determined by parent-reported responses to the Language Environment Questionnaire (LEQ). I used a median split on the LEQ to identify groups that came from households with higher and lower levels of English language exposure. Then, I used a 4 x 2 repeated measures ANOVA with pedagogical supports (4: definitions, repetitions, visual effects, sound effects) as a four-level within-subjects' variable, and LEQ (2: higher, lower) as a 2-level between subjects' variable. Repeated measures ANOVAs were run on each of the posttests (vocabulary in context posttest,

vocabulary in new context posttest, combined vocabulary posttest), which served as dependent variables (see Table 7).

Table 7

ANOVA Inferential Statistics for All Vocabulary Assessments Screen-Based Pedagogical Supports and English Language Environment (LEQ)

		Main Effects and Interactions					
Dependent Variable	Contrast	F	df	Sig.	MS_{Effect}	SS_{Error}	MS_{Error}
Vocabulary in Context Posttest	Pedagogical Support *	6.328	1, 42	.016	.425	7.152	.170
	Pedagogical Support x LEQ	3.980	1, 42	.053	.267		
Vocabulary in New Context Posttest	Pedagogical Support	.031	1, 42	.861	.002	7.586	.181
	Pedagogical Support x LEQ*	.396	1, 42	.018	.396		
Combined Vocabulary Posttest	Pedagogical Support *	6.301	1, 42	.016	.382	7.138	.170
	Pedagogical Support x LEQ	.233	1, 42	.056	.233		

Note. SS = sum of squares; MS = mean square; LEQ = Language Environment Questionnaire.
* $p < .05$.

Repeated measures ANOVAs were run on all three posttests. Results indicated that screen-based pedagogical supports were facilitative in L2 vocabulary learning in the in-context vocabulary posttest. In other words, there

was a main effect, indicating significant differences between specific pedagogical supports on children's ability to label vocabulary words in the context that the word was presented in, $F(1, 42) = 6.33$, $p = .016$. When the two vocabulary posttests were combined, there was also a main effect for differentially effective screen-based pedagogical supports on vocabulary outcomes, $F(1, 42) = 6.30$, $p = .016$.

Interestingly, there were no differences between pedagogical supports on screen in supporting children's ability to identify words in a new context. In this way, neither attention-directing cues nor ostensive cues were able to support children's ability to identify words in relatively challenging and unfamiliar settings, $F(1, 42) = .031$, $p = .861$. In sum, findings indicate that screen-based pedagogical supports were differentially able to provide DLLs with developing understandings of vocabulary words in their L2, but were not differentially able to equip DLLs with a deeper understanding of these words.

Home Language Environment Moderating Vocabulary Learning

Running repeated measures ANOVAs with language environment as a between-subjects variable, results indicated that there was an interaction between screen-based pedagogical supports and the language environment (see Table 7). In the new-context posttest, the language environment of the home played a role in participants' ability to learn vocabulary words using screen-based pedagogical supports, $F(1, 42) = .396$, $p = .018$. This indicates that when learning vocabulary

in a new language, different pedagogical supports were beneficial for children from households with more English exposure compared to those with less English exposure. Interestingly, this interaction was not present in the in-context posttest, $F(1, 42) = 3.98$, $p = .053$. For the in-context measure, there were no differential effects of screen-based pedagogical supports on L2 vocabulary learning according to children's home language environments.

To further explore these interactions between English language environment and pedagogical supports, I next examined posttest results by high and low language environment subgroups. I used a median split to create high ($N = 22$) and low ($N = 22$) English language environment groups. The lower English language environment group had an average LEQ score of 1.23 (SD = .75) out of 4, and a mean standard PPVT score of 78.10 (SD = 11.98). The higher English language environment group had an average LEQ score of 3.77 (SD = .43) out of 4, and a mean standard PPVT score of 84.36 (SD = 11.32).

Table 8 provides descriptive statistics of the three vocabulary posttest assessments by language environment group. Comparing means and standard deviations by group, participants in the higher English language environment group demonstrated greater gains overall in vocabulary learning in all three vocabulary posttests compared to the lower English language environment group. Considering all participants were screened and excluded from this study if they knew any of the vocabulary words, findings indicate that children who are

exposed to more English (L2) in the home are more readily able to learn L2 vocabulary words than those with less exposure to English.

Screen-Based Pedagogical Supports. Examining the specific screen-based pedagogical supports between subgroups (Table 8), participants in the higher English language environment group demonstrated greater gains in vocabulary assessments than those in the lower language environment group when educational media used definitions, visual effects, and sound effects to support L2 vocabulary development. Interestingly, when the repetition pedagogical support was used on screen, children in the lower English language environment group had higher vocabulary scores in all posttest assessments than the higher English language environment group.

Because the repeated measures ANOVA indicated differential effects of pedagogical supports on word learning by language exposure groups, I next used paired-sample *t*-tests to examine differences between the four pedagogical supports in each language group. In the lower English language environment group, the repetition pedagogical support was significantly higher than the use of explicit definitions and sound effects for both the in-context posttest and combined vocabulary posttest. In the in-context posttest, the repetitions support was significantly more effective than the definitions support, $t(21) = -3.50$, $p = .002$ and sound effects support, $t(21) = -2.22$, $p = .038$, for L2 vocabulary word learning. Similarly, in the combined vocabulary posttest, the repetitions were

significantly more effective than definitions, $t(21) = -3.77$, $p = .001$ and sound effects, $t(21) = -2.22$, $p = .038$. This was not evident in the new-context measure.

At the same time, in the new-context measure, paired-sample *t*-tests in the lower English language environment group indicated the sound effects support was particularly helpful. In this posttest, sound effects were significantly better than the use of explicit definitions, $t(21) = -2.38$, $p = .027$, and visual effects, $t(21) = -2.11$, $p = .047$, at facilitating L2 word learning. This indicates that children in this group benefited more from sound effects on screen to identify vocabulary words in a new and unfamiliar environment.

Finally, in the higher English language environment subsample, paired-sample *t*-tests indicated there were no significant differences between any of the four pedagogical supports. This suggests that children exposed to more English in the home did not necessarily benefit from any particular pedagogical support when learning vocabulary in a new language. In other words, screen-based pedagogical supports had neither a facilitative nor detrimental effect on L2 vocabulary learning when children were exposed to more of the L2 at home. It was only in households with less English exposure that differences emerged between the pedagogical supports.

Table 8

Means and SDs on Vocabulary Posttests of Screen-based Pedagogical Supports by Language Environment Group (N = 44)

	Lower English Language Environment ($N = 22$)				Higher English Language Environment ($N = 22$)			
	Definition	Repetition	Visual Effects	Sound Effects	Definition	Repetition	Visual Effects	Sound Effects
In Context Posttest	.42 (.31)	.70 (.31)*	.58 (.36)	.55 (.26)	.65 (.28)	.67 (.33)	.59 (.27)	.64 (.27)
New Context Posttest	.45 (.33)	.56 (.26)	.53 (.32)	.67 (.31)†	.65 (.32)	.50 (.29)	.56 (.30)	.62 (.36)
Combined Posttest	.44 (.27)	.70 (.31)*	.58 (.34)	.55 (.32)	.65 (.26)	.67 (.33)	.59 (.27)	.64 (.27)

Note: * $p < .05$, statistically higher than the Definitions and Sound Effects pedagogical supports
† $p < .05$, statistically higher than the Definitions and Visual Effects pedagogical supports

Discussion

The current study was designed to examine how screen-based pedagogical supports might affect vocabulary learning in educational media. Building on previous research that scanned the media marketplace for vocabulary learning opportunities in a child's L1 (Danielson et al., 2019; Larson & Rahn, 2015; Neuman et al., 2019; Vaala et al., 2010) and L2 (Wong & Neuman, 2019), this study attempted to isolate the most prevalent pedagogical supports on screen to

understand how they might be correlated with a child's ability to identify L2 vocabulary words in-context and in a new context.

Findings indicated that children were able to learn vocabulary words in a new language on screen, and that screen-based pedagogical supports were differentially facilitative in helping DLLs recall words presented in their original context, measured by the in-context posttest measure. Unlike previous studies that examined specific screen-based pedagogical supports for vocabulary learning in predominantly monolingual populations (Larson & Rahn, 2015; Neuman, et. al., 2019), findings from this study demonstrate that DLLs who come from households where English is not the primary language are also able to learn words in a new language through educational media.

When viewing media in a new language, DLLs are required to understand not only the content of the media program, but also the language used to make sense of this content. Language serves as the vehicle through which content can become both comprehensible and accessible (Echevarria, Vogt, & Short, 2008). When media programs present content or vocabulary words in a child's L2, the learning burden, defined as the amount of effort required to learn a word in a new language (Nation, 2013), increases as children need to process both the content and language that occur on screen. Still, the current study uncovers the potential of media to help children overcome this burden and learn vocabulary words in a new language. Moreover, DLLs are able to learn these vocabulary words through certain screen-based pedagogical supports that scaffold children's learning.

Specific scaffolds, however, are only beneficial for children when they bridge the gap between what they already know and need to know (Vygotsky, 1980). In the current study, participants came from households with varying levels of exposure to the English (L2) language, which is directly related to the English language proficiency of a child (Nation, 2013). Findings demonstrated that children with higher levels of L2 exposure had, on average, higher post-test vocabulary scores than those with lower levels of L2 exposure. This was evident across all three outcome variables when explicit definitions, sound effects, and visual effects were used on screen to support L2 word learning. With greater exposure to the English language at home, children have emerging understandings of words that they incidentally pick up from everyday interactions in the L2 (Harris, Golinkoff, & Hirsh-Pasek, 2011). Without clearly identified ostensive cues or prompting from adults, children may use their incidental understandings of language in conjunction with screen-based pedagogical supports to develop a deeper understanding of target words.

Of notable mention is the *repetition* pedagogical support, which appeared to benefit children with less English exposure more than those with greater L2 exposure in the home. More specifically, children with lower English language environment scores had higher vocabulary scores in all posttest measures when they viewed video clips that intentionally repeated vocabulary words. The repetition pedagogical support provided participants with the target vocabulary word six times within the span of a 17-second (average) video clip. With repeated

exposure to vocabulary words, children have opportunities to see and hear multiple representations of words that reinforce their emerging understandings of words in a new language (Carlo et al., 2004; Collins, 2010; Lugo-Neris, 2010). Aligned with Neuman's (1997, 2009) theory of synergy, when children are exposed to multiple media presentations of specific words, they have opportunities to construct meaning and generate inferences in new contexts. For children from households where English is rarely or not spoken at all, these synergistic, repeated exposures to target words serve as strategic scaffolds that support vocabulary learning in a new language. Likewise, for children from households with more exposure to the English language, repeated exposure to a word does not necessarily scaffold learning for children who already have incidental exposure of vocabulary words.

In fact, for children from households with more English language exposure, no specific screen-based pedagogical support more effectively facilitated vocabulary learning than the others. On the one hand, children with more exposure to a particular language are often more familiar with the patterns and knowledge behind words in the L2 than those with less exposure. This indicates a lighter learning burden. With a higher degree of L2 familiarity, DLLs in this group may not have required the scaffolds offered by the pedagogical supports to learn unfamiliar words on screen. Moving beyond the specific on-screen supports, future research may also consider examining what these unfamiliar words are, and how different types of words (i.e., different parts of

speech, levels of abstractness, etc.) might also affect the learning burden and scaffold L2 word learning on screen.

On the other hand, in the group of students with less exposure to English at home, the repetitions support appeared to scaffold word learning in context, and the sound effects support facilitated English vocabulary learning in new contexts. Two contexts of vocabulary assessments (in-context, new-context) were designed to reflect the incremental nature of vocabulary learning (Nagy et al., 1987; Nagy & Herman, 1987), as depth of word knowledge can appear on a continuum from simple vocabulary knowledge to greater word understanding. From this study, certain pedagogical supports on screen appeared to be more helpful than others in scaffolding depth of word knowledge. While repetitions helped children identify words in a relatively simple vocabulary knowledge task (in-context), sound effects better supported a deeper understanding of words presented in a new or unfamiliar environment (new-context). Although studies investigate instructional strategies that promote L2 vocabulary learning among DLLs (Buysse et al., 2014; Collins, 2010; Lugo-Neris et al., 2010; Takanishi & Le Menestrel, 2017), research has yet to examine how specific instructional approaches might be associated with the depth of L2 word learning.

Future research may build off of the current study by examining how specific pedagogical supports on screen might facilitate a deeper understanding of vocabulary words in a new language. Attention-directing cues are a unique affordance of media programs as a viewer's attention is deliberately guided to the

moment when a learning experience is presented on screen. Narrowing the "temporal proximity" between images on screen and viewers' attention, children are given a greater opportunity to understand story events and recall or retain unfamiliar words (Bus, Takacs, & Kegel, 2015, p. 84). Sound effects in the current study used audible shimmering or bell sounds to signal a learning experience. Consistent with Paivio's (1986, 2010) dual-coding theory, unfamiliar words appeared to be more fully processed because verbal (i.e., sound) and non-verbal (i.e., image) stimuli were transmitted to both speech and imagery cognitive systems. When children have opportunities to simultaneously see and hear, they create coherent mental images of screen content that facilitate deep learning in a new language (Wong & Samudra, in press). From this study, it appears that children with less exposure to the target language at home benefited from dually coded presentations of unfamiliar words on screen.

There are several limitations of this study. First, video clips were short with concentrated repetitions of target words. Considering their brevity, children were likely to view video clips with greater attention than full-length episodes. At the same time, using shortened clips in the study allowed me to include more vocabulary words with multiple representations of each condition, while also tending to the attention spans of young children. In addition, although multiple measures were used to select similar vocabulary words and screen out participants who already knew words in the study, target words could not be perfectly comparable to one another as participants were exposed to all conditions in a

within-subjects design. A between-subjects design would have allowed me to use the same words for all pedagogical conditions, but would not allow me to reduce threats to internal validity or control for between-subjects variability (e.g., how children attend to screens, variation in vocabulary knowledge, viewing behaviors). Moreover, I used vocabulary words available in four seasons of *Sesame Street* available on streamed platforms. While this limited options for word selection, it also increased the ecological validity of the current study. Thirdly, the reliability of researcher-created measures was relatively low due, in part, to the few number of items per assessment, which were used to avoid fatigue. With this in mind, differences between screen-based pedagogical supports may be underestimated and require careful interpretation. Similarly, Spanish and Haitian-Creole language proficiency measures were not used as pretests to consider the important influence of the L1 on L2 development, as per Cummins' (1979) theory of linguistic interdependence. Additionally, using a median-split to examine trends in higher- and lower- English language environment groups transforms a continuous variable into a categorical one. Yet, examining trends by language group did reveal some important differences about how DLLs learn from screens. Still, another consideration for future studies is to document the language of instruction in schools as this is another critical source of input and L2 language exposure. Finally, when examining the moderating role of L2 proficiency, findings were correlational and not causal; rather, causal inferences applied to the role of screen-based pedagogical supports on L2 vocabulary

learning. Neither do I claim that the study is fully naturalistic as children viewed short video episodes on an iPad while wearing headphones.

Recognizing these considerations, the current study represents an important step in understanding how specific screen-based pedagogical supports in educational media might be associated with L2 vocabulary learning in young DLLs. It provides evidence to suggest that certain pedagogical supports on screen can serve as important scaffolds for word learning, and that the effectiveness of these scaffolds differs by the language proficiency of children. Noteworthy screen-based pedagogical supports include the use of repetition as well as sound effects, which researchers, educators, and media producers may find useful to develop a program with a more nuanced understanding of language learning from screens. On the one hand, the current study unlocks the potential of educational media to provide young children who are on screens for more than two hours a day (Common Sense Media, 2013; Rideout, 2014) with pedagogically-rich vocabulary instruction to support L2 word learning. On the other hand, pinpointing how screen-based pedagogical supports might uniquely scaffold language learning for children less proficient in the target language has implications for better preparing multilingual learners for the linguistic demands of school.

CHAPTER IV

INSTRUCTIONAL CONTEXTS STUDY

Research Questions

Research has yet to examine the instructional contexts on screen that promote vocabulary learning in young DLLs. In previous studies, researchers have examined how children learn words through different macrostructures (Linebarger et al., 2017). However, children's programming often includes a number of different structures within these so-called macrostructures to convey words. Consequently, an analysis of episode is a more fine-grained strategy to understand how a different instructional context might affect word learning (Neuman et al., under review). These contexts reflect different genre features, including Narrative, Expository, or more recently, Participatory contexts. These are described in greater detail in the *Video Stimuli* section and in Table 10.

To examine how the genre might affect vocabulary learning in young DLLs, I propose the following research questions:

1. To what extent do certain genres (Participatory, Narrative, Expository) affect L2 vocabulary learning in young DLLs?
2. How do effects of genres on vocabulary learning differ by children's L2 language skills?

Methods

Research Design

I used a within-subjects design to examine how the instructional context might affect L2 vocabulary learning in young DLLs. The within-subjects variable in this study was the instructional context used to teach L2 vocabulary. Participants received all three conditions (3: Participatory, Narrative, and Expository), serving as their own control. This design helped account for significant threats to internal validity because participants served as their own controls. Using a within-subjects design also allowed me to control for between-subjects variability. Because students received all conditions, I was able to reduce error and increase power to detect potential differences between conditions. I, therefore, could conduct the study with a smaller sample of children. A G*Power analysis indicated a sample size of 45 children would allow me to detect a small effect of .15 at an alpha level of .05 and power of .80 (Faul et al., 2007). In addition, by adopting a within-subjects design, threats of a carry-over effect were minimized because nine different video clips were examined.

Children were presented with all three conditions with three videos in each condition; there were nine video clips in total. To account for order effects and fatigue, the conditions were assigned based on a Latin Squares design. In this design, children are exposed to each condition, but the changing conditions are controlled over the course of the experiment. Looking at the subjects altogether, the sequences of treatment are counterbalanced to help reduce carry-over effects

and ensure effects are not limited to a single order or presentation. Videos were put into three blocks, each block containing one Participatory, one Expository, and one Narrative condition. Children were systematically assigned to one of three video sequences and assessed after each block of videos. This model was deemed appropriate after piloting the study with children in this specific context. It allowed short stretch breaks between video blocks to minimize fatigue.

An assumption underlying a within-subjects design is that all aspects of the video stimuli are equivalent with the exception of the within-subject variable (instructional context). To make video clips comparable to one another, I controlled for the following criteria: video length, word selection, and word repetitions. These are described in greater detail in the "Video Stimuli" section.

Sample

The sample of children in this study came from 12 classrooms in the two Head Start preschools in the northeast region of the United States (the same schools as Study 1 in this dissertation, but different children). All students qualified for free and reduced lunch. To participate in this study, children had to be four- or five-year-old dual-language learners (DLLs), defined as children from households where a language other than English is spoken. The majority of the DLL population in these schools come from Spanish- or Haitian-Creole-speaking households. To select eligible participants, the education director and teachers of the two schools invited specific children who met the eligibility criteria to

participate in the study. A total of 55 children were invited to participate in the study. Parents were given English-Spanish bilingual consent forms to complete, of which 53 (94.5%) agreed to participate. After an expressive vocabulary screening measure, three additional participants were excluded from the study due to prior vocabulary knowledge (see Table 9). The final sample consisted of 50 children (48.0% female) with an average age of 52.52 months (SD = 3.98). From this sample of DLLs, 76% were from Spanish-speaking households, 18% were from Haitian-Creole-speaking households, and 6% were from Arabic-, Bambara-, or Fulani-speaking households. Household income was not collected.

To examine the English language proficiency of participants, the Peabody Picture Vocabulary Test (PPVT-IV) was administered as a pretest. Measuring the general receptive vocabulary knowledge of children, the average standard PPVT score of the sample was 78.84 (SD = 19.60), approximately one and a half standard deviations below the monolingual norm. In addition to the PPVT pretest, a Language Environment Questionnaire (LEQ) was administered to better understand the English (L2) language environment of the home. This was included on the original consent form for parents to complete. This version of the LEQ, adapted from Paradis (2011) and Luk and Bialystok's (2013) respective bilingual environment questionnaires, asked parents to rate children's exposure to English on a five-point scale from 0% exposure to 100% exposure. Parents also self-reported their own English language proficiency levels on a five-point-scale, and documented children's language and literacy activities (e.g., reading, singing,

watching TV) in English on a three-point-scale. The maximum score on the LEQ was 4. The average score of the sample was 2.48 (SD = 1.46), indicating children came from households where English was not consistently spoken or used.

The LEQ was also used as a screening measure to exclude children who had no exposure to English in the home or emergent levels of English proficiency as they would unlikely comprehend video clips presented entirely in English. The education director and teachers used the LEQ to decide which DLLs were eligible for the study, and provided consent forms accordingly. From the 12 classrooms at the two Head Start preschools that served approximately 180 children, 50 (27.8%) of the students were invited to participate in the study, screened by age, home language, and language environment. Children with IEPs were also not included in the study.

Table 9

Descriptive Statistics and Demographics of Full Sample (N = 50)

Variable	Characteristic
Female	48.0%
Age (months)	52.52 (3.98)
Home Language	
Spanish	76.0%
Haitian Creole	18.0%
Other (Arabic, Bambara, Fulani)	6.0%
PPVT Standard Score	78.84 (19.60)
Language Environment Questionnaire (max = 4)	2.48 (1.46)

Measures

Both standardized measures and researcher-developed measures were used to assess children's vocabulary knowledge in this study. The following two pretests were used to collect a baseline measure of children's receptive language in English, and to serve as a screening tool for children in the study.

Peabody Picture Vocabulary Test-IV *(PPVT-IV;Dunn & Dunn, 2007).* The PPVT was used as a pretest to collect a baseline for general English receptive vocabulary knowledge. The test measures receptive vocabulary knowledge through an individually administered, norm-referenced test. Participants select one of four images in an assessment booklet, which contains three foils. Reliability of the standardized assessment ranges from .91-.94. Participants' raw scores were converted to standard scores according to their age in months.

Vocabulary screening measure. To determine whether children could participate in this study, each eligible child was given an expressive vocabulary screening measure before the study. This vocabulary screening measure included images of the nine target words in the study and six picture foils. Assessors showed participants a picture of a vocabulary word and asked them in English, "What is this?" Children's answers were noted. If participants knew any of the vocabulary words in the study, they were excluded from the study. In total, three children (5.7% of the sample that provided consent) were screened from the study.

The following posttest measures were used to assess children's target word learning: word identification and word meaning. These researcher-created measures were piloted before the study.

Word Identification Measure. The word identification posttest measure was designed to examine children's ability to identify or recall vocabulary words after viewing video clips. Cronbach's alpha for this measure was $\alpha = .61$, indicating a moderate level of reliability. The posttest consisted of 18 receptive vocabulary items, with each target word assessed two times.

The word identification measure was a receptive vocabulary posttest where children were asked to point to one of four images to identify the vocabulary word. To represent vocabulary words in their original video context, images in this measure were screenshot images from *Bubble Guppies, Martha Speaks,* and *Sesame Street* video clips. Distractor images were thematically related to the target word and also taken from the same program.

Word Meaning Measures. Beyond identifying vocabulary words, a posttest measure was developed to examine preschool children's developing understandings of new words (Nagy & Herman, 1987), captured by their ability to identify the meaning of vocabulary words. Cronbach's alpha was $\alpha = .69$ for the word meaning measure.

The researcher-created word meaning task was designed to assess children's comprehension of target words using their receptive language skills.

Assessors asked participants to point to one of three images to identify a vocabulary word based on its meaning. For example, to assess the word "actor," the assessor asked children to "Point to the one that dresses up in a costume." To ensure children did not rely on screenshot images from the previous word identification measure, images in this measure were cartoon representations of the vocabulary word. Children were then presented with another image of the vocabulary word and asked a Yes/No question related to its meaning. Following Silverman (2013) who examined word meaning for young learners, assessors asked children, "Do you put *rubbish* in a trash can?" (Yes) or, "Do you put *rubbish* in your bed?" (No). Each word included both a yes and no answer. Word meaning was assessed three times per word, totaling 27 items.

Video Stimuli

I selected three children's programs to represent three distinct instructional contexts for vocabulary learning on screen. The three instructional contexts (see Table 10), defined as the genres of pedagogical support for vocabulary learning on screen, included a Narrative context, Expository context, and Participatory context. Videos were selected from the three educational programs: *Bubble Guppies* (Participatory)*, Martha Speaks* (Narrative) and *Sesame Street's Word on the Street* (Expository)*.* They were chosen from a content analysis of all preschool children's programming available on streamed platforms, which provided explicit vocabulary instruction to preschool-aged viewers (Danielson et al., 2019). These

programs were also highly rated for this age group by Common Sense media, a national leader for media reviews in the United States. Videos were piloted in all conditions prior to the study to ensure children in this specific context responded to them.

Table 10

Descriptions of Episodes in Each Instructional Context

Context	Program	Title	Duration	Vocabulary Word	CHILDES frequency	Flesch Reading Ease Score
Participatory	Bubble Guppies	*Ducks in a Row*	1:56	Conductor	1	Very easy to read (92.8)
		Going to Play the Big Bad Wolf	2:01	Actor	1	
		Build Me a Building	1:52	Materials	0	
Expository	Sesame Street	*Word on the Street*	1:29	Sculpture	0	Very easy to read (90.7)
			1:32	Author	0	
			1:34	Adventure	4	
Narrative	Martha Speaks	*Martha Sings*	1:50	Audience	0	Very easy to read (90.7)
		Martha Sings	2:00	Lyrics	0	
		TD the Pack Rat	1:54	Rubbish	4	

A total of nine video clips were selected from *Bubble Guppies, Martha Speaks,* and *Sesame Street*, three episodes from each program. Selected video clips taught vocabulary words with clear visual representations of the words on screen. Regardless of instructional context, each clip provided explicit definitions to support L2 word learning. In light of findings from the first study of this dissertation, words were also repeated the same number of times in each episode.

Building on prior research, videos were selected to represent three distinct instructional contexts or genres for vocabulary learning. In the Narrative genre, the ostensive cues of new words were embedded within a narrative structure. That is, words were presented in a story that had a setting, characters, plot, events, and resolution (Mandler & Johnson, 1977; Stein & Glenn, 1975). For example, in a video clip of an episode of *Martha Speaks*, there are children playing together in a rock band in the garage. One band member says, "It looks like we might have a hit!" Another child says, "Maybe… but we need one more thing." "What's that?" his friend responds. "To be a hit, we need an audience. An audience is a group of people who listen to us play." The band then goes through a series of conversations and events to find an audience. The story is resolved when they find a group of babies to listen to them inside the house. Many children, including DLLs, are familiar with these types of narrative storylines, which may provide support for word learning in a new language.

Secondly, in an Expository instructional context, words are likely to be more topic-centered with multiple examples to convey their meaning. For

example, in *Sesame Street's Word on the Street* program, the target vocabulary word, "sculpture," is first introduced by the Muppet, Murray, who interviews people in the community about the meaning of the "Word on the Street" and asks them to provide specific examples of it. The scene then changes to a conversation between Jon Hamm and Elmo who is building a sculpture. Through examples, synonyms, humor, and other attention-directing cues, the word "sculpture" is presented multiple times to viewers. These Expository contexts may provide DLLs with multiple exemplars that scaffold word learning (Larson & Rahn, 2015).

A third format to support word learning and vocabulary includes a direct-to-audience, Participatory context (Anderson et al., 2000). In this context, the program attempts to intentionally engage viewers (e.g., through pauses) in the educational experience. In this approach, the television character addresses the camera and appears to be directly speaking to the child viewer, asking questions for them to overtly or covertly answer, soliciting viewer participation, and providing immediate feedback. For example, in the program *Bubble Guppies,* one child is hiding behind a curtain and pretending to be the Big Bad Wolf. She successfully scares her peers until she emerges and says, "I'm not the Big Bad Wolf, I'm an actor!" Another child asks, "What's an actor?" The teacher, Mr. Grouper, says, "Let's think about it," and a bubble with an actor in it emerges. Mr. Grouper looks directly at the audience and says, "Someone who puts on a costume and pretends to be someone else is…" There is a three-second pause to

encourage viewers to participate. “An actor!” says a little fish who simultaneously pops the bubble, allowing the actor to swim out. Participatory cues such as these may increase DLL engagement in word learning experiences on screen.

Video clips were short and comparable in length to one another, averaging 107.56 seconds per clip (SD = 12.47 seconds) (see Table 10). Vocabulary words were similar in difficulty level according to the Child Language Data Exchange System (CHILDES) database (MacWhinney, 2014). With approximately 5,000 transcriptions of adult-child spoken interactions at home and in laboratory settings, as well as 3,500,000 words in the database, word frequency was ordered as a function of age. All words included in the study occurred less than five times in the utterances of 48-month-old children in the CHILDES database, which indicated children were less likely to be exposed to these words in their home environments, and were similar in difficulty level. Words were also consistent in English-Spanish cognateness.

To further enhance word comparability, I coded target words for level of abstractness (concrete; somewhat concrete; abstract), ultimately excluding words that fell under the ‘abstract’ category. Abstract words would also be particularly challenging to find visual representations of words to assess. Moreover, videos were manipulated so that words in the video transcripts were rated as “Very Easy to Read” on the Flesch reading scale (http://www.readabilityformulas.com/free-readability-formula-tests.php).

Procedure

Eligible children with signed consent forms ($N = 50$) were brought to a quiet room to first complete the screening measure and PPVT pretest. Children worked one-on-one with a trained research assistant. After the PPVT, participants were assigned to one of three sequences of videos, which were counterbalanced according to a Latin Squares design. Following a script, trained assessors put headphones on children and showed them the first block of videos, followed immediately by the word identification and word meaning posttest measures. After a short break, assessors then administered the second and third round of video clips and vocabulary measures. Videos and assessments took approximately 35-40 minutes to complete per child, including the two short breaks between videos. Children were then returned to their classrooms. All participants provided assent and completed all videos and assessments.

Data Analysis

I conducted the following analyses to determine how instructional contexts in educational media affected L2 vocabulary learning in DLLs. For all analyses, I converted posttest raw scores into proportion of items correct for each assessment type (word identification, word meaning). This allowed me to examine the effects of genre on each dependent variable. Prior to addressing specific research questions, I conducted preliminary analyses to determine whether children developed an understanding of the words from educational

media clips. I first computed one-sample *t*-tests against chance values for all vocabulary posttests. Considering children were excluded from the study if they knew any of the vocabulary words in the study, chance values were used to indicate that children learned vocabulary words above chance; scores would be at chance if they did not learn words from videos.

To answer my first research question, I used a repeated measures Analysis of Covariance (ANCOVA) by condition with the three instructional supports as the within-subjects factor to examine how they affect L2 vocabulary learning. To answer my second research question, I used children's PPVT scores to consider the influence of English language proficiency. I conducted a median split on the standard English PPVT scores to identify higher and lower English language proficiency groups. I used a 3 x 2 repeated measures ANCOVA, with instructional context (3: Participatory, Expository, Narrative) as a three-level within-subjects' variable, and standard English PPVT scores (2: higher, lower) as a 2-level between-subjects' variable. I also used age in months as a covariate in the analyses. The repeated measures ANCOVA was run two times on each posttest (word identification, word meaning), which served as dependent variables.

Finally, to better understand the effects of instructional contexts on L2 vocabulary learning by children's L2 language skills, I examined descriptive statistics (means and standard deviations) of outcomes in the high and low PPVT groups with follow-up paired-sample *t*-tests between conditions. I also ran

repeated measures ANCOVAs to understand the role of instructional supports on L2 vocabulary learning by each language group.

Results

In the following results, I answer my research questions that examine (1) the role of instructional context supports, and (2) the role of English exposure in the home environment on the L2 vocabulary development of Dual-Language learners. I report results pertaining to each question in the following sections.

L2 Vocabulary Learning from Educational Media

I first conducted preliminary analyses to investigate whether children were able to develop an understanding of L2 vocabulary words when they viewed educational media clips. There were two measures of vocabulary knowledge: word identification and word meaning. For each posttest, an understanding of vocabulary words in media was defined as children performing statistically significantly above chance level on each posttest. If children performed at chance level, for example, this indicated children were not able to identify words learned in media or describe their meanings. I conducted one-sample *t*-tests with the chance value at .25 for the word identification posttest, and .34 for the word meaning measure (see Table 11). Analyses revealed that children were able to develop vocabulary knowledge in both measures: word identification, $t(50) = 9.083$, $p < .001$; word meaning, $t(50) = 11.469$, $p < .001$.

Table 11

One-Sample t*-tests Against Chance Values for the Full Sample*

Question Type	M	SD	Chance Level	Mean Difference	95% CI for Mean Difference	*t*	*df*	Significance
Word identification posttest	.47	.18	.25	.23	.18, .27	9.083*	49	<.001
Word meaning posttest	.51	.10	.34	.17	.13, .20	11.469*	49	<.001

Note. * $p < .001$

In this manner, findings indicate that children were able to learn vocabulary words in a second language from educational media clips. More specifically, children were able to identify about half of the vocabulary words in the context that they were presented in (.47, SD = .18), and demonstrated a deeper understanding of word knowledge for approximately half of the words as measured by the word meaning measure (.51; SD = .10). After a single viewing of educational video clips, preschool-aged DLLs appeared to develop an understanding of words in their L2.

Instructional Contexts in Educational Media

To answer the first research question on the influence of instructional contexts on L2 vocabulary learning among DLLs, I first examined descriptive

statistics (means and standard deviations) of each instructional context in the two posttest measures (see Table 12). Findings from proportioned scores suggest that participants were able to identify more than half of the vocabulary words that were taught on screen when both the Expository (.51, SD = .25) and Participatory (.56, SD = .25) instructional contexts were used. In other words, when characters provided multiple exemplars of vocabulary words or used pause to invite viewers to participate in the learning experience, children were more likely to identify L2 vocabulary words than if they were embedded within a story (i.e., Narrative instructional context; .35, SD = .25). Running paired-sample *t*-tests between each condition in the word identification posttest, results indicated that the Narrative instructional context was least able to help children identify new words in media clips. In other words, participants scored significantly higher in the Expository instructional context, $t(49) = 3.340$, $p = .002$, and the Participatory instructional context, $t(49) = 5.248$, $p < .001$, than the Narrative instructional context. There were no significant differences between the Expository and Participatory instructional contexts, $t(49) = -1.124$, $p = .266$. After a single-viewing of educational media clips, children appeared to identify vocabulary words when they were presented in an Expository or Participatory instructional context.

Interestingly, when examining the word meaning posttest, which was designed to assess children's developing understandings of word knowledge, participants had comparable scores in the Expository (.52, SD = .15), Narrative (.51, SD = .13), and Participatory (.49, SD = .16) instructional contexts. This

finding suggests that all instructional contexts played a similar role in facilitating L2 word meaning among young DLLs. Running paired-sample *t*-tests between each condition in the word meaning posttest, analyses confirmed that there were no significant differences between the three instructional contexts. No specific instructional context appeared to scaffold children's understandings of word meanings better than the other contexts. In other words, after a single viewing of educational media clips, all instructional contexts were equally likely to facilitate a deeper understanding of L2 word knowledge, demonstrated by a child's understanding of the word meaning.

Table 12

Means and SDs on Vocabulary Posttests of Instructional Contexts (N = 50)

	Expository	Narrative	Participatory
Word identification posttest	.51 (.25)*	.36 (.25)	.56 (.25)*
Word meaning posttest	.52 (.15)	.51 (.13)	.49 (.16)

Note: * $p < .05$, statistically higher than the Narrative instructional context

To better understand the influence of the instructional context on the L2 vocabulary learning of DLLs, I used a 4 x 2 repeated measures ANCOVA with

instructional context (3: Expository, Narrative, Participatory) as a within-subjects factor, and Standard English PPVT scores as a 2-level between-subjects variable (2: Higher PPVT; Lower PPVT). Age in months was used as a covariate in the analysis, and the repeated measures ANCOVA was run twice, once on each posttest assessment (word identification, word meaning).

Findings from the repeated measures ANCOVAs indicated that the instructional contexts were differentially facilitative in L2 vocabulary learning in the word identification posttest (see Table 13). In other words, there was a main effect for the influence of certain instructional contexts on children's ability to label a vocabulary word learned in a new language, $F(1, 47) = 11.003$, $p = .002$. In this posttest, the Standard English PPVT scores and age of children did not appear to have a significant interaction with instructional context.

Moreover, in the vocabulary meaning posttest measure, which represented a developing understanding of vocabulary words, there was not a significant effect for the instructional context, $F(1, 47) = 1.604$, $p = .212$ (Table 13). Instead, Standard English PPVT scores, which served as a between-subjects variable, had a statistically significant interaction with the instructional context, $F(1, 47) = 4.962$, $p = .031$. This suggests that as students' Standard English PPVT scores increased, the instructional context was more likely to differentially influence outcomes in the vocabulary meaning posttest than students with lower Standard English PPVT scores. Because of the potentially moderating influence of L2 proficiency on children's ability to learn vocabulary words from screen, the next

section of results examines both the Higher and Lower PPVT subsamples to better understand the effects of instructional contexts on word learning by differing language proficiency groups.

Table 13

ANCOVA Inferential Statistics for Vocabulary Assessments in Full Sample (N = 50)

		Main Effects and Interactions					
Dependent Variable	Contrast	F	df	Sig.	MS_{Effect}	SS_{Error}	MS_{Error}
Vocabulary identification posttest	Instructional Context*	11.003	1, 47	.002	.601	2.566	.055
	English PPVT	.564	1, 47	.456	.031		
	Age	.670	1, 47	.417	.037		
Vocabulary meaning posttest	Instructional Context	1.604	1, 47	.212	.021	.611	.013
	English PPVT*	4.962	1, 47	.031	.065		
	Age	1.220	1, 47	.943	.000		

Note. SS = sum of squares; MS = mean square; PPVT = Peabody Picture Vocabulary Test.
* $p < .05$.

L2 Proficiency Moderating Vocabulary Learning

To understand how L2 proficiency interacted with the instructional context to facilitate vocabulary learning, I first examined the descriptive statistics (means and standard deviations) of each instructional support by L2 proficiency group. L2 groups were created by a median split on participants' Standard English PPVT scores. The average Standard PPVT score was 93.36 (SD = 9.57) in the higher PPVT group (N = 25), and 64.32 (SD = 15.91) in the lower PPVT group (N = 25).

In the higher PPVT group, findings suggest that participants were able to identify most vocabulary words in the Participatory (.65, SD = .23) instructional context, followed by the Expository (.55, SD = .27) instructional, and then the Narrative (.44, SD = .29) instructional context (Table 14). Consistent with findings from the overall sample, it appeared that children were less likely to identify the label of a vocabulary word when the word was embedded within the storyline or narrative of a media clip, compared to words that were presented in an Expository or Participatory context. Running paired-sample *t*-tests on each of the instructional contexts in the word identification posttest, findings indicated that children were able to identify more vocabulary words presented in the Participatory instructional context than the Narrative context. Children scored significantly higher in the Participatory instructional context, $t(24) = 3.454$, $p = .002$, than in the Narrative instructional context. Findings also suggest that children tended to identify more words in the Expository context than the

Narrative context. In other words, there was also a marginally significant difference between the Expository instructional context, $t(24) = 1.715$, $p = .099$, and the Narrative context. There were no significant differences between the Expository and Participatory contexts, $t(24) = -1.686$, $p = .105$. After a single-viewing of educational media clips, children with higher levels of L2 proficiency appeared to identify vocabulary words best when they were presented in a Participatory instructional context.

Shifting to the word meaning posttest, participants were able to provide the meaning of more than half of the vocabulary words presented in media clips in the higher PPVT group (Table 14). More specifically, children demonstrated greater vocabulary gains in the word meaning posttest when words were presented in the Expository instructional context (.60, SD = .12) compared to the Narrative (.53, SD = .12) or Participatory (.52, SD = .18) instructional contexts. When educational media provided multiple exemplars of vocabulary words, and strategically used attention-directing cues to engage viewers in a word learning episode, children appeared to understand the meaning of words more clearly than if a Participatory or Narrative context were used. Running paired-sample *t*-tests on word meaning posttests in each instructional condition, children in the higher PPVT group demonstrated greater gains in word meaning in the Expository instructional context compared to the Narrative or Participatory contexts. In other words, children scored significantly higher in the Expository instruction context

than in the Narrative, $t(24) = -2.551$, $p = .018$, or Participatory, $t(24) = -2.295$, $p = .031$, instructional contexts.

In the lower PPVT group (Table 14), findings suggest that participants were also able to identify more vocabulary words in the Expository (.47, SD = .22) and Participatory (.47, SD = .24) instructional contexts compared to the Narrative (.27, SD = .47) instructional context. Consistent with trends in both the overall sample as well as the higher PPVT group, children appeared to learn the labels of vocabulary words more readily in Expository or Participatory instructional contexts than when these words were embedded within a narrative. Running paired-sample *t*-tests on the word identification posttests for each instructional context, findings confirm that the Expository and Participatory instructional contexts scaffolded word identification better than the Narrative context. In other words, children scored significantly higher on the word identification posttest in the Expository instructional context, $t(24) = 3.040$, $p = .006$, and Participatory instructional context, $t(24) = 4.044$, $p < .001$, than in the Narrative instructional context. There were no significant differences between the Expository and Participatory instructional contexts for this measure, $t(24) = 4.213$, $p = .213$. After a single-viewing of educational media clips, DLLs with lower levels of L2 proficiency were better able to identify vocabulary words when these words were presented in Expository or Participatory instructional contexts than in Narrative contexts.

Finally, examining the word meaning posttest in the lower PPVT group, children demonstrated an accurate understanding of just under half of the vocabulary words (Table 14). Findings from the word meaning posttest indicate children had comparable outcomes in all three instructional contexts, Expository (.44, SD = .13), Narrative (.48, SD = .12), and Participatory (.46, SD = .12). In other words, for children less proficient in English, none of the instructional contexts were particularly helpful in scaffolding a deeper understanding of word meaning. Paired sample *t*-tests confirmed that there was no statistically significant relationship between any of the three instructional contexts. After single-viewings of educational media clips, the instructional contexts on screen did not appear to provide children less proficient in English with a deeper understanding of word knowledge.

In sum, findings from both the higher and lower PPVT groups suggest that instructional contexts play a role in L2 word identification. Beyond recalling words, however, it appeared that for children with a higher level of English (L2) proficiency, the different instructional contexts played a more prominent differential role in scaffolding children's understandings of a word's meaning.

Table 14

Means and SDs on Vocabulary Posttests of Screen-based Pedagogical Supports by Language Environment Group (N = 50)

	Lower PPVT ($N = 25$)			Higher PPVT ($N = 25$)		
	Expository	Narrative	Participatory	Expository	Narrative	Participatory
Word identification posttest	.47 (.22)*	.27 (.18)	.47 (.24)*	.55 (.27) ‡	.44 (.29)	.65 (.23)*
Word meaning posttest	.44 (.13)	.48 (.12)	.46 (.12)	.60 (.12) †	.53 (.12)	.52 (.18)

Note: * $p < .05$, statistically higher than the Narrative instructional context within each PPVT group

‡ $.05 < p < .10$, statistically higher than the Narrative instructional context in the Higher PPVT group.

† $p < .05$, statistically higher than the Narrative and Participatory instructional contexts in the Higher PPVT group

To better understand the influence of instructional contexts on the L2 vocabulary learning of DLLs in each language subsample, I ran a repeated measures ANCOVA with instructional context (3: Expository, Narrative, Participatory) as a within-subjects factor, and Standard English PPVT scores as well as age in months as covariates for the higher and lower PPVT groups. The repeated measures ANCOVA was run twice, once on each posttest assessment (word identification, word meaning).

In the higher PPVT group, findings from the repeated measures ANCOVA indicated that the instructional context had neither a facilitative nor detrimental

effect on L2 word identification (see Table 15). In other words, there was not a main effect for the instructional context on the vocabulary identification posttest, $F(1, 22) = .650$, $p = .429$. There was, however, a significant interaction for Standard English PPVT scores, $F(1, 22) = 4.711$, $p = .041$. This interaction indicates that in the higher PPVT group, children's L2 proficiency levels influenced how well different instructional contexts facilitated word identification.

Next, examining the word meaning posttest in the higher PPVT group, there did not appear to be a main effect for the instructional context, or significant interactions for English PPVT or children's age (Table 15). In other words, the instructional context did not appear to scaffold children's ability to learn the meaning of vocabulary words in the higher PPVT group. Interestingly, the instructional context did have a trend towards facilitating L2 word meaning in young DLLs. There was a marginally significant effect for instructional context, $F(1, 22) = 3.532$, $p = .074$. This might be explained, in part, by descriptive statistics that indicated the Expository instructional context was significantly higher than the Narrative or Participatory instructional contexts for the word meaning posttest. With such a trend, future research should continue to examine the mechanisms that drive vocabulary instruction on screen, particularly as they relate to the genre or instructional context.

In the lower PPVT group, there were no significant effects in the repeated measures ANCOVAs for any of the posttest measures (see Table 16). In other

words, for children with lower L2 proficiency, the instructional contexts did not appear to facilitate L2 word identification or word meaning.

Table 15

ANCOVA Inferential Statistics for Vocabulary Assessments in High PPVT Subsample (N = 25)

Dependent Variable	Contrast	Main Effects and Interactions					
		F	df	Sig.	MS_{Effect}	SS_{Error}	MS_{Error}
Vocabulary identification posttest	Instructional Context	.650	1, 22	.429	.033	1.130	.051
	English PPVT*	4.711	1, 22	.041	.242		
	Age	.427	1, 22	.520	.022		
Vocabulary meaning posttest	Instructional Context†	3.532	1, 22	.074	.057	.354	.016
	English PPVT	.640	1, 22	.432	.010		
	Age	.004	1, 22	.953	.000		

Note. SS = sum of squares; MS = mean square; PPVT = Peabody Picture Vocabulary Test.
* = $p < .05$.
† = $.05 < p < .10$.

Table 16

ANCOVA Inferential Statistics for Vocabulary Assessments in Low PPVT Subsample (N = 25)

Dependent Variable	Contrast	Main Effects and Interactions					
		F	df	Sig.	MS_{Effect}	SS_{Error}	MS_{Error}
Vocabulary identification posttest	Instructional Context	1.372	1, 22	.254	.067	1.078	.049
	English PPVT	2.357	1, 22	.139	.116		
	Age	.455	1, 22	.507	.022		
Vocabulary meaning posttest	Instructional Context	.620	1, 22	.439	.007	.245	.011
	English PPVT	.133	1, 22	.719	.001		
	Age	.004	1, 22	.951	.000		

Note. SS = sum of squares; MS = mean square; PPVT = Peabody Picture Vocabulary Test.
* $p < .05$.

Consistent with findings from the analyses of descriptive statistics, the repeated measures ANCOVAs of both language groups demonstrate that the instructional contexts were more differentially beneficial for children from the higher PPVT group than the lower PPVT group. In other words, when children had lower L2 proficiency, instructional contexts were not differentially able to scaffold L2 word identification or word meaning. Rather, children with a higher L2 proficiency were likely able to draw from their prior L2 knowledge (Cummins, 1979) to learn both word labels and word meanings from certain genres of educational media. With the potential of media to differentially facilitate

L2 word learning in young DLLs, findings from this study highlight the need for future research to specifically investigate how media might address the needs of children less proficient in their L2.

Discussion

The current study was designed to investigate how instructional contexts used to teach vocabulary words on screen might affect L2 word learning in educational media. Taking a fine-grained approach to understanding the macrostructures of educational media programming (Linebarger et al., 2017), this study sought to isolate three salient instructional contexts on screen – Expository, Narrative, and Participatory – to examine how they might affect bilingual children's ability to both identify words in a new language and understand word meanings.

Findings from this study established that dual-language learners were able to learn vocabulary words in their L2 when words were presented on screen. While previous studies with bilingual populations have investigated how multimedia might facilitate L2 word learning when media is incorporated into classroom instruction (Silverman & Hines, 2009), or when specific television patterns and viewing habits are established at home (Uchikoshi, 2006), the current study uniquely examines L2 word learning from manipulated videos to establish that DLLs are able to learn vocabulary words after single-viewings of educational media clips.

Moreover, results demonstrate that instructional contexts on screen were

facilitative in helping DLLs identify new vocabulary words that were presented on screen. Repeated measures ANCOVAs in the full sample indicated that instructional contexts differentially influenced L2 word learning for the word identification posttest. An analysis of descriptive statistics demonstrated that children were able to identify more words in both the Expository and Participatory instructional contexts compared to the Narrative context, and that these differences were statistically significant. To identify or label a word in a second language, this study suggests that after a short period of instruction, the instructional context does differentially affect children from households where a language other than English is spoken. With unique on-screen mechanisms afforded by each instructional context, the current study highlights that certain supports on screen are better able to facilitate word identification among young DLLs than others.

The Narrative instructional context, which presented vocabulary words and their meanings through embedded conversations in the storyline of an episode, did not facilitate L2 word learning as well as the Expository and Participatory contexts. Both Expository and Participatory contexts are relatively active genres that require viewers to engage with screen content through visual or interactive scaffolds. Aligned with findings from the first study of this dissertation, Expository instructional contexts use attention-directing cues (e.g., visual effects and sound effects) and ostensive cues (e.g., repetitions or multiple exemplars) that provide children with the scaffolds needed to learn words in a

second language. Commanding the attention of viewers and directing attention towards a specific word learning episode, children engaged in this genre appeared to learn more words than in the Narrative context.

Likewise, Participatory instructional contexts provided children with word learning experiences in socially contingent learning environments (Troseth, Saylor, & Archer, 2006). This was defined as an environment with two-way exchanges in which an adult figure on screen engaged with a viewer with information that was appropriate in content and intensity. Because language learning also takes place in socially contingent environments (Roseberry, Hirsh-Pasek, & Golinkoff, 2014), these Participatory environments appeared to strategically engage viewers in learning experiences that better scaffolded L2 word learning than Narrative contexts. In other words, when DLLs were provided with opportunities on screen that commanded the attention of viewers and explicitly guided children through a word learning experience in their second language, they were more likely to learn these words.

Clearly, all contexts are not created equal. Applying a fine-grained analysis to the macrostructures that govern media content (Linebarger, et. al., 2017), findings from this study concur with Beck, McKeown, and McCaslin (1983) that contexts were not created equally. The Narrative instructional context appeared to be more cognitively demanding for DLL viewers to discern new, heavily contextualized words that were tossed between characters in dialogue. In the Expository instructional context, multiple examples or synonyms of words

provided scaffolds that repeatedly presented target learning experiences to young DLLs. Learning not only the content on screen, but also the language used to deliver it (Echevarria et al., 2008), repetitions and other explicit supports appeared to help reinforce the learning of L2 vocabulary words. Finally, in the Participatory instructional context, media programs established joint attention, exaggerated prosody, and elicited a response from viewers to help children focus on new content and relate this content to word labels and meanings. With significant differences established between instructional contexts in certain measures with the full sample and language subsamples, this area of study warrants further research.

In fact, there were interesting differences established between the two language proficiency groups. In both the higher and lower PPVT subsamples, children were able to identify more vocabulary words in the Expository and Participatory contexts than the Narrative context. Like in the full sample, the differences between these contexts were statistically significant. However, for the word meaning posttest, only the Expository context appeared to provide more scaffolds for children in the higher PPVT group. There were no differences between instructional contexts for the lower PPVT group in the word meaning posttest. In fact, repeated measures ANCOVAs revealed that there were no effects or interactions with the instructional context for either vocabulary assessment with children from the lower PPVT group. Because significant patterns did emerge in the higher PPVT group, findings from this study suggest that children

may need to have a certain threshold (Cummins, 1979) or command of the second language in order to benefit from learning experiences on screen. Without the language to discern content on screen, viewers with a low L2 proficiency were unlikely able to retrieve words from their dynamic linguistic system (García, 2009) to make sense of content presented in a new language.

Thus, it appears that the Matthew Effect may be at work (Stanovich, 2009) whereby the children in the higher PPVT group benefit from certain instructional contexts on screen, while children in the lower PPVT group receive no benefit or added vocabulary knowledge from these learning experiences. Exacerbating the divide, educational media has the potential to facilitate word learning in a new language, but may also miss the opportunity to prepare children with L2 words that they will later encounter in school systems. Future research may continue to uncover specific mechanisms on screen that might facilitate learning among populations with less proficiency in the L2. Drawing from pedagogical supports in classroom research, this might include altering the number of repetitions of words, the pace at which words are presented, the types of words presented on screen, or the lexical density of program episodes for young DLLs.

There are several limitations of this study. First, children may have paid closer attention to the video clips in this study than in natural settings because they were shorter than full-length episodes with targeted word instruction. Although this study does not claim to be naturalistic, using shortened clips allowed me to maximize the number of episodes per condition to more reliably

examine differences between instructional context. Second, the specific vocabulary words used in the videos were not 100% comparable to one another as children's background knowledge in the L2 varied. However, using a screening test and within-subjects design, as well as carefully selecting similar words for the study, I aimed to reduce any threats to internal validity. Moreover, increasing the ecological validity of the study, words were selected from media programs (*Bubble Guppies, Martha Speaks, Sesame Street*) that were readily available and accessible to young children. Because programs were selected from the current media marketplace, however, there may have been a program effect where certain aspects of the program unrelated to genre could have driven L2 word learning. This could include children's familiarity with the show or character, how engaging characters were in each program, or features of language that programs tended to use. As such, findings need to be carefully interpreted with regard to the main effect as they may not have been from genre alone.

Importantly, the reliability of the two researcher-created measures was not particularly high. While reported reliability measures were marginally acceptable at $\alpha = .61$ and $\alpha = .69$, this may be due, in part, to the few number of items per assessment, which were created to avoid fatigue. Findings should, therefore, be carefully interpreted as differences between genres may be underestimated, which could have important implications for null findings. Similarly, Arabic, Bambara, Fulani, Haitian-Creole and Spanish proficiency measures were not used as a pretest to consider the influence of children's L1 proficiency on L2 word

development, according to Cummins' (1979) theory of linguistic interdependence. Additionally, using a median-split to examine trends in higher- and lower-English PPVT scores treats language proficiency as a categorical variable (i.e., children have high proficiency or low proficiency) rather than a continuous variable. Still, using a median split allowed me to uncover how certain instructional contexts affected word learning differently among children with higher and lower L2 proficiency. Another key consideration for future studies is to document the language of instruction in classrooms as this is another critical source of L2 input and language exposure. Finally, when examining the moderating role of L2 proficiency, findings were correlational and not causal; rather, causal inferences applied to the role of instructional contexts on L2 vocabulary learning.

Despite these limitations, the current study demonstrates that DLLs are able to learn words in a new language from screens, and that word learning can be influenced by certain instructional contexts. It provides evidence to suggest that specific instructional contexts that actively engage viewers in on-screen learning affected vocabulary gains in the new language. These gains also differ according to the L2 language proficiency of children. Those with higher levels of English proficiency were able to learn words through the Expository and Participatory instructional contexts; those with lower levels of English proficiency appeared to be left behind. As young children are on screens for more than two hours a day (Common Sense Media, 2013; Rideout, 2014), media has the potential to serve as

a vehicle for high-quality L2 word instruction. With the opportunity for educational media to scaffold L2 vocabulary words that children will encounter in school contexts, researchers, media producers and educators alike need to continue this line of scholarship to uncover specific mechanisms on screen that are effective for all children, especially when they are from linguistically diverse communities.

CHAPTER V

HOME LANGUAGE SUPPORTS STUDY

Research Questions

1. To what extent do DLLs learn L1 and L2 vocabulary through educational media?
2. How do the language of instruction and language of definitions in a child's L1 or L2 affect L1 and L2 vocabulary learning in DLLs? How might this vary according to a child's dominant language?
3. How do the language of instruction and language of definitions support longer-term retention of vocabulary knowledge in the L1 and L2?

Method

Research Design

I conducted a within-subjects design to examine how the language of instruction and language of definitions affect vocabulary learning in young DLLs. In this type of design, each participant received all four conditions (English Immersion, English with Mandarin Supports, Mandarin Immersion, Mandarin with English supports), and therefore, served as his/her own control. I selected a within-subjects design for a number of reasons. First, because students received all conditions, I could control for between-subjects variability (e.g., English and Mandarin language proficiency). This helped to reduce error and increase power

to detect potential differences between conditions (Shadish, Cook, & Campbell, 2002). Using a within-subjects design also allowed me to conduct the study with a smaller sample of children. A G*Power analysis indicated a sample size of 80 children was required to detect a small effect of .15 at an alpha level of .05 and power of .80 (Faul et al., 2007). Third, with a within-subjects design, threats of a carry-over effect were minimal because four different video clips were examined. Finally, because participants essentially served as their own controls, a within-subjects design helped account for significant threats to internal validity.

In this design, children were presented with four conditions, learning six words in English and six words in Mandarin. These words were presented in four different video clips. To account for order effects and fatigue, conditions and video clips were counterbalanced using a Latin square design. In other words, the four conditions and four video clips were counterbalanced such that children were randomly assigned to one of 16 sequences of videos. This Latin square design also minimized any carry-over effects between videos and conditions. In other words, I better controlled for video differences not related to the language of instruction or language of definitions.

Sample

Children were recruited from 11 preschool and kindergarten classes in the northeast region of the United States. Eight of these classes were afterschool programs that belonged to an organization that promotes the social and economic empowerment of Chinese American, immigrant, and low-income communities.

Two of these programs were independent daytime preschools serving children from Chinese American, low-income communities. The remaining program was a private Mandarin language learning center for children between the ages of two to seven years old from middle-class households. To be eligible for this study, children had to be four- or five-years-olds from households where Mandarin was spoken. With the help of education directors and teachers, 90 eligible children were invited to participate in the study. Parents and caregivers were provided with English-Chinese bilingual consent forms; 87 (96.7%) provided consent (see Table 17). The final sample consisted of 87 children (51% female) with an average age of 59.42 months (SD=7.97). Ninety-one percent of children in the sample were ethnically Chinese and 9% were interracial where one of the parents was Chinese. Moreover, 90% of the children qualified for free and reduced lunch, a proxy for low socio-economic status in education research; those from middle-class households in the private Mandarin language learning center did not (10%). Household income was not collected.

Parents provided information about their children's home language environment on a questionnaire appended to the consent forms (LEQ). More specifically, parents rated children's exposure to English and Mandarin on a five-point scale from 0% exposure to 100% exposure. Language environment was measured by the languages spoken by parents in each language, and by the language and literacy activities (e.g., reading, singing, watching TV) that children engaged in at home in each language. These questions were presented to parents

in English and Chinese. The maximum score possible on this self-reported measure was 14 for the English language environment measure and 14 for the Mandarin language environment measure. Children in the sample had an average English composite score of 7.07 (SD = 2.70) and Mandarin composite score of 8.21 (SD = 3.28), indicating a modicum of exposure to both English and Mandarin in the home environment. These scores suggest that children in the sample are exposed to more Mandarin than English in the home environment.

To examine children's language proficiency in English and Mandarin, the Peabody Picture Vocabulary Test (PPVT) was also administered as a pretest in English and Mandarin. Measuring general receptive vocabulary knowledge, the average standard English PPVT score of children in the sample was 88.78 (SD = 13.21) and the average standard Chinese PPVT score was 80.15 (SD = 19.93). These standard PPVT scores indicated the sample was approximately one standard deviation below the norm according to monolingual norms in both English and Mandarin receptive vocabulary. These scores also suggest that children had a degree of proficiency in both languages.

Table 17

Descriptive Statistics and Demographics of Full Sample (N = 87)

Variable	Characteristic
Female	51%
Age (months)	59.42 (7.97)
Age Span	48-72
Ethnically Chinese	91%
PPVT	
English PPVT Standard Score	88.78 (13.21)
Chinese PPVT Standard Score	80.15 (19.93)
Language Environment Questionnaire (max. = 14)	
English Composite Score	7.07 (2.70)
Chinese Composite Score	8.21 (3.28)

Measures

In this study, both standardized measures and researcher-developed measures were used to assess children's vocabulary knowledge. The following were used as baseline measures to examine children's receptive language in English and Mandarin.

English Peabody Picture Vocabulary Test-IV *(PPVT-IV; Dunn & Dunn, 2007).* The English PPVT was used as a pretest measure and served as a baseline for general English receptive vocabulary knowledge. It is an individually administered, norm-referenced test designed to measure receptive language skills. Children point to one of four images with three foils in an assessment book. Reliability of the standardized assessment ranges from .91-.94. Raw scores were

converted to standardized scores according to the participant's age in months. These baseline standardized scores were used as a covariate in the data analysis.

Chinese Peabody Picture Vocabulary Test-II (Lu & Liu, 1998). The Chinese PPVT was also used as a pretest measure and a baseline for general Mandarin receptive vocabulary knowledge. The second edition of the Chinese PPVT was developed in Taiwan and captures normative values of typically developing children from 3 to 12 years of age, provided by the test developer. It is identical in format to the English PPVT where children point to one target word among three foils in an assessment booklet. Standardized scores and percentile values are age-matched to a scale provided in the test manual with a mean of 100 and a standard deviation of 15. The reported split-half reliability from the norms for native Mandarin-speaking children is .95 (Lu & Liu, 1998). Standardized scores were used as a covariate in the data analysis.

The following measures were used to collectively assess children's target word learning: word identification and word meaning. These researcher-created measures were piloted before the study.

Word Identification Measure.

The word identification measure was designed to examine gains in children's word knowledge. This test was given as a pre- and posttest measure to find the difference between target word knowledge before and after each video clip. Reliability of the assessment, calculated by Cronbach's alpha, was $\alpha = .83$.

The word identification measure consisted of 24 receptive vocabulary items and 24 expressive vocabulary items. Receptive and expressive items were combined as one score in this measure. Each assessment contained the 12 target words in English ($\alpha = .82$) and the 12 target words in Mandarin ($\alpha = .73$).

In the word identification measure, vocabulary words were assessed once receptively and once expressively. The receptive vocabulary items in this measure consisted of three images on a screen: one target image and two thematically-related foils. Children were asked to point to the vocabulary word. To minimize children's exposure to the vocabulary word during assessments, assessors were instructed to only use the vocabulary word once (i.e., they could not repeat the word). In addition, the language of the receptive vocabulary items was alternated to account for order effects. For example, Student 1 received the English receptive items followed by the Chinese receptive items, while Student 2 received these assessments in the opposite order.

The expressive vocabulary items in the word identification measure consisted of one image on a screen. Assessors presented students with the image and provided children with a sentence for them to complete using the vocabulary word. For example, with the word *pinwheel*, assessors showed an image of a pinwheel and asked children, "This toy that turns in the wind is called a…" Using the same image on screen, the assessor then switched to Mandarin and said, "這種在風裡會轉動的玩具叫做…". After answering the assessor in both English and Mandarin, the next vocabulary word was assessed. If students answered English

questions with the Chinese vocabulary word, assessors marked the answer correct for the Chinese word, and vice versa. Assessing each word in both languages at the same time was deemed appropriate when piloting these expressive items. This method was more efficient and allowed bilingual children to simultaneously retrieve the English and Mandarin labels from their conceptual vocabulary. Like the receptive items, the order of languages used for the expressive items was counterbalanced.

Word identification delayed recall. The word identification measure was used again one week later as a delayed posttest to measure longer-term word retention. The posttest and delayed posttest were the same.

In addition, beyond identifying vocabulary words, two posttest-only measures were developed to examine preschool children's developing understandings of new words (Nagy & Herman, 1987), captured by their ability to identify the meaning of vocabulary words receptively and expressively. Because expressive language skills are preceded by receptive language skills (Bloom, 1974), these two posttests represented different levels of difficulty for children to demonstrate word meaning. Cronbach's alpha for both measures was $\alpha = .89$, indicating a high level of reliability.

Word Meaning Measures.

Receptive Word Meaning. The researcher-created receptive word meaning task was a posttest-only measure. More than word identification, this measure was

designed to assess children's comprehension of a target word using their receptive language skills. Assessors asked children to point to one of three images to identify a vocabulary word based on its meaning. Images were screenshots from the program, representing the context in which the words were presented. Each word was assessed three times, totaling 36-items. More specifically, there were 18-items for the six English vocabulary words ($\alpha = .80$); and 18-items for the six Chinese vocabulary words ($\alpha = .80$). Although each word was assessed receptively three times, to minimize children's exposure to the vocabulary label, assessors did not mention the vocabulary word during this assessment. For example, assessors would ask a question related to the definition of the word ("Point to the one where people go to roller skate"), or one that presented the word in a scenario ("John put on his roller skates. Where should he go?").

Expressive word meaning measure. The researcher-created expressive word meaning task was a posttest-only measure. It was designed to assess children's comprehension of vocabulary words using their expressive or productive language skills. Each vocabulary word was assessed three times, totaling 36-items. Like the receptive word meaning measure, there were 18-items for the six English vocabulary words ($\alpha = .83$); and 18-items for the six Chinese vocabulary words ($\alpha = .71$). In the expressive vocabulary assessments, participants were prompted once if they did not provide an answer or said they did not know the answer. If the child was incorrect after prompting, they were given a 0. The expressive vocabulary measure consisted of three different questions. First,

an image of the target word appeared on screen. Children were asked, "Can you describe this?" or "What is happening?" (for a verb). Second, children were asked questions based on a synonym of the word. For example, for the word *ice sculpture*, children were asked, "What is another word for an ice statue?" In the third and final expressive question, assessors used the vocabulary word, asking children, "What does *ice sculpture* mean?" Children's answers were recorded by the assessor verbatim in English and Chinese. This third expressive assessment was graded on a three-point scale (0 = incorrect; 0.5 = partially correct; 1 = correct) by me. If children answered the question in the partner language, they were given full credit if their definitions were correct. For example, if the assessor asked a child what *ice sculpture* meant in English, and the child accurately defined *ice sculpture* in Chinese, the student was given full credit because he/she demonstrated an understanding of the English vocabulary word, *ice sculpture*.

Word meaning delayed recall. The word meaning measure (both receptive and expressive) were used again one week later as delayed posttests to measure longer-term word retention. The posttest and delayed posttest were the same.

Video stimuli

Videos were taken from the program *Ni hao, Kai-lan*, which teaches preschool-aged children vocabulary words in English and Mandarin. This program was chosen from a content analysis that examined opportunities for L1 and L2 vocabulary learning on programs marketed towards Dual-Language

Learners (Wong & Neuman, 2019). It was also selected because of the culturally relevant, Chinese-American protagonist who shared new words with viewers in English and Mandarin.

From the program, I selected four different episodes that included vocabulary words with visual representations of the words on screen and clear definitions. I transcribed each episode and recreated a script that allowed me to make the episodes more comparable to one another. These scripts were similar in length and followed a straightforward narrative structure with a setting, problem, and resolution. They also introduced three new vocabulary words that were repeated the same number of times (see below for more detail on word choice). These scripts were reviewed by a colleague with expertise in educational media for preschool-aged children. Finally, scripts were translated, back translated, recorded by bilingual speakers, and dubbed onto existing video clips. In total, there were four versions of each video, one for each condition (see conditions in Table 18 and video selection in Table 19).

The average running time of each video clip was 132.5 seconds (SD = 3.1). Videos also used the same expository instructional approach for vocabulary learning where programs uniquely directed children's attention to topic-centered vocabulary words and used multiple examples (Larson & Rahn, 2015; Linebarger et al., 2004) (see Study 2 in dissertation). Video clips were piloted in all four conditions prior to the study to ensure they were appropriate for preschoolers in this context.

Table 18

Conditions for Home Language Supports

	Language of instruction	Language of definitions	Example
Condition 1: English Immersion	English	English	Monkey: **Blow** out the candles, Rintoo. Kai-Lan: What does **blow** mean? Monkey: **Blow** is when you make air come out of your mouth.
Condition 2: English with Mandarin Supports	English	Mandarin	Monkey: **Blow** out the candles, Rintoo. Kai-Lan: **Blow** 的意思是什麼呢？ Monkey: **Blow** 就是從你的嘴巴把空氣推出來的動作。
Condition 3: Mandarin Immersion	Mandarin	Mandarin	Monkey: Rintoo 要吹蠟燭。 Kai-Lan: 吹的意思是什麼呢？ Monkey: 吹就是從你的嘴巴把空氣推出來的動作。
Condition 4: Mandarin with English Supports	Mandarin	English	Monkey: Rintoo 要吹蠟燭。 Kai-Lan: What does 吹 mean？ Monkey: 吹 is when you make air come out of your mouth.

Table 19

Details of Video Clips Selected

Episode	Duration	Synopsis	English Vocabulary	Chinese Vocabulary	CHILDES
Roller Rintoo	2:08	Kai-lan and friends go roller skating. Rintoo doesn't know how to roller skate but learns to skate with the help of his friends.	rink (n.) wobbly (adj.) glide (v.)	旱冰場（量） 搖搖晃晃（形） 滑行（動）	0 3 0
The Snowiest Ride	2:14	Kai-lan and friends go on a sledding adventure down a mountain and discover beautiful ice sculptures.	ice sculpture (n.) transparent (adj.) carve (v.)	冰雕（量） 透明（形） 雕刻（動）	0 0 2
Lulu Day	2:15	Kai-lan gets ready to play with her friend, Lulu. Together, they play with a new toy, the pinwheel.	pinwheel (n.) thrilled (adj.) twirl (v.)	紙風車（量） 興奮（形） 旋轉（動）	1 0 0
Tolee's Rhyme Time	2:13	Kai-lan's friend, Tolee, is feeling frustrated. After grandpa teaches them how to do Tai Chi, they feel better.	Tai Chi (n.) frustrated (adj.) meditate (v.)	太極（量） 挫敗（形） 冥想（動）	0 0 0

Three vocabulary words were selected per video; one noun, one adjective, one verb; 12 words in total (see word selection in Table 19). To ensure comparability, I took into account the cultural context of words in English and Mandarin so that the most common meanings were consistently presented on screen. I also matched the complexity of the sentence structures (e.g., verb

phrases, subordinate clauses) in each language so that they required similar cognitive demands to process. Next, I selected comparable words on the Child Language Data Exchange System (CHILDES) database of 5,000 transcriptions of adult-child spoken interactions in home and laboratory settings (MacWhinney, 2014). With approximately 3,500,000 words in the database, frequency of words could be ordered as a function of age or mean length of utterance. Words selected in this study occurred less than five times in the utterances of 48-month-old children in the CHILDES database, indicating a word was challenging and unlikely to be known by DLLs, as well as comparable in level of difficulty.

In each video, vocabulary words were repeated four times. Two repetitions occurred when a visual representation of the word was on screen (e.g., when Kai-lan says the word *Tai Chi*, there is an image of grandfather doing Tai Chi in the background); the other two repetitions included visual representations of the vocabulary word with clear definitions (e.g., Kai-lan mentions the word *Tai Chi* and offers a definition of it as grandfather does Tai Chi in the background). The language of vocabulary labels and language of vocabulary definitions varied according to video condition (see Table 18). When the language of instruction was English, vocabulary labels were presented in English (Conditions 1 and 2); when the language of instruction was Mandarin, vocabulary labels were presented in Mandarin (Conditions 3 and 4). The definitions of vocabulary words were presented in English in Conditions 1 and 3, and in Mandarin in Conditions 2 and 4 (Table 18). This way, depending on the language proficiency of the child,

definitions on screen would reflect the dominant language of children in at least two conditions.

Procedure

Eligible participants were brought to a quiet room to complete the English PPVT, Chinese PPVT, and word identification pretest measure. This took approximately 20-25 minutes to complete, depending on the language proficiency of each child. Children were also asked if they were familiar with the program *Ni Hao, Kai-lan* as a program effect could influence their viewing experience. No students had watched the program before.

The next day, children viewed a total of four videos, counterbalanced by a Latin square design; Children were randomly assigned to one of 16 sequences. English-Mandarin bilingual graduate assessors were trained prior to the study and monitored during data collection with random spot checks. Assessors sat beside participants as they viewed the video clips with headphones. At the end of each video, assessors followed a script to administer the vocabulary knowledge assessments: a word identification posttest (6 items), receptive word meaning posttest (9 items), and expressive word meaning posttest (9 items). After viewing all videos and completing all assessments, children returned to their classrooms. Videos and assessments took approximately 30-35 minutes to complete per child. One week later, assessors re-administered the delayed posttests (without videos), which took approximately 10 minutes to complete.

The language of assessments was parallel to the sequence of videos students were assigned to. If, for example, a child viewed video clips with a sequence of English, Mandarin, English, and Mandarin videos, the language of assessments followed suit. Assessors conducted assessments using the dominant language of the child but assessed vocabulary words and definitions in the languages being assessed. In other words, while an assessor might encourage or give directions to a child in their dominant language, English vocabulary words were always assessed in English, and Mandarin vocabulary words were always assessed in Mandarin. This was the most effective method for eliciting children's responses according to piloted assessments prior to the study.

Data analysis

I conducted the following analyses to determine how the language of instruction and language of definitions in educational media affected L1 and L2 vocabulary learning in DLLs. For all analyses, I converted posttest raw scores into proportion of items correct for each assessment type (word identification, receptive word meaning, expressive word meaning). I then determined whether children developed an understanding of the words from educational media clips. I first computed a paired-sample *t*-test for gains in the word identification measure, and one-sample *t*-tests against chance values for receptive and expressive word meaning assessments. Chance values were used to indicate children learned

vocabulary words above chance; scores would be at chance if they did not learn words from videos.

To answer my first and second research questions, I used a 2 x 2 repeated measures ANCOVA with the language of instruction (2: English, Chinese) as the first between-subjects factor and the language of definitions (2: English, Chinese) as the second between-subjects factor. Covariates included age in months, standardized English and Chinese PPVT scores, as well as word identification pretest scores to consider their respective influence on vocabulary outcomes. Repeated measures ANCOVAs were run on each posttest (word identification, receptive word meaning, expressive word meaning), which were converted to proportions correct scores and served as dependent variables.

My third research question examined how language of instruction and definitions supported longer-term retention of vocabulary knowledge in the L1 and L2. Longer-term retention was assessed using delayed posttest scores. The analytical method was identical to the first and second research question, using repeated measures ANCOVAs on students' delayed posttest scores instead of posttest scores as dependent variables.

Results

In the following results, I answer my research questions that examine: (1) the extent to which DLLs are able to learn L1 and L2 vocabulary words through educational media; (2) the role of the language of instruction and language of definitions in educational media on the L1 and L2 vocabulary development of

DLLs; as well as (3) the influence of language of instruction and definitions on longer-term retention of vocabulary words. I report results pertaining to each question in the following sections.

L1 and L2 Vocabulary Learning from Educational Media

I first investigated whether children demonstrated an understanding of vocabulary words that were presented in educational media clips. There were two measures of vocabulary knowledge: word identification and word meaning. The word identification assessment captured gains in children's ability to identify a target vocabulary word. Moving beyond word identification, the word meaning measure assessed children's comprehension of vocabulary words, receptively and expressively. These were posttest-only assessments.

Examining mean differences in Table 20, children demonstrated gains in word identification between the posttest (.36, SD = .14) and pretest (.25, SD = .11), indicating words were learned through the educational media clips. To corroborate these gains through statistical analysis, an understanding of vocabulary words was defined as children performing statistically higher in the posttest than the pretest. Running a paired-sample *t*-test, findings demonstrated significant word gains in the word identification assessment, $t(86) = 7.984$, $p < .05$ (see Table 20). In other words, children were able to identify more vocabulary words after a single-viewing of educational media.

For the word meaning measure (Table 21), descriptive statistics indicate that children were better able to provide the meaning of new words receptively

(.73, SD = .15) than they were able to expressively describe the meaning of these words (.23, SD = .13). Expressive word meaning scores were also notably low. Examining these mean differences through statistical analysis, an understanding of vocabulary words was defined as children performing statistically above chance level on each assessment. If children performed at chance level, for example, they likely guessed the answers to the questions. Running one-sample *t*-tests with chance level as the comparison value for each of these posttests (see Table 21), analyses revealed that children demonstrated an understanding of word meaning both receptively, $t(86) = 24.76$, $p < .001$, and expressively, $t(86) = -19.49$, $p < .001$.

Table 20

Descriptive Statistics and Paired-Sample t*-test Between Word identification Pretest and Posttest*

	Word Identification									
	Pretest		Posttest			Mean Difference	95% CI for Mean Difference			
Question Type	M	SD	M	SD	n			r	t	df
Word identification	.25	.11	.36	.14	87	.11	0.08, 0.13	.01	7.984*	86

Note. * p < .05.

Table 21

One-Sample t-*tests Against Chance Values for Word Meaning Posttests in the Full Sample*

Question Type	M	SD	Chance Level	Mean Difference	95% CI for Mean Difference	*t*	*df*	Significance
Word meaning: receptive posttest	.73	.15	.34	.39	.36, .42	24.76*	86	<.001
Word meaning: expressive posttest	.23	.13	.50	-.27	-.30, -.24	-19.49*	86	<.001

Note. * $p < .001$

In this manner, findings indicate that DLLs were able to learn the meaning of some vocabulary words from educational media. Children demonstrated gains in the word identification posttests as they accurately identified vocabulary words. They were also able to identify vocabulary words based on their meaning (receptive word meaning), and described target words to assessors (expressive word meaning), although children had particularly lower scores in the expressive word meaning posttest (.23, SD = .13). As such, after a single viewing of educational media clips in English and Chinese, preschool-aged DLLs were able to identify new vocabulary words, understand word meanings receptively and, to a lesser extent, describe word meanings expressively.

Investigating further how children learned vocabulary words in each language, I examined mean differences of each vocabulary assessment by language learned (Table 22). I then used a paired-sample *t*-test between word

identification pretests and posttests in each language to examine gains, as well as one-sample *t*-tests with chance levels as the comparison value for the word meaning measures in each language.

For the first word identification measure, differences in means and standard deviations between the pretests and posttests indicated gains in word identification in both English and Chinese. These gains were statistically significant in both the English and Chinese word identification measures: English word identification, $t(86) = 6.62$, $p < .001$; Chinese word identification, $t(86) = 6.01$, $p < .001$.

Examining the word meaning measures, descriptive statistics suggest that children were also able to demonstrate an understanding of word meaning in the receptive and expressive posttests in English and Chinese. More specifically, participants performed better in the receptive word meaning measures (.79 in English; .68 in Chinese) than the expressive word meaning measures (.27 in English; .19 in Chinese). Consistent with overall findings, the expressive word meaning outcomes were notably low. Moreover, general Chinese posttest scores appeared to be lower than English posttest scores (Table 22). Running paired-sample and one-sample *t*-tests, children learning English words demonstrated an understanding of word meaning: receptive word meaning, $t(86) = 25.58$, $p < .001$; and expressive words meaning, $t(86) = -11.60$, $p < .001$. Likewise, children learning Chinese demonstrated an understanding of word meanings: receptive word meaning, $t(86) = 15.25$, $p < .001$; and expressive words meaning, $t(86) =$ -

23.49, $p < .001$. In sum, after a single viewing of educational media clips in English and Chinese, preschool-aged DLLs were able to identify new vocabulary words, understand the word meanings receptively and, to a lesser extent, describe word meanings expressively.

Table 22

Means and Standard Deviations for all Vocabulary Assessments by Language (N = 87)

Language Condition	Word Identification				Word Meaning			
	Pretest		Posttest		Receptive Posttest		Expressive Posttest	
	M	SD	M	SD	M	SD	M	SD
English	.27	.14	.39*	.18	.79†	.16	.27†	.18
Chinese	.24	.13	.34*	.15	.68†	.21	.19†	.12

Note. * $p < .001$ between word identification pretest and posttest
† $p < .001$ against chance values in word meaning posttests

Language of Instruction and Language of Definitions in Educational Media

I next investigated whether the language of instruction and language of definitions presented in educational media enhanced L1 and L2 vocabulary learning in young DLLs. I used a 2 x 2 repeated measures ANCOVA with

language of instruction (2: English, Chinese) and language of definitions (2: English, Chinese) as between-subjects factors, and covariates of age in months, standardized English and Chinese PPVT scores, and pretest scores to assess whether language of instruction or definitions impacted vocabulary learning in educational media (see Table 23).

Table 23

ANCOVA Inferential Statistics for All Vocabulary Assessments

Dependent Variable	Contrast	Main Effects and Interactions					
		F	df	Sig.	MS_{Effect}	SS_{Error}	MS_{Error}
Word Identification Posttest	Language of Instruction*	7.835	1, 82	.006	.201	45.270	.041
	Language of Definitions	1.644	1, 82	.203	.032		
	English PPVT	3.492	1, 82	.065	.143		
	Chinese PPVT*	8.828	1, 82	.004	.361		
	Age*	30.057	1, 82	.000	1.229		
	Pretest*	15.409	1, 82	.000	.630		
Receptive Word Meaning Posttest	Language of Instruction*	20.833	1, 82	.000	.972	185.541	.062
	Language of Definitions	.201	1, 82	.655	.005		
	English PPVT*	6.438	1, 82	.013	.402		
	Chinese PPVT	3.925	1, 82	.051	.245		
	Age*	9.158	1, 82	.003	.572		
	Pretest*	6.426	1, 82	.013	.402		
Expressive Word Meaning Posttest	Language of Instruction*	22.136	1, 82	.000	.528	18.354	.047
	Language of Definitions	1.306	1, 82	.257	.027		
	English PPVT*	6.974	1, 82	.010	.327		
	Chinese PPVT	1.539	1, 82	.218	.072		
	Age	2.084	1, 82	.153	.098		
	Pretest*	13.032	1, 82	.001	.611		

Note. SS = sum of squares; MS = mean square; PPVT = Peabody Picture Vocabulary Test.
* $p < .05$.

Language of instruction. Repeated measures ANCOVAs were run on each of the three posttests (word identification, receptive word meaning, expressive word meaning). Results indicated that the language of instruction was facilitative in L1 and L2 vocabulary learning. In all three posttest measures, there was a main effect for the language of instruction: word identification, $F(1, 82) = 7.84$, $p = .006$; receptive word meaning, $F(1, 82) = 20.83$, $p = .000$; expressive word meaning, $F(1, 82) = 22.14$, $p = .000$.

Findings from this study demonstrate that the language of instruction plays an instrumental role in the L1 and L2 vocabulary development of children viewing educational media. In this within-subjects design, children were assigned to English and Mandarin language of instruction conditions where English and Mandarin vocabulary words were taught. Because children were exposed to both English and Mandarin language conditions, participants had opportunities to learn vocabulary words in either their L1 or L2, depending on the proficiency levels of participants in each language. Findings from this study reveal a main effect for language of instruction, indicating the language used by characters on screen to teach vocabulary words directly influences children's vocabulary learning in both their L1 and L2. More specifically, the language of instruction supports children's ability to label vocabulary words in their L1 and L2, as well as demonstrate an understanding of the meaning of words receptively and expressively in both languages.

Language of definitions. Running repeated measures ANCOVAs on the three posttest assessments, results indicated that the language of definitions was neither facilitative nor a hindrance towards L1 and L2 vocabulary learning in educational media. In other words, the language of definitions on screen was not statistically significant among the three posttest measures: word identification, $F(1, 82) = 1.64$, $p = .203$; receptive word meaning, $F(1, 82) = .201$, $p = .655$; expressive word meaning, $F(1, 82) = 1.31$, $p = .257$.

Children viewed educational media clips with the language of definitions presented in either English or Mandarin. Because children were exposed to all four conditions: English with English definitions, English with Chinese definitions, Chinese with Chinese definitions, and Chinese with English definitions, participants viewed clips that provided definitions in either their L1 or L2. Findings indicate the language of definitions did not have a significant effect on vocabulary learning in educational media. In other words, the language of definition did not provide children with extra scaffolds to learn a vocabulary word. At the same time, the language of definition did not have a negative effect on vocabulary learning. Children were equally likely to label a vocabulary word or describe a word's meaning receptively or expressively regardless of the language of definitions.

English- and Chinese-dominant speakers. In light of the finding that the language of instruction had a main effect on the L1 and L2 vocabulary learning of the overall sample, I next examined how these factors specifically influenced L1

and L2 vocabulary learning according to the dominant language of children. Addressing the second research question, I identified the dominant languages of children to create an English-dominant and Mandarin-dominant subsample for analysis. Following Uchikoshi and colleagues who determined language dominance by clustering participants using L1 and L2 language proficiency levels (Leung & Uchikoshi, 2012; Uchikoshi & Marinova-Todd, 2012), I ran a cluster analysis of standard English and Chinese PPVT scores using Ward's method. More specifically, I ran a hierarchical cluster with between-group linkages to identify relatively homogenous groups of cases based on PPVT scores in both languages. Using a Dendrogram (see Figure 2), which allowed me to trace clusters at any level down to individual cases, I identified four larger clusters to represent the four groups of bilinguals. Figure 3 illustrates a scatterplot of standard English PPVT scores against standard Chinese PPVT scores with plot point colors indicating the cluster that each case belongs to.

In sum, there were 13 children in the English-dominant cluster with high English proficiency and low Chinese proficiency. There were also 16 children in the Chinese-dominant cluster with high Chinese proficiency and low English proficiency. A total of 27 children were balanced bilinguals with high levels of proficiency in both English and Chinese, and 32 were balanced with low levels of proficiency in both languages (see Table 24 for descriptive statistics of each language subsample). Because research questions investigated how media support

influenced children according to their dominant language, I primarily investigated the English-dominant and Chinese-dominant subsamples.

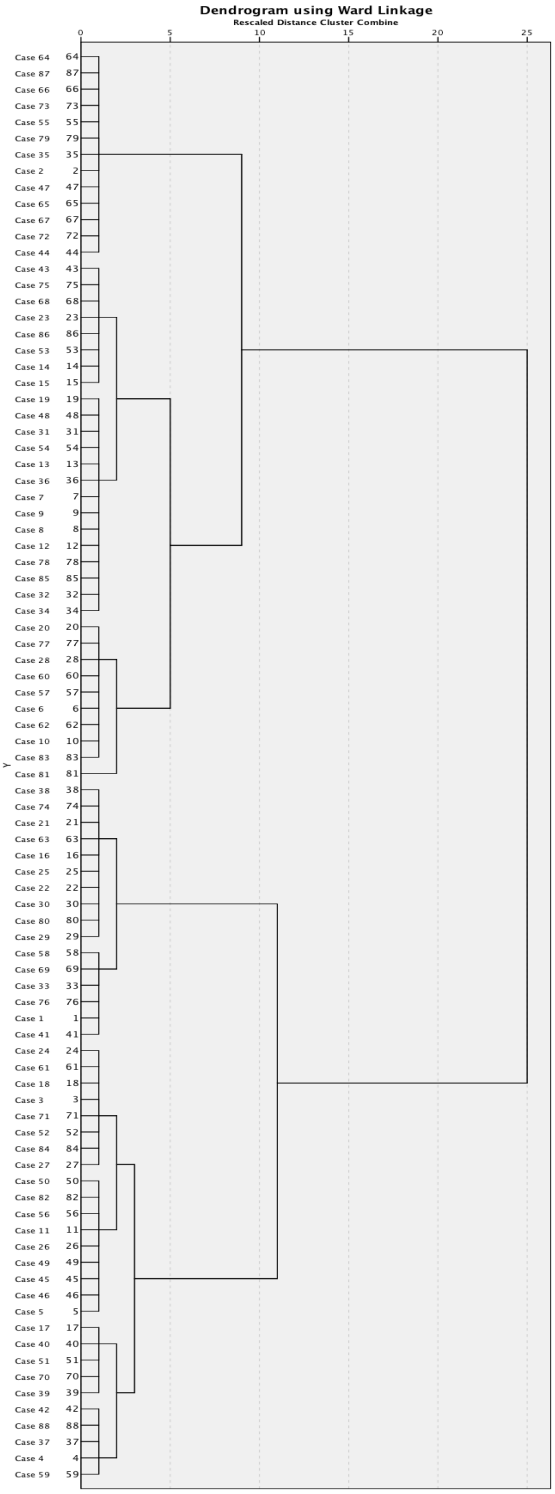
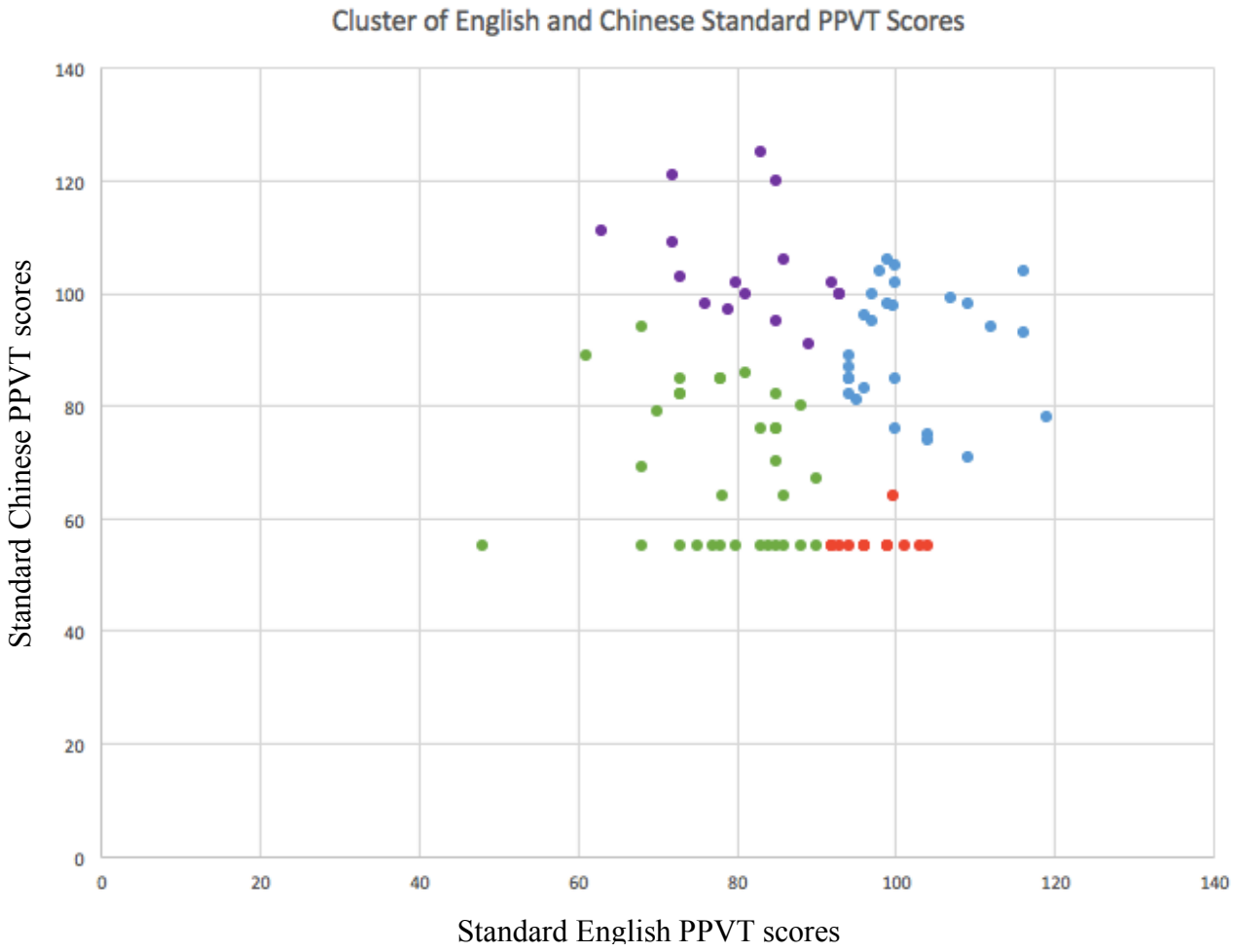


Figure 2. Dendrogram showing clustering of individual cases



Note: a minimum score on the Chinese PPVT was 55.
Key:

- English-dominant cluster
- Chinese-dominant cluster
- Balanced high bilinguals
- Balanced low bilinguals

Figure 3. Scatterplot showing the four clusters: Cluster 1 (balanced low bilinguals, green), Cluster 2 (English dominant, red), Cluster 3 (balanced high bilinguals, blue), Cluster 4 (Chinese dominant, purple) N = 88.

Table 24

Descriptive Statistics of Participants by Language Clusters

	N	Standard English PPVT Score			Standard Chinese PPVT Score		
		M	SD	Min. – Max.	M	SD	Min. – Max.
English Dominant	13	97.28	4.01	92 – 104	55.69	2.49	55 – 64
Chinese Dominant	16	81.38	8.61	63 – 93	105.00	9.80	91 – 125
Balanced Bilingual (High Proficiency)	27	101.58	7.48	94 – 119	90.48	10.61	71 – 106
Balanced Bilingual (Low Proficiency)	32	78.23	9.20	48 – 90	68.94	13.39	55 – 94

Language of instruction. Examining vocabulary learning in the English-dominant and Chinese-dominant subsamples, I created means and standard deviations of the three posttests by language (see Tables 25 and 26). Due to the small sample sizes in these retroactively clustered language groups, I first provide a descriptive analysis of vocabulary learning by group. With less statistical power, descriptive analyses provide an understanding of how children in this specific sample responded to educational media, with implications for future research to examine these descriptive patterns in a larger sample.

First, consistent with findings from the overall sample, participants in both the English-dominant (Table 25) and Chinese-dominant (Table 26) subsamples demonstrated gains in the word identification assessment. This indicates that

children were able to learn the labels of vocabulary words in both their L1 and L2 from educational media.

In the English-dominant subsample (Table 25), findings demonstrate that when children viewed media clips with English (L1) as the medium of instruction (i.e., the first two conditions), they had greater gains in the word identification posttest ($\overline{M}$ = .49) than when they viewed media clips with Chinese (L2) as the medium of instruction (i.e., the third and fourth conditions; $\overline{M}$ = .36). In other words, when the language of video clips reflected the dominant language of children, children were able to identify more vocabulary words both receptively and expressively.

Likewise, in the Chinese-dominant subsample (Table 26), children exhibited greater gains in the word identification posttest when Chinese (L1) was used as the medium of instruction (i.e., the third and fourth conditions; $\overline{M}$ = .43) than when English (L2) was used as the medium of instruction (i.e., the first two conditions; $\overline{M}$ = .33). Consistent with findings in the English-dominant subsample, children in the Chinese-dominant group appeared to label vocabulary words more accurately when the language of the video reflected their dominant language.

Next, I examined descriptive statistics of the word meaning posttest measures when words were presented on screen in children's L1 and L2. In the English-dominant sample (Table 25), children exhibited higher scores in the receptive and expressive word meaning measures when English (L1) was used as

the medium of instruction (i.e., conditions 1 and 2) compared to the two conditions when Chinese (L2) was used as the medium of instruction (i.e., 3 and 4). This indicates that when English-dominant children viewed programs that reflected their dominant language, they demonstrated a better understanding of word meanings than when videos used their non-dominant language. This pattern was consistent for the expressive word meaning posttest with the Chinese-dominant sample (Table 26). Interestingly, however, children in this subsample had similar scores in the receptive word meaning measures regardless of language. This may be due, in part, to the English and Chinese PPVT scores in the Chinese-dominant sample that are closer together than the PPVT scores in the English-dominant sample. With scores closer together, students in the Chinese-dominant sample may not require the scaffold of having the language of instruction aligned with their dominant language.

This descriptive analysis indicates a trend that when the language of instruction reflects a child's L1, it might support L2 vocabulary learning. Running 2 x 2 repeated measures ANCOVAs on all three posttests in the English and Chinese dominant subsamples, results indicated that the language of instruction was neither facilitative nor interfering with L1 and L2 vocabulary learning. This was true in the English-dominant subsample: word labeling, $F(1, 8) = .130$, $p = .728$; receptive word meaning, $F(1, 8) = 1.354$, $p = .278$; expressive word meaning, $F(1, 8) = .849$, $p = .384$; and the Chinese-dominant subsample: word labeling, $F(1, 11) = 1.64$, $p = .203$; receptive word meaning, $F(1, 11) = .201$, p

= .655; expressive word meaning, $F(1, 11) = 1.31$, $p = .257$. There was also no statistically significant relationship between the language of instruction and any of the posttests in the two balanced bilingual subsamples.

Table 25

Means and Standard Deviations of English-dominant *Sub-sample for All Vocabulary Assessments by Language Condition (N = 13)*

	Word Identification					Word Meaning			
	Pretest		Posttest		Gains	Receptive		Expressive	
Language Condition	M	SD	M	SD	M	M	SD	M	SD
English Immersion	.44	.15	.51	.22	.07	.86	.14	.44	.32
English w/ Chinese Definitions	.31	.16	.47	.15	.16	.95	.23	.34	.17
Chinese Immersion	.24	.17	.40	.14	.16	.68	.23	.17	.09
Chinese w/ English Definitions	.26	.17	.32	.19	.06	.64	.22	.20	.09

Table 26

Means and Standard Deviations of Chinese-dominant *Sub-sample for All Vocabulary Assessments by Language Condition (N = 16)*

	Word Labeling					Word Meaning			
	Pretest		Posttest		Gains	Receptive		Expressive	
Language Condition	M	SD	M	SD	M	M	SD	M	SD
English Immersion	.24	.16	.34	.15	.10	.73	.18	.23	.16
English w/ Chinese Definitions	.24	.16	.32	.19	.08	.76	.19	.17	.17
Chinese Immersion	.23	.15	.44	.16	.21	.73	.27	.23	.18
Chinese w/ English Definitions	.22	.18	.41	.14	.19	.74	.14	.24	.16

Language of definitions. To investigate how the language of definitions in educational media influence L2 vocabulary learning in DLLs, I analyzed descriptive statistics of Chinese word learning for English-dominant children, and English word learning for Chinese-dominant children. More specifically, I examined how the language of definitions might influence L2 vocabulary learning when the definitions of these vocabulary words were presented in the child's L1 or L2.

To learn Chinese words, children were presented with video clips that used Chinese as the medium of instruction, presenting the definitions of vocabulary words in either English or Chinese. In the English-dominant subsample (Table 25), posttest means indicated that when English (L1) definitions were provided, children did not necessarily have greater gains in vocabulary knowledge than in Chinese immersive environments without L1 supports. Descriptive statistics indicate marginally higher vocabulary scores in the Chinese Immersion condition than the Chinese with English Supports condition for the word identification measure (.08 difference) and receptive word meaning posttest (.04 difference). At the same time, findings also demonstrate marginally higher expressive word meaning posttest scores (.03 difference) when English (L1) was used to define vocabulary words.

Similarly, to learn English words, children viewed video clips with English as the medium of instruction, which presented definitions of vocabulary words in either English or Chinese. In the Chinese-dominant subsample (Table 26), findings suggest that when definitions were presented in Chinese (L1), children did not necessarily have greater gains in vocabulary outcomes. Descriptive statistics indicate marginally higher vocabulary scores in the English Immersion conditions than the English with Chinese Supports conditions for the word identification measure (.02 difference) and expressive word meaning (.06 difference) posttests. In contrast, findings also demonstrate marginally higher

receptive word meaning posttest scores (.03 difference) when Chinese (L1) was used to define vocabulary words.

These descriptive analyses indicate there is no trend between the language of definitions and L2 vocabulary learning. This is confirmed by 2 x 2 repeated measures ANCOVAs on almost all posttests in the English and Chinese dominant subsamples: English-dominant subsample, word identification, $F(1, 8) = .448$, $p = .522$; receptive word meaning, $F(1, 8) = .115$, $p = .744$; expressive word meaning, $F(1, 8) = .743$, $p = .414$; and the Chinese-dominant subsample, word identification, $F(1, 11) = .033$, $p = .859$; expressive word meaning, $F(1, 11) = .484$, $p = .501$. There was also no statistically significant relationship between the language of definitions and most of the posttests in the two balanced bilingual subsamples. For the Chinese-dominant subsample, however, there was a main effect for the language of definitions in the receptive word meaning posttest, $F(1, 11) = 6.071$, $p = .031$. Recognizing that the subsample is small and that the language of definitions did not appear to have a main effect on any other combination of posttests and language groups, this does suggest that the language of definitions warrants attention in future research.

In fact, looking to the two balanced bilingual subsamples and running similar 2 x 2 repeated measures ANCOVAs on each posttest, there was a main effect for the language of definitions with participants from the balanced bilingual group with low language proficiency in both languages. More specifically, the languages of definitions in educational media appeared to influence children's

ability to label vocabulary words, $F(1, 26) = 4.616$, $p = .041$. There were no other significant relationships between the language of definitions and any other posttest in these two balanced bilingual groups. Still, together with the statistically significant relationship between the language of definitions and the receptive word posttest in the Chinese-dominant sample, future research should consider examining the role of language on screen more closely.

Longer-term Retention of Vocabulary in Educational Media

The final research question investigated how language of instruction and language of definitions supported the longer-term retention of vocabulary knowledge in the L1 and L2. Longer-term retention was measured by delayed posttests, captured one week after children viewed video clips. Delayed posttests were identical to the three posttests conducted immediately after each video viewing. A 2 x 2 repeated measures ANCOVA with language of instruction (2: English, Chinese) and language of definitions (2: English, Chinese) as between-subjects factors, and covariates of age in months, English and Chinese PPVTs, and pretest scores were used in the analysis. Delayed posttest scores, which were converted to proportion correct scores, were used as outcome variables (Table 27).

Table 27

ANCOVA Inferential Statistics for All Delayed Vocabulary Assessments

Dependent Variable	Contrast	Main Effects and Interactions					
		F	df	Sig.	MS_{Effect}	SS_{Error}	MS_{Error}
Word Identification Posttest	Language of Instruction	1.225	1, 82	.272	.026	3.377	.041
	Language of Definitions	.020	1, 82	.887	.000		
	English PPVT	1.635	1, 82	.205	.067		
	Chinese PPVT	2.041	1, 82	.157	.084		
	Age*	10.578	1, 82	.002	.436		
	Pretest*	12.910	1, 82	.001	.532		
Receptive Word Meaning Posttest	Language of Instruction*	14.098	1, 82	.000	.349	5.424	.066
	Language of Definitions	.207	1, 82	.650	.003		
	English PPVT*	4.791	1, 82	.031	.317		
	Chinese PPVT*	10.020	1, 82	.002	.663		
	Age*	14.451	1, 82	.000	.956		
	Pretest*	5.699	1, 82	.019	.377		
Expressive Word Meaning Posttest	Language of Instruction*	10.757	1, 82	.002	.205	4.426	.054
	Language of Definitions	.195	1, 82	.660	.004		
	English PPVT*	4.784	1, 82	.032	.258		
	Chinese PPVT	1.016	1, 82	.316	.055		
	Age*	4.881	1, 82	.030	.263		
	Pretest*	10.340	1, 82	.002	.558		

Note. SS = sum of squares; MS = mean square; PPVT = Peabody Picture Vocabulary Test.
* $p < .05$.

Language of instruction. Repeated measures ANCOVAs were run on each of the three delayed posttests (word identification, receptive word meaning, expressive word meaning). Results indicated that the language of instruction was facilitative in L1 and L2 vocabulary learning for the receptive and expressive word meaning measures. In these delayed posttests, there was a main effect for the language of instruction: receptive word meaning, $F(1, 82) = 14.098$, $p = .000$; and expressive word meaning, $F(1, 82) = 10.757$, $p = .002$. However, there was no significant relationship between the language of instruction and the word identification delayed posttest, $F(1, 82) = 1.225$, $p = .272$.

Consistent with findings from the posttests conducted immediately after video viewings, this study demonstrates that the language of instruction generally plays a facilitative role in the longer-term development of L1 and L2 vocabulary knowledge when DLLs view educational media. In other words, when characters presented vocabulary words using languages that were aligned with children's dominant languages (i.e., characters speaking Mandarin to Mandarin-dominant children, and English to English-dominant children), there was a significant effect on the longer-term retention of these words in their L1 and L2. One week after viewing video clips, the language of instruction influenced how accurately children could identify words based on their word meaning, and how well they could provide verbal definitions of these new vocabulary words in both languages. The language of instruction, however, did not predict whether children could label vocabulary words one week later.

Language of definitions. Results from the repeated measures ANCOVAs run on the three delayed posttests indicated the language of definitions did not have an effect on longer-term L1 and L2 vocabulary learning from educational media. In other words, the language of definitions was neither facilitative nor a hindrance towards L1 or L2 vocabulary learning according to the three delayed posttest measures: word identification, $F(1, 82) = .020$, $p = .887$; receptive word meaning, $F(1, 82) = .207$, $p = .650$; expressive word meaning, $F(1, 82) = .195$, $p = .660$.

Children viewed educational media clips with the language of definitions presented in either English or Mandarin. This means that children viewed video clips with definitions that reflected either their L1 or L2. Findings indicate that the language of definitions in educational media did not have a significant effect on the longer-term L1 or L2 vocabulary development of children. In other words, children were equally able to label a vocabulary word or describe a word's meaning receptively or expressively regardless of the language of definitions.

Language Subsamples. Repeated measures ANCOVAs were run on each of the three delayed posttests (word identification, receptive word meaning, expressive word meaning) for all four language subsamples (English dominant, Chinese dominant, Balanced bilinguals with high proficiency, and Balanced bilinguals with low proficiency). Although findings need to be carefully interpreted due to the small sample sizes, these ANCOVAs revealed interesting

findings regarding the influence of both the language of instruction and language of definitions on longer-term L1 and L2 vocabulary development.

First, examining the influence of the language of instruction, findings indicated a main effect for participants from both balanced bilingual groups with high and low language proficiency in both languages. In other words, for children with generally equal language skills in two languages, the language of instruction helped support longer-term L2 vocabulary development: balanced bilinguals with low proficiency in the word identification delayed posttest, $F(1, 26) = 4.716$, $p = .039$; balanced bilinguals with high proficiency in the expressive word meaning delayed posttest, $F(1, 22) = 6.137$, $p = .021$. While it is important to note that the language of instruction appeared to have a main effect on only two of the possible 12 delayed posttest assessments, results validate that the language of instruction in educational media warrants further research.

Lastly, investigating the influence of the language of definitions on longer-term vocabulary development, there were main effects for the repeated measures ANCOVAs among the Chinese-dominant, balanced bilinguals with high proficiency, and balanced bilinguals with low proficiency language groups. Moreover, this influence of the language of definitions occurred in all three posttest measures. For the word identification posttest measure, balanced bilinguals with high language proficiency in both languages exhibited longer-term benefits from the language of definitions support, $F(1, 22) = 5.661$, $p = .026$. Secondly, for the receptive word meaning measure, participants who were

Chinese-dominant or balanced bilinguals with low language proficiency demonstrated significant longer-term vocabulary outcomes due to the language of definitions: Chinese-dominant, $F(1, 11) = 5.510$, $p = .039$; Balanced bilinguals with low language proficiency, $F(1, 26) = 7.166$, $p = .013$. Moreover, in the expressive word meaning posttests, the language of definitions appeared to have an influence on the Chinese-dominant subsample, $F(1, 11) = 5.498$, $p = .039$. There were no significant effects for any of the delayed posttest in the English-dominant subsample. With four of the potential 12 delayed posttests yielding significant relationships between the language of definitions and vocabulary outcomes, future studies may consider how the language of definitions can specifically scaffold longer-term L1 and L2 word learning in DLLs.

Discussion

The current study was designed to examine how the language of instruction and language of definitions in educational media might affect L1 and L2 vocabulary learning among Dual-Language Learners. Building on research that emphasizes the potential of using a child's mother tongue or L1 as a scaffold in classrooms (Durán, Roseth, Hoffman, & Robertshaw, 2013; Durán, Roseth, & Hoffman, 2015) to support vocabulary development (Collins, 2010; Farver et al., 2009; Gutiérrez-Clellen et al., 2012; Lugo-Neris et al., 2010; Méndez et al., 2015), this study uniquely examined how home language supports might influence learning in media contexts. Moreover, media clips provided children

with the definitions of target words in their L1 and L2 to investigate how this specific use of the home language might also influence bilingual vocabulary development.

Findings indicated that DLLs were able to learn vocabulary words through educational media programs, and that in all conditions (Chinese immersion, English immersion, Chinese with English definitions, English with Chinese definitions), children were able to identify novel words and demonstrate an understanding of word meaning, both receptively and expressively, in their L1 and L2. Unlike previous studies that examined how largely monolingual preschool populations learn vocabulary words through media (Larson & Rahn, 2015; Neuman et al., 2019), findings from this study establish that DLLs have the capacity to learn words in not only their L1 or heritage language, but also in a new language. With the opportunity for heritage language maintenance, this study shows that educational media has the potential to meet the needs of increasingly diverse and multilingual households around the globe.

When viewing educational media video clips, the language of instruction appeared to influence both L1 and L2 vocabulary development among preschool-aged DLLs. Children learned English vocabulary words when the language of instruction was in English, and Chinese vocabulary words when the language of instruction was in Chinese. To facilitate word learning in a new language, children with varying levels of English and Chinese proficiency were presented with opportunities to learn vocabulary words in either their L1 or L2. The

language that characters used on screen directly influenced children's ability to learn target words in a new language, as well as words in their heritage language. Extending research that stress the importance of the medium of instruction in preschool classrooms (Baker, 2017; Soltero-González, 2009), the current study establishes that the language of instruction is equally important to consider in multimedia contexts. Through video clips that reflected children's dominant and non-dominant languages, participants in this study were able to label vocabulary words and demonstrate an understanding of bilingual word meaning both receptively and expressively. Still, rather than aligning the language of instruction with the language of vocabulary words like in the current study, future research may consider varying the language of instruction such that participants learn English words through Chinese immersion (when Chinese is the dominant language of participants), and Chinese words through English immersion (when English is the dominant language of participants).

To *strategically* use the home language in educational media, DLLs were presented with the definitions of target words in both English and Chinese. Each video delivered three new vocabulary words – one noun, one adjective, one verb – with definitions that reflected children's L1 and L2. Definitions were repeated two times in each video clip in the timespan of approximately 132.5 seconds. In each video clip, only the language of definitions varied from one condition to the next; the alternating language was not used in any other way in selected clips. Findings demonstrate that for the full sample of children, the language of

definitions did not provide children with the scaffolds needed to learn vocabulary words in their L1 or L2. At the same time, the language of definitions did not appear to hinder vocabulary learning in the two languages. As scholars continue to investigate how the home language can be *strategically* used in classroom instruction (Farver et al., 2009; Gersten & Baker, 2000; Méndez et al., 2015; Uchikoshi & Maniates, 2010), findings from the current study suggest that while clear explanations in the home language cannot solely scaffold word learning, it may play an additive role in bilingual word learning.

In fact, media has the potential to provide multilingual viewers with a number of additive supports in a child's home language to collectively scaffold L1 and L2 development. Mayer (2002) highlights 12 principles of multimedia learning, arguing that specific screen-based principles (e.g., modality, signaling, coherence) reduce the cognitive load needed to process information on screen. While Mayer does not include the language(s) used in multimedia as one of his principles, findings from this study suggest that aligning the language of media with the dominant language of viewers has the potential to reduce the cognitive load needed to process information on screen. Descriptive analyses of English- and Chinese-dominant subsamples in the current study demonstrated that when the language of media clips mirrored the dominant language of viewers, participants had better vocabulary outcomes than when they viewed programs in their non-dominant language. In response, findings from this study might extend

Mayer's (2002) 12 principles of multimedia learning by considering the influence of languages used on screen.

While the language of instruction appeared to influence vocabulary learning in the full sample of this study, the language of definitions did not facilitate L1 and L2 word learning. Examining these factors according in each language subsample, however, descriptive analyses indicated that for some posttest measures, word learning was scaffolded by the language of definitions. Although smaller in sample size, there was a statistically significant relationship between the language of definitions and the receptive word meaning posttest for Chinese-dominant participants; and between the language of definitions and the word identification measure for balanced bilinguals with low language proficiency. Children viewed media clips with the language of definitions sometimes presented in English and sometimes presented in Chinese. Drawing from their full linguistic repertoire, DLLs in these groups were able to use the definitions presented on screen in one language to build their vocabulary in the other language. Described as a dynamic bilingual system (García, 2011; García & Woodley, 2009) where the L1 and L2 are in an interdependent relationship with one another (Cummins, 1979), researchers and media producers may need to carefully consider which languages are used between characters on screen to reflect the languages of viewers and better scaffold word learning in a new or heritage language.

A dynamic bilingual system was particularly evident in the delayed posttest measures as children drew from their linguistic system to make sense of the alternating languages on screen. There was a significant main effect for the language of instruction on two of the three delayed posttests in the full sample. In the language subsamples, there were also significant relationships between longer-term vocabulary outcomes and the language of instruction (two delayed posttests) and the language of definitions (four delayed posttests). Although small in sample size and not evident in all delayed posttests, findings suggest that the languages used on screen may have an influence on longer-term L1 and L2 vocabulary development. Looking at the full sample and subsamples together, the languages used on screen appeared to not only facilitate the cognitive processing of novel information, but also scaffold longer-term vocabulary learning in the two languages. By potentially reducing the cognitive load required to process and retain new information on screens, language use in media contexts warrants further research. Future studies may unpack and isolate how certain additive supports like the language of instruction or language of definitions can be strategically used to maximize the potential of vocabulary learning on screen. This could include using language with specific attention-directing cues where a character uses the home language to orient children's attention to a learning episode (e.g., "Look at this!" or "你在看！"); or using the repetition of key words in *two* languages to scaffold vocabulary knowledge and build children's conceptual vocabulary.

There are several limitations of this study. First, videos were not full-length episodes of the program, which would have provided a more naturalistic setting to examine how children learn words from educational media. Clips were just over two-minutes long, so children were likely to view them with greater attention. These shortened clips, however, allowed me to use multiple videos in each condition and enabled me to complete the study in a reasonable amount of time that was sensitive to the attention spans of preschool-aged children. Secondly, by using a within-subjects design, I had to select different vocabulary words that were comparable to one another rather than using the same words in a between-subjects design. This was a threat to validity as children in the study had varying levels of vocabulary knowledge in both the L1 and L2 prior to the study. To address this concern, I carefully selected similar vocabulary words to include, and used a pretest measure to serve as a covariate in ANCOVA analyses. Relatedly, while the CHILDES database was used to understand the frequency of words encountered in English speech, there was not an equivalent database for Chinese words. Third, when analyzing English-dominant, Chinese-dominant and balanced bilingual high and low subsamples, the sample sizes became much smaller. This means findings should be carefully interpreted and are less generalizable. Likewise, there was not an equal number of participants in the subsamples because a cluster analysis was used to retroactively assign students to language dominant groups. Considering the study spanned 11 different preschools and centers, it was unrealistic to run a cluster analysis after initial PPVT scores

were collected to determine whether we required more or less children in a particular language group. In addition to English and Chinese PPVT scores to indicate language proficiency in either language, future studies should also document the language(s) of instruction to better understand children's exposure to languages at school.

In light of these limitations, the current study explored unchartered territory at the nexus of bilingual education and early vocabulary development in educational media. More specifically, this study investigated how the language of instruction and language of definitions in educational media impacted vocabulary learning in the L1 and L2. Findings provided evidence to suggest that the language of instruction on screen does serve as an important scaffold for word learning in two languages. Moreover, this scaffold is effective for both immediate and longer-term retention of vocabulary words in two languages. When learning a new language, schools around the globe contemplate whether the home language should be used and, if so, how it can be strategically incorporated into the classroom (Goldenberg, 2013). Responding to the call to better understand multilingual and translanguaging pedagogy (Creese & Blackledge, 2010; García, 2009), the current study suggests that presenting the definitions of target words in a child's L1 or L2 might serve as an additive support for word learning on screens.

As the field of bilingual education advocates for children to learn English as a new language (in the U.S. context) while simultaneously maintaining their

heritage language, findings from this study uncover the potential of educational media to address the multilingual needs of DLLs and equip them with vocabulary knowledge in two languages. With the goal of fostering bilingual development in young learners, this study recommends that research not only consider how languages are represented on screen, but also determine how to strategically scaffold language learning, so that children might thrive in our increasingly multilingual societies.

CHAPTER VI

CONCLUSION

The purpose of this dissertation was to investigate some of the mechanisms underlying vocabulary learning through educational media for preschool-aged dual-language learners. More specifically, three studies were designed to collectively examine how the instructional supports on screen and in the media viewing context served as scaffolds for L1 and L2 vocabulary learning in DLLs. Extending the body of research on early literacy development through educational media (Linebarger, Brey, Fenstermacher, & Barr, 2017), the current dissertation pioneers multimedia research with young bilingual viewers learning a new language, with opportunities for home language maintenance. Approaching multimedia learning through various contexts, I examined how specific screen-based pedagogical supports, instructional contexts for word learning, and languages of instruction facilitated L1 and L2 vocabulary development in preschool-aged DLLs. In all studies, I also considered how the language proficiency of DLLs interacted with each context to influence word learning after single-viewings of video clips. In the following section, I briefly summarize the main findings from each study, followed by a synthesis of overall findings, future directions, and instructional implications.

Findings from Study 1

The aim of the first study was to examine how specific screen-based pedagogical supports in educational media might facilitate L2 vocabulary learning in preschool-aged DLLs. Using the four most salient ostensive and attention-directing cues in preschool media programs (Danielson et al., 2019; Neuman et al., 2019), 51 children viewed 12 short video clips with sound effects, visual effects, explicit definitions, and repetition supports in a within-subjects design. They then completed two vocabulary identification assessments: one with images in-context, and one with images in a new context. First and foremost, findings established that children were able to learn vocabulary words in their L2 after a single-viewing of educational media. Findings also indicated that screen-based pedagogical supports were differentially facilitative in helping DLLs recall words presented in their original context (i.e., the in-context posttest). However, these supports did not appear to differentially facilitate word learning in new contexts, as measured by the vocabulary in new-context measure.

Examining findings by language groups, determined by children's exposure to English (L2) in the home environment, results demonstrated that children with more English exposure had higher vocabulary scores overall than those with less English exposure in the home after watching media clips. The repetition pedagogical support, however, was an exception. When children were repeatedly presented with specific vocabulary words on screen, children with less English exposure learned more words than those with more English exposure at

home. In fact, this pedagogical support was significantly more effective than the other pedagogical supports in facilitating L2 word knowledge for children from households with less English exposure. For children from households with more English exposure, all pedagogical supports were equally effective in scaffolding L2 word knowledge.

Findings from Study 2

Shifting from the specific screen-based pedagogical supports on screen to the broader instructional contexts for word learning, the second study aimed to provide a fine-grained understanding of how macrostructures in educational media (Linebarger et al., 2017) might affect word learning. More specifically, this study isolated three instructional contexts for word learning on screen – Expository, Narrative, and Participatory – to determine how they might influence L2 word learning. Fifty children viewed nine video clips in a within-subjects design, completing posttest assessments for word identification and word meaning in their second language. Findings from this study established that children were able to learn vocabulary words in their L2 from educational media. Moreover, the instructional contexts on screen were differentially facilitative in helping DLLs identify words in a new language (i.e., the word identification posttest), where the Expository and Participatory instructional contexts were more effective at scaffolding word identification than Narrative instructional contexts. At the same time, the instructional contexts did not appear to differentially facilitate word

meaning; all genres were equally effective at supporting children's ability to demonstrate an understanding of word meanings.

Examining findings by children's language proficiency, measured by standard English PPVT scores, descriptive statistics indicated that both Expository and Participatory contexts were more effective scaffolds for L2 word identification than Narrative instructional contexts in both higher and lower PPVT groups. In the higher PPVT group, only the Expository instructional context appeared to scaffold word meaning, indicating a deeper understanding of word comprehension. In the lower PPVT group, however, instructional contexts did not differentially scaffold word identification or an understanding of word meaning. This suggests that not only might there be a threshold of L1 proficiency to facilitate L2 development (Cummins, 1979), but also an L2 proficiency threshold for children to benefit from the instructional contexts on screen.

Findings from Study 3

Exploring a third context of multimedia learning, the final study of this dissertation investigated how manipulating the language of instruction influenced word learning in young children (Durán, Roseth, Hoffman, & Robertshaw, 2013; Durán, Roseth, & Hoffman, 2015). More specifically, it examined how the language of instruction and the language of definitions in media might affect both L1 and L2 word learning among preschool-aged DLLs. Adopting a within-subjects design, 87 participants viewed media clips in four different conditions:

English immersion, English with Chinese definitional supports, Chinese immersion, Chinese with English definitional supports. After viewing videos, word identification gains and word meaning posttest measures were collected, as well as a delayed posttest one week later to examine longer term L1 and L2 word retention. Findings indicated that DLLs were able to learn vocabulary words in both their L1 and L2 after single-viewings of educational media. In all conditions, children accurately identified novel words and demonstrated an understanding of word meaning, both receptively and expressively, in their L1 and L2. Moreover, the language of instruction simultaneously influenced both L1 and L2 vocabulary development when DLLs viewed educational media video clips. The language of definitions, however, did not scaffold word learning in the two languages in the full sample.

Examining findings by children's language proficiencies, which were captured by standard English and Chinese PPVT scores, descriptive statistics were analyzed for the English-dominant and Chinese-dominant participants. Overall, children were better able to identify vocabulary words and demonstrate an understanding of word meaning in the L1 and L2 when the language of instruction reflected their dominant language. In these subsamples, however, the language of instruction was not statistically significant. Examining the language of definitions in each subsample, findings indicated changing the language of definitions scaffolded word learning in some posttest measures. Although the language of definitions was not statistically significant in five of the posttest

measure across English- and Chinese-dominant subsamples, it was significant for the receptive word meaning posttest in the Chinese-dominant subsample. Interestingly, for participants from the balanced bilingual group with low language proficiency in both languages, the languages of definitions also appeared to influence children's ability to label vocabulary words. These mixed results on the influence of language definitions in media indicate that the language of definitions may play a relatively additive role in scaffolding L1 and L2 vocabulary learning among DLLs.

Finally, investigating the longer-term retention of L1 and L2 vocabulary learning through the delayed posttest, the language of instruction appeared to play a facilitative role in two of the three delayed posttests (receptive word meaning, expressive word meaning) for children in the full sample. In the language dominant subsamples, there were also significant relationships between longer-term word learning and the language of instruction (for two of the delayed posttests) and also the language of definitions (for four of the delayed posttests). Examining the language of definitions by language groups, findings indicated there was a significant influence on certain posttest assessments in the Chinese-dominant and two balanced bilingual groups. Together, results from this study suggest that the language of instruction plays a facilitative role in the immediate and longer-term recall of L1 and L2 word labels and meanings. The language of definitions also influenced certain word learning assessments with particular

groups of students, suggesting language definitions may play an additive role in developing children's vocabulary knowledge in their L1 and L2.

Overall Findings

This dissertation was designed to examine how certain instructional supports on screen and in the media viewing context might scaffold L1 and L2 vocabulary learning in young DLLs. More specifically, this dissertation examined how screen-based pedagogical supports, instructional contexts for word learning, and languages of instruction might influence word learning on screens. Working with DLLs with varying proficiency levels in two languages, this dissertation also considered the potential influence of language proficiency in moderating L1 and L2 word learning on screens. The following section provides a synthesis of main findings from these three studies.

First, dual-language learners are able to learn vocabulary words in both their L1 and L2 through single-viewings of educational media. Across all three studies, DLLs with varying levels of English and home language proficiency were largely able to identify vocabulary words and demonstrate an understanding of word meaning in their L1 or L2. Previous studies investigating early literacy development in educational media have primarily worked with monolingual preschoolers or kindergartners who speak the dominant language of society (Fisch & Truglio, 2014; Flynn, Wong, Neuman, & Kaefer, 2019; Krcmar & Cingel, 2017; Larson & Rahn, 2015; Linebarger & Piotrowski, 2010; Linebarger et al.,

2017; Rice, Huston, Truglio, & Wright, 1990; Samudra, Flynn, & Wong, 2019). In the field of applied linguistics, scholars have also begun to examine how multimedia environments influence language and literacy development in multilingual learners, focusing largely on older students in secondary or tertiary education contexts (Montero Perez, Peters, Clarebout, & Desmet, 2014; Montero Perez, Peters, & Desmet, 2015; Rodgers & Webb, 2016). In early childhood or elementary school contexts, studies have examined how media can be incorporated into lessons to enhance classroom instruction (Leacox & Jackson, 2014; Silverman, 2013; Silverman & Hines, 2009) or how longitudinal media-viewing habits at home might influence the growth trajectories of early literacy development (Uchikoshi, 2005, 2006). Unlike previous studies, the current dissertation uniquely examines how DLLs learn vocabulary words after single-viewings of educational media, and establishes that children are able to learn words on screen in both their L1 and L2. Moreover, with the opportunity for DLLs to learn a new language (e.g., English) and maintain their heritage language (e.g., Spanish), educational media has the potential to meet the diverse linguistic needs of multilingual populations around the globe.

Relatedly, there were important differences in how well children learned words from educational media by their language proficiency. Moderating the impact of media scaffolds in this dissertation, findings demonstrated that when children were less proficient in English or exposed to less English in the household, certain instructional supports were more effective than others.

Specifically, in Study 1, screen-based pedagogical supports were equally effective at scaffolding L2 word learning when children had more exposure to the English language. Yet, the repetition pedagogical support was especially helpful for children with less exposure to the English language at home. In Study 2, the instructional supports on screen were equally effective at facilitating learning among children with lower standard English PPVT scores. Meanwhile, the Expository support was particularly effective at scaffolding L2 word learning among students with higher standard English PPVT scores. Finally, in Study 3, children from English- and Chinese-dominant subgroups had higher vocabulary scores when the language of instruction in media reflected their dominant languages. Moreover, the language of instruction and language of definitions differentially impacted the immediate and delayed posttest scores of children in each language group.

Thus, children with different levels of language proficiency across all three studies had unique responses to each media scaffold. When the repetitions pedagogical support was particularly helpful for the group less proficient in English, media provided an opportunity to accelerate the development of L2 vocabulary knowledge. When instructional contexts differentially affected vocabulary learning in the group more proficient in English, but had indiscriminate effects in the group less proficient in English, media appeared to fuel the Matthew Effect (Stanovich, 2009). While the study was able to determine specific genres to support those with more English vocabulary knowledge to

develop more English vocabulary knowledge, the study could not determine specific genres that could help those with less English vocabulary, thereby missing potential opportunities for vocabulary growth. Clearly, children with varying language proficiency levels learn differently from one another in multimedia environments.

Theoretically, the differences in vocabulary outcomes among students with varying levels of L1 and L2 proficiency support Cummins' (1979) Threshold Hypothesis as children less proficient in the L1 (Study 3) learned fewer words in the L2 than those more proficient in the L1. Likewise, in Studies 1 and 2, children less proficient in the L2 were also less likely to learn words in the L2 than those more proficient in it, suggesting a possible L2 threshold for L2 word learning. Moreover, Paivio's (1986) Dual-Coding theory is clearly supported as DLLs successfully learning vocabulary in a new language through visual and auditory presentations. Moreover, using a media-based theory that has been traditionally used among monolingual viewers (Wong & Samudra, in press), this dissertation extends Dual-Coding theory to bilingual populations, demonstrating that children are also able to learn vocabulary in a new language on screen.

Lastly, looking at the media contexts examined in this study as a collective, the screen-based pedagogical supports, instructional contexts for word learning, and the language of instruction and definitions played additive roles in facilitating word learning from screen contexts. In fact, findings from each study informed the design of the next study. In Study 1, the repetition pedagogical

support played a facilitative role in L2 word learning for DLLs. As such, repetitions were carefully incorporated and controlled for in Studies 2 and 3, with an equal number of word repetitions in video clips, and minimal repetitions of the target word during pretest and posttest assessments. In Study 2, both the Expository and Participatory instructional contexts scaffolded L2 word learning better than the Narrative instructional context. Moreover, the Expository context was particularly helpful for scaffolding word meaning for children with higher PPVT scores. In response, *Ni Hao, Kai-Lan* was selected for Study 3 because it provided vocabulary instruction in an Expository context for learning, with 1-2 instances of Participatory engagement. In other words, the episode gave multiple examples and synonyms of vocabulary words and occasionally paused to look at the viewer and ask questions related to the target word. Together, findings from this dissertation demonstrate that while each mechanism was able to differentially facilitate word learning in young DLLs, these scaffolds also worked collectively to provide a robust model of screen-based vocabulary instruction to children learning a new language. Future research may consider examining more closely how specific combinations and synergies of media scaffolds support DLLs, particularly when they come to screens with variation in their L1 and L2 background knowledge.

Directions for Future Research

This dissertation is at the nexus of bilingual education, early childhood literacy development, and learning from multimedia environments. The three studies uncovered how various media contexts – screen-based pedagogical supports, instructional contexts, and the language of instruction – differentially scaffolded L1 and L2 word learning for young dual-language learners. After establishing that children were able to learn new languages from single-viewings of educational media, and exploring how certain media supports influenced word learning, findings from the current dissertation set the groundwork for a number of future research directions.

First, research may continue to examine how media scaffolds besides the ones investigated in this dissertation might promote vocabulary learning in a new language. Future studies might also consider how specific combinations of media supports can enhance teaching and learning from multimedia contexts. While the media supports in this dissertation built upon findings from each study, future research can systematically combine media supports to ascertain optimal conditions for on-screen learning. For example, a future study might consider staggering the following conditions to tease out differences between media supports: (1) repetition pedagogical supports with language of instruction aligned with dominant language of viewers; (2) Expository instructional contexts with language of instruction aligned with dominant language of viewers; (3) repetition

pedagogical supports within an Expository instructional context; (4) all supports combined together.

Relatedly, future studies may consider examining how other media features might scaffold L1 and L2 word learning from screens. These could include the influence of pacing, lexical density, previewing, repeated viewings or co-viewing, which are described in brief below.

Pacing refers to the speed in which content is delivered in media clips. By quickening or slowing down the pace of videos, children view programs with more or less time to process information on screen (Anderson, Levin, & Lorch, 1977; Kirkorian, Wartella, & Anderson, 2008; Singer, 2014). Drawing from research that examines how the pace of teacher instruction influences learning with DLLs (Genesee, 1999; Nation & Newton, 2008; Short & Echevarria, 2004), the cognitive load of slower-paced videos might be more appropriate for DLLs who have more time to process content presented in a second language.

Lexical density refers to the complexity of language delivered on screen (Castello, 2008). Calculated by the number of functional words (i.e., grammatical units) and content words (i.e., lexical units), lexical density is related to the cognitive load required to process content on screen. If, for example, sentences spoken by characters on screen use vocabulary words that are less dense, then the burden of processing language on screen is lightened; the content of media may then become more comprehensible and accessible to young viewers (Echevarria et al., 2008; Nation & Newton, 2008).

Third, providing children with a preview that explicitly mentions the target words before the program begins heightens viewers' awareness of a learning objective (Echevarria et al., 2008; Gonzalez et al., 2014; Short & Echevarria, 2004). Shows such as *Dinosaur Train* and *Sesame Street's Word on the Street* incorporate this practice so that children have opportunities to raise metacognitive awareness of what they are to learn, which could serve DLLs particularly well when navigating both content and language demands on screen.

Additionally, repeated viewings in media research refers to the number of times people view a certain program as well as the time elapsed between viewings. While massed viewings occur immediately with back-to-back replays of the same video clip, spaced viewings allow more time to lapse between repetitions, lasting an hour, a day, or even a week depending on the research design (Leacox & Jackson, 2014; Namaziandost, Rahimi Esfahani, & Hashemifardnia, 2018; Nation & Newton, 2008; Samudra, Wong, & Neuman, 2019). Both massed and spaced viewings provide DLLs with opportunities to scaffold and clarify content; one main difference is whether one condition might be more effective in committing content to children's short-term or longer-term memories.

Finally, co-viewing generally refers to children viewing educational media with an adult figure. Issued by the American Academy of Pediatrics (2016), parents and caregivers are encouraged to view media clips with children and provide them with scaffolds during or after the episode to reinforce lessons taught

on screen (Lavigne, Hanson, & Anderson, 2015; Samudra et al., 2019; Strouse, O'Doherty, & Troseth, 2013; Strouse et al., 2018). For bilingual learners, co-viewers have the opportunity to provide translations or clarifications of target vocabulary words on screen.

Beyond examining specific media-based scaffolds, this dissertation also found that the language proficiency of children in both their L1 and L2 moderated learning from educational media. Language proficiency is a critical consideration in education research with DLLs that is often overlooked in education policy (Artiles, Rueda, Salazar, & Higareda, 2005; Gándara & Hopkins, 2010). Policymakers often consider English Language Learners as a category, where children are considered to be an English Language Learner or not an English Language Learner (Luk & Bialystok, 2013). Yet, preschool children's background knowledge in their L1 and L2 is heavily nuanced and shaped by not only the home language environment or language proficiency of parents and guardians (Luk & Bialystok, 2013), but also by media exposure in the home environment (Christakis, 2009; Kirkorian et al., 2008; Kuppens, 2010).

In response, future research may continue to examine how children with varying levels of language proficiency respond to specific supports in media. The current dissertation demonstrated important differences between children with higher and lower levels of L2 proficiency, where certain supports were more beneficial than other supports at affecting word learning. If future media research could identify specific supports on screen that were particularly helpful for

children less proficient in the L1 or L2, media would have the potential to equip DLL communities with vocabulary in the language of school, help monolingual communities move towards bilingualism, and also facilitate heritage language maintenance in communities that often learn the dominant language at the expense of their heritage language (Menken & Kleyn, 2010).

Instructional Implications

This media-based dissertation draws heavily from research conducted in classroom contexts (Buysse et al., 2014; Carlo et al., 2004; Collins, 2010; Crevecoeur et al., 2014; Leacox & Jackson, 2014; Lugo-Neris et al., 2010; Silverman & Hines, 2009; Takanishi & Le Menestrel, 2017). Examining how specific pedagogical supports in classrooms might be applied to screens, findings from this dissertation have reciprocal implications for instruction. First, the current dissertation established that certain pedagogical supports like the use of repetition could effectively scaffold L2 word learning in DLLs. Thus, educators may consider using multiple representations of L2 vocabulary words to scaffold learning in preschool-aged children. Word exposure can be presented multiple times within a lesson, across content areas and modalities, or over the span of multiple days.

Second, findings from this dissertation suggest that educators need to consider the context in which vocabulary is presented. While embedding vocabulary words within stories might be common practice among parents and

educators (i.e., Narrative context), findings from this dissertation suggest that when children are learning words in a new language, using multiple exemplars (i.e., Expository context) or engaging children in direct back-and-forth conversation about the vocabulary words (i.e., Participatory context) may be more effective in the preschool years.

Language of instruction has been at the forefront of debates in the field of bilingual education (Goldenberg, 2013). Proponents advocate that using a child's home language can equip children with language and literacy skills in the L2 while simultaneously developing their L1. Opponents say that the tradeoffs are not worth the costs as children take longer to acquire the L2 or language of school. Examining language of instruction in media contexts, the current dissertation isolated the effects of language instruction to determine how it might influence word learning. Findings suggest that when instruction reflects children's dominant language, they are more likely to learn words in both their L1 and L2. In response, school policymakers and educators might consider using the home language when students in their classrooms speak a language other than the dominant language of society.

Moreover, strategic use of the home language, examined in this dissertation by word definitions on screen that reflected children's dominant or non-dominant languages, is an area that warrants further research. While strategically altering the language of definitions on screen did not scaffold word learning in all assessments, they did facilitate learning among certain groups of

children on specific vocabulary posttests. As such, educators might consider providing the definitions of vocabulary words in a child's home language, possibly delivering content using multiple modalities (e.g., in written form; using think-pair-share) or offering them as a pre-learning task the day before a lesson. To help students develop a deeper understanding of new words in their L1 or L2, teachers may consider other strategic uses of the home language, such as having bilingual word walls, allowing peer conversations in the home language, or integrating multimedia into the classroom.

Finally, this dissertation established that children were able to learn new words in their L1 and L2 after a single-viewing of educational media. Video clips were short, 1-3 minute segments that focused on teaching vocabulary words. With the efficacy of such short clips, educators and curriculum leaders may consider how video can be strategically incorporated into classroom instruction. Offering content on an engaging, novel platform with both visual and auditory input (Neuman, 1997; Paivio, 1986; Wong & Samudra, in press), short media clips that deliver high-quality vocabulary instruction may be an effective way to scaffold word knowledge in a lesson with DLLs. Moreover, media can be incorporated in both large group and small group instruction, and can be viewed repeatedly and incorporated into centers to reinforce target words. With a clearer understanding of how multimedia environments can enhance children's vocabulary development in their L1 and L2, educational media has the potential to address the diverse

linguistic needs of children in today's society and help cultivate future generations of bilingual speakers.

BIBLIOGRAPHY

AAP Council on Communications and Media. (2016). Media and young minds. *Pediatrics*, *138*(5). https://doi.org/10.1542/peds.2016-2591

Anderson, D. R., Bryant, J., Wilder, A., Santomero, A., Williams, M., & Crawley, A. M. (2000). Researching Blue's Clues: Viewing Behavior and Impact. *Media Psychology*, *2*(2), 179–194. https://doi.org/10.1207/S1532785XMEP0202_4

_____, Levin, S. R., & Lorch, E. P. (1977). The effects of TV program pacing on the behavior of preschool children. *Educational Technology Research and Development*, *25*(2), 159–166.

Artiles, A. J., Rueda, R., Salazar, J. J., & Higareda, I. (2005). Within-group diversity in minority disproportionate representation: English language learners in urban school districts. *Exceptional Children*, *71*(3), 283–300.

August, D., Shanahan, T., & Escamilla, K. (2009). English Language Learners: Developing Literacy in Second-Language Learners—Report of the National Literacy Panel on Language-Minority Children and Youth. *Journal of Literacy Research*, *41*(4), 432–452. https://doi.org/10.1080/10862960903340165

Baker, M. (2017). *Exemplary practices for teaching young dual language learners: Learning from early childhood teachers* (PhD Thesis). Boston College.

Beck, I. L., McKeown, M. G., & McCaslin, E. S. (1983). Vocabulary development: All contexts are not created equal. *The Elementary School Journal*, *83*(3), 177–181.

Beck, I. L., McKeown, M. G., & Omanson, R. C. (1987). The effects and uses of diverse vocabulary instructional techniques. In M. G. McKeown & M. E. Curtis (Eds.), *The nature of vocabulary acquisition* (p. 147-163). Lawrence Erlbaum Associates, Inc.

Bedore, L. M., Peña, E. D., Griffin, Z. M., & Hixon, J. G. (2016). Effects of Age of English Exposure, Current Input/Output, and grade on bilingual language performance. *Journal of Child Language*, *43*(3), 687–706. https://doi.org/10.1017/S0305000915000811

Benson, C., & Wong, K. M. (2015). Development Discourse on Language of Instruction and Literacy: Sound Policy and Ubuntu or Lip Service? *Reconsidering Development, 4*(1), 1–16.

Benson, C., & Wong, K. M. (2019). Effectiveness of policy development and implementation of L1-based multilingual education in Cambodia. *International Journal of Bilingual Education and Bilingualism*, *22*(2), 250–265. https://doi.org/10.1080/13670050.2017.1313191

Bialystok, E., & Feng, X. (2011). Language proficiency and its implications for monolingual and bilingual children. In A. Y. Durgunoglu & C. Goldenberg (Eds.), *Language and Literacy Development in Bilingual Settings* (p.121–138). New York, NY: Guilford Press.

Bloom, L. (1974). Talking, understanding, and thinking: Developmental relationship between receptive and expressive language. In *Language perspectives, acquisition, retardation and intervention* (pp. 285–311). University Park Press.

Brewer, J., & Hunter, A. (2006). *Foundations of multimethod research: Synthesizing styles*. Sage.

Burchinal, M., Field, S., López, M. L., Howes, C., & Pianta, R. (2012). Instruction in Spanish in pre-kindergarten classrooms and child outcomes for English language learners. *Early Childhood Research Quarterly*, *27*(2), 188–197. https://doi.org/10.1016/j.ecresq.2011.11.003

Bus, A. G., Takacs, Z. K., & Kegel, C. A. T. (2015). Affordances and limitations of electronic storybooks for young children's emergent literacy. *Developmental Review*, *35*, 79–97. https://doi.org/10.1016/j.dr.2014.12.004

Buysse, V., Peisner-Feinberg, E., Páez, M., Hammer, C. S., & Knowles, M. (2014). Effects of early education programs and practices on the development and learning of dual language learners: A review of the literature. *Early Childhood Research Quarterly*, *29*(4), 765–785. https://doi.org/10.1016/j.ecresq.2013.08.004

Capps, R. (2015, May). *Trends in Immigration and Migration of English and Dual Language Learners*. Presented at the National Research Council Committee on Fostering School Success for English Learners, Washington, DC. Retrieved from http://www.nationalacademies.org/hmd/~/media/Files/Activity%20Files/Children/DualLanguageLearners/2015-MAY-28/1Capps%20Randy.pdf

Carlo, M. S., August, D., McLaughlin, B., Snow, C., Dressler, C., Lippman, D., … White, C. E. (2004). Closing the gap: Addressing the vocabulary needs of English-language learners in bilingual and mainstream classrooms. *Reading Research Quarterly*, *39*(2), 188–215.

Carnoy, M., & Garcia, E. (2017). Five key trends in US student performance. *Washington, DC: Economic Policy Institute. Retrieved June*, *30*, 2017.

Carter, P. L., & Welner, K. G. (2013). *Closing the opportunity gap: What America must do to give every child an even chance*. Oxford University Press.

Castello, E. (2008). *Text complexity and reading comprehension tests* (Vol. 85). Peter Lang.

Cha, K., & Goldenberg, C. (2015). The complex relationship between bilingual home language input and kindergarten children's Spanish and English oral proficiencies. *Journal of Educational Psychology*, *107*(4), 935–953. https://doi.org/10.1037/edu0000030

Christakis, D. A. (2009). The effects of infant media usage: What do we know and what should we learn? *Acta Paediatrica*, *98*(1), 8–16.

Clifford, B. R., Gunter, B., & McAleer, J. L. (1995). *Television and children: Program evaluation, comprehension, and impact*. Psychology Press.

Collins, M. F. (2010). ELL preschoolers' English vocabulary acquisition from storybook reading. *Early Childhood Research Quarterly*, *25*(1), 84–97.

Common Sense Media. (2013). *Zero to eight: Children's media use in America 2013*. San Francisco, CA.

Connor, P., Cohn, D., Gonzalez-Barrerra, A., & Oates, R. (2013). *Changing Patterns of Global Migration and Remittances* (pp. 1–29). Retrieved from Pew Research Center website: http://www.pewsocialtrends.org/files/2013/12/global-migration-final_12-2013.pdf

Core, C., Hoff, E., Rumiche, R., & Señor, M. (2013). Total and conceptual vocabulary in Spanish–English bilinguals from 22 to 30 months: Implications for assessment. *Journal of Speech, Language, and Hearing Research*, *56*(5), 1637–1649. https://doi.org/10.1044/1092-4388(2013/11-0044)

Creese, A., & Blackledge, A. (2010). Translanguaging in the bilingual classroom: A pedagogy for learning and teaching? *The Modern Language Journal*, *94*(1), 103–115.

Crevecoeur, Y. C., Coyne, M. D., & McCoach, D. B. (2014). English Language Learners and English-Only Learners' response to direct vocabulary instruction. *Reading & Writing Quarterly*, *30*(1), 51–78. https://doi.org/10.1080/10573569.2013.758943

Csibra, G., & Gergely, G. (2006). Social learning and social cognition: The case for pedagogy. In Y. Munakata & M. H. Johnson (Eds.). *Processes of Change in Brain and Cognitive Development. Attention and Performance XXI* (p. 249–274). Oxford: Oxford University Press.

Csibra, G., & Gergely, G. (2009). Natural pedagogy. *Trends in Cognitive Sciences*, *13*(4), 148–153.

Cummins, J. (1979). Linguistic Interdependence and the Educational Development of Bilingual Children. *Review of Educational Research*, *49*(2), 222-251. https://doi.org/10.2307/1169960

_____. (1981). Empirical and theoretical underpinnings of bilingual education. *Journal of Education*, *163*(1), 16–29.

_____. (1991). Interdependence of first- and second-language proficiency in bilingual children. In E. Bialystok (Eds.), *Language processing in bilingual children* (pp. 70–89). https://doi.org/10.1017/CBO9780511620652.006

_____. (2007). Rethinking monolingual instructional strategies in multilingual classrooms. *Canadian Journal of Applied Linguistics*, *10*(2), 20.

Danielson, K., Wong, K. M., & Neuman, S. B. (2019). Vocabulary in educational media for preschoolers: A content analysis of word selection and screen-based pedagogical supports. *Journal of Children and Media*, *13*(4), 345–362. https://doi.org/doi:10.1080/17482798.2019.1585892

de Groot, A. M. (2006). Effects of stimulus characteristics and background music on foreign language vocabulary learning and forgetting. *Language Learning*, *56*(3), 463–506.

De Houwer, A. (2009). *Bilingual first language acquisition*. Multilingual Matters.

Dunn, L. M., & Dunn, D. M. (2007). *PPVT-4: Peabody picture vocabulary test*. Pearson Assessments.

_____, Padilla, E. R., Lugo, D. E., & Dunn, L. M. (1986). *TVIP: Test de vocabulario en imágenes Peabody: adaptación Hispanoamericana*. American Guidance Service.

Durán, L. K., Roseth, C. J., & Hoffman, P. (2010). An experimental study comparing English-only and Transitional Bilingual Education on Spanish-speaking preschoolers' early literacy development. *Early Childhood Research Quarterly*, *25*(2), 207–217. https://doi.org/10.1016/j.ecresq.2009.10.002

Durán, L. K., Roseth, C. J., Hoffman, P., & Robertshaw, M. B. (2013). Spanish-speaking preschoolers' early literacy development: A longitudinal experimental comparison of predominantly English and transitional bilingual education. *Bilingual Research Journal*, *36*(1), 6–34. https://doi.org/10.1080/15235882.2012.735213

Durán, L., Roseth, C. J., & Hoffman, P. (2015). Effects of transitional bilingual education on Spanish-speaking preschoolers' literacy and language development: Year 2 results. *Applied Psycholinguistics*, *36*(4), 921–951. https://doi.org/10.1017/S0142716413000568

Echevarria, J., Vogt, M., & Short, D. (2008). *Making content comprehensible for English learners: The SIOP model*.

Farver, J. A. M., Lonigan, C. J., & Eppe, S. (2009). Effective Early Literacy Skill Development for Young Spanish-Speaking English Language Learners: An Experimental Study of Two Methods. *Child Development*, *80*(3), 703–719.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191.

Fenstermacher, S. K., Barr, R., Salerno, K., Garcia, A., Shwery, C. E., Calvert, S. L., & Linebarger, D. L. (2010). Infant-directed media: An analysis of product information and claims. *Infant and Child Development*, *19*(6), 557–556.

Fisch, S. M., & Truglio, R. T. (2014). *G is for growing: Thirty years of research on children and Sesame Street*. Routledge.

Flynn, R. M., Wong, K. M., Neuman, S. B., & Kaefer, T. (2019). Children's attention to screen-based pedagogical supports predicts vocabulary learning: An eye-tracking study with low-income preschool children. *Journal of Children and Media*, *13*(2), 180–200. https://doi.org/doi:10.1080/17482798.2019.1575887

Gándara, P., & Hopkins, M. (2010). *English learners and restrictive language policies.* New York: Teachers College Press.

García, O. (2009). Education, multilingualism and translanguaging in the 21st century. In *Multilingual Education for Social Justice: Globalising the local* (pp. 140–158). New Delhi: Orient Blackswan.

_____. (2011). *Bilingual education in the 21st century: A global perspective*. John Wiley & Sons.

_____, Flores, N., & Woodley, H. (2012). Transgressing monolingualism and bilingual dualities: Translanguaging pedagogies. In A. Yiakoumetti (Eds.), *Harnessing Linguistic Variation to Improve Education* (p. 45–75). Peter Lang.

_____, & Wei, L. (2014). Translanguaging and education. In *Translanguaging: Language, bilingualism and education* (pp. 63–77). Springer.

_____, & Woodley, H. H. (2009). Bilingual education. In M. Bigelow & J. Ennser-Kananen (Eds.), *The Routledge Handbook of Educational Linguistics*. New York: Routledge

Genesee, F. (1999). Program alternatives for linguistically diverse students. *UC Berkeley: Center for Research on Education, Diversity and Excellence*. Retrieved from https://escholarship.org/uc/item/95t956xz

_____, Lindholm-Leary, K., Saunders, W., & Christian, D. (2005). English Language Learners in U.S. Schools: An Overview of Research Findings. *Journal of Education for Students Placed at Risk (JESPAR)*, *10*(4), 363–385. https://doi.org/10.1207/s15327671espr1004_2

Gersten, R., & Baker, S. (2000). What we know about effective instructional practices for English-language learners. *Exceptional Children*, *66*(4), 454–470.

Goldenberg, C. (2013). Unlocking the research on English Learners: What we know–and don't yet know–about effective instruction. *American Educator*, *37*(2), 4-11.

Gonzalez, J. E., Pollard-Durodola, S., Simmons, D. C., Taylor, A. B., Davis, M. J., Fogarty, M., & Simmons, L. (2014). Enhancing preschool children's vocabulary: Effects of teacher talk before, during and after shared reading. *Early Childhood Research Quarterly*, *29*(2), 214–226.

Greene, J. P. (1997). A meta-analysis of the Rossell and Baker review of bilingual education research. *Bilingual Research Journal*, *21*(2–3), 103–122.

Gutiérrez-Clellen, V., Simon-Cereijido, G., & Sweet, M. (2012). Predictors of second language acquisition in Latino children with specific language impairment. *American Journal of Speech-Language Pathology*, *21*(1), 64–77. https://doi.org/10.1044/1058-0360(2011/10-0090)

Halle, T., Hair, E., Wandner, L., McNamara, M., & Chien, N. (2012). Predictors and outcomes of early versus later English language proficiency among English language learners. *Early Childhood Research Quarterly*, *27*(1), 1–20.

Hamada, M., & Koda, K. (2008). Influence of first language orthographic experience on second language decoding and word learning. *Language Learning*, *58*(1), 1–31. https://doi.org/10.1111/j.1467-9922.2007.00433.x

Hammer, C. S., Hoff, E., Uchikoshi, Y., Gillanders, C., Castro, D. C., & Sandilos, L. E. (2014). The language and literacy development of young dual language learners: A critical review. *Early Childhood Research Quarterly*, *29*(4), 715–733. https://doi.org/10.1016/j.ecresq.2014.05.008

_____, Lawrence, F. R., & Miccio, A. W. (2008). Exposure to English before and after entry into Head Start: Bilingual children's receptive language growth in Spanish and English. *International Journal of Bilingual Education and Bilingualism*, *11*(1), 30–56. https://doi.org/10.2167/beb376.0

Han, W. J. (2012). Bilingualism and academic achievement. *Child Development*, *83*(1), 300–321.

Heugh, K. (2012). Theory and practice-language education models in Africa: Research, design, decision-making and outcomes. In A. Ouane & C. Glanz (Eds). *Optimising learning, education and publishing in Africa: The language factor: A review and analysis of theory and practice in mother-*

tongue and bilingual education in sub-Saharan Africa (p. 105-156). Hamburg: UNESCO.

_____, Benson, C., Yohannes, M. A. G., & Bogale, B. (2012). Implications for multilingual education: Student achievement in different models of education in Ethiopia. In T. Skutnabb-Kangas & K. A. Heugh (Eds.) *Multilingual education and sustainable diversity work: From periphery to center* (p. 239-262). New York: Routledge.

Hindman, A. H., & Wasik, B. A. (2015). Building vocabulary in two languages: An examination of Spanish-speaking Dual Language Learners in Head Start. *Early Childhood Research Quarterly*, *31*(2), 19–33. https://doi.org/10.1016/j.ecresq.2014.12.006

Hoff, E. (2006). How social contexts support and shape language development. *Developmental Review*, *26*(1), 55–88.

_____, Core, C., Place, S., Rumiche, R., Señor, M., & Parra, M. (2012). Dual language exposure and early bilingual development. *Journal of Child Language*, *39*(1), 1–27. https://doi.org/10.1017/S0305000910000759

Howes, C., Burchinal, M., Pianta, R., Bryant, D., Early, D., Clifford, R., & Barbarin, O. (2008). Ready to learn? Children's pre-academic achievement in pre-Kindergarten programs. *Early Childhood Research Quarterly*, *23*(1), 27–50. https://doi.org/10.1016/j.ecresq.2007.05.002

Huston, A. C., & Wright, J. C. (1983). Children's processing of television: The informative functions of formal features. In J. Bryant & D. R. Anderson (Eds.), *Children's Understanding of Television: Research on Attention and Comprehension* (p. 35–68). New York: Academic Press.

Junker, D. A., & Stockman, I. J. (2002). Expressive vocabulary of German-English bilingual toddlers. *American Journal of Speech-Language Pathology*, *11*(4), 381–394.

Kamil, M. L., Intrator, S. M., & Kim, H. S. (2000). The effects of other technologies on literacy and literacy learning. *Handbook of Reading Research*, *3*, 771–788.

Kirkorian, H. L., & Anderson, D. R. (2008). Learning from Educational Media. In S. L. Calvert & B. J. Wilson (Eds.), *The Handbook of Children, Media, and Development* (pp. 188–213). Blackwell Publishing Ltd. https://doi.org/10.1002/9781444302752.ch9

_____, Wartella, E. A., & Anderson, D. R. (2008). Media and young children's learning. *The Future of Children*, *18*(1), 39–61.

Kovács, Á. M., & Mehler, J. (2009). Flexible learning of multiple speech structures in bilingual infants. *Science*, *325*(5940), 611–612.

Krcmar, M., & Cingel, D. P. (2017). Do young children really learn best from the use of direct address in children's television? *Media Psychology*, *22*(1), 152–171.

Kuppens, A. H. (2010). Incidental foreign language acquisition from media exposure. *Learning, Media and Technology*, *35*(1), 65–85.

Larson, A. L., & Rahn, N. L. (2015). Vocabulary Instruction on *Sesame Street*: A Content Analysis of the Word on the Street Initiative. *Language Speech and Hearing Services in Schools*, *46*(3), 207. https://doi.org/10.1044/2015_LSHSS-14-0079

Lavigne, H. J., Hanson, K. G., & Anderson, D. R. (2015). The influence of television coviewing on parent language directed at toddlers. *Journal of Applied Developmental Psychology*, 1–10.

Leacox, L., & Jackson, C. W. (2014). Spanish vocabulary-bridging technology-enhanced instruction for young English language learners' word learning. *Journal of Early Childhood Literacy*, *14*(2), 175–197.

Lesser, G. (1972). Learning, teaching, and television production for children: The experience of Sesame Street. *Harvard Educational Review*, *42*(2), 232–272.

Leung, G., & Uchikoshi, Y. (2012). Relationships Among Language Ideologies, Family Language Policies, and Children's Language Achievement: A Look at Cantonese-English Bilinguals in the U.S. *Bilingual Research Journal*, *35*(3), 294–313. https://doi.org/10.1080/15235882.2012.731588

Lindholm-Leary, K. J. (2001). *Dual language education* (Vol. 28). Multilingual Matters.

Linebarger, D. L., Kosanic, A. Z., Greenwood, C. R., & Doku, N. S. (2004). Effects of viewing the television program Between the Lions on the emergent literacy skills of young children. *Journal of Educational Psychology*, *96*(2), 297–308. https://doi.org/10.1037/0022-0663.96.2.297

_____, & Piotrowski, J. T. (2010). Structure and strategies in children's educational television: The roles of program type and learning strategies in children's learning: Television features and literacy. *Child Development*, *81*(5), 1582–1597. https://doi.org/10.1111/j.1467-8624.2010.01493.x

_____, Brey, E., Fenstermacher, S., & Barr, R. (2017). What makes preschool educational television educational? A content analysis of literacy, language-promoting, and prosocial preschool programming. In *Media Exposure During Infancy and Early Childhood* (pp. 97–133). Springer.

Lu, L., & Liu, H. S. (1998). The peabody picture vocabulary test-revised in Chinese. *Taipei: Psychological Publishing*.

Lugo-Neris, M. J., Jackson, C. W., & Goldstein, H. (2010). Facilitating vocabulary acquisition of young English language learners. *Language, Speech, and Hearing Services in Schools*, *41*(3), 314–327.

Luk, G., & Bialystok, E. (2013). Bilingualism is not a categorical variable: Interaction between language proficiency and usage. *Journal of Cognitive Psychology*, *25*(5), 605–621. https://doi.org/10.1080/20445911.2013.795574

Lundén, M., & Silvén, M. (2011). Balanced communication in mid-infancy promotes early vocabulary development: Effects of play with mother and father in mono-and bilingual families. *International Journal of Bilingualism*, *15*(4), 535–559.

MacWhinney, B. (2014). *The CHILDES project: Tools for analyzing talk, Volume II: The database*. Psychology Press.

Mancilla-Martinez, J., & Lesaux, N. K. (2011). Early home language use and later vocabulary development. *Journal of Educational Psychology*, *103*(3), 535–546. https://doi.org/10.1037/a0023655

Mandler, J. M., & Johnson, N. S. (1977). Remembrance of things parsed: Story structure and recall. *Cognitive Psychology*, *9*(1), 111–151.

Marulis, L. M, & Neuman, S. B. (2010). The effects of vocabulary intervention on young children's word learning: A meta-analysis. *Review of Educational Research, 80*(3), 300-335.

Marulis, L. M., & Neuman, S. B. (2013). How vocabulary interventions affect young children at risk: A meta-analytic review. *Journal of Research on*

Educational Effectiveness, *6*(3), 223–262. https://doi.org/10.1080/19345747.2012.755591

Mayer, R. E. (1997). Multimedia learning: Are we asking the right questions? *Educational Psychologist*, *32*(1), 1–19.

_____. (2002). Multimedia learning. In *Psychology of learning and motivation* (Vol. 41, pp. 85–139). Elsevier.

Méndez, L. I., Crais, E. R., Castro, D. C., & Kainz, K. (2015). A culturally and linguistically responsive vocabulary approach for young Latino Dual Language Learners. *Journal of Speech, Language, and Hearing Research*, *58*(1), 93-106. https://doi.org/10.1044/2014_jslhr-l-12-0221

Menken, K., & Kleyn, T. (2010). The long-term impact of subtractive schooling in the educational experiences of secondary English language learners. *International Journal of Bilingual Education and Bilingualism*, *13*(4), 399–417. https://doi.org/10.1080/13670050903370143

Meringoff, L. K. (1980). Influence of the medium on children's story apprehension. *Journal of Educational Psychology*, *72*(2), 240–249. https://doi.org/10.1037/0022-0663.72.2.240

Montero Perez, M., Peters, E., Clarebout, G., & Desmet, P. (2014). Effects of captioning on video comprehension and incidental vocabulary learning. *Language Learning and Technology*, *18*(1), 118–141.

Montero Perez, M., Peters, E., & Desmet, P. (2015). Enhancing vocabulary learning through captioned Video: An eye-tracking study. *The Modern Language Journal*, *99*(2), 308–328.

Nagy, W. E., Anderson, R. C., & Herman, P. A. (1987). Learning word meanings from context during normal reading. *American Educational Research Journal*, *24*(2), 237–270.

_____, & Herman, P. A. (1987). Breadth and depth of vocabulary knowledge: Implications for acquisition and instruction. In M. G. McKeown & M. E. Curtis (Eds.), *The Nature of Vocabulary Acquisition* (p. 19-35). Lawrence Erlbaum Associates, Inc.

Namaziandost, E., Rahimi Esfahani, F., & Hashemifardnia, A. (2018). The comparative effect of spacing instruction and massed instruction on intermediate EFL learners' reading comprehension. *SAGE Open*, *8*(4), 1-8.

Nation, I. S. P., & Newton, J. (2008). *Teaching ESL/EFL listening and speaking*. Routledge.

_____. (1990). *Teaching and Learning Vocabulary*. New York, NY: Newbury House.

_____. (2013). *Learning vocabulary in another language* (2nd ed.). Cambridge: Cambridge University Press.

Neuman, S. B. (1997). Television as a learning environment: A theory of synergy. In J. Flood, S. B Heath, & D. Lapp (Eds.), *Handbook of Research on Teaching Literacy through the Communicative and Visual Arts* (p. 15–30). Old Tappan, NJ: Simon and Schuster.

_____. (2009). The case for multimedia presentations in learning. In A. G. Bus & S. B. Neuman (Eds.), *Multimedia and Literacy Development: Improving Achievement for Young Learners* (p. 44–56). Routledge.

_____, Flynn, R. M., Wong, K. M., & Kaefer, T. (under review). *Quick, incidental word learning in educational media: All contexts are not equal among low-income preschoolers*.

_____, Wong, K. M., Flynn, R., & Kaefer, T. (2019). Learning vocabulary from educational media: The role of pedagogical supports for low-income preschoolers. *Journal of Educational Psychology*, *111*(1), 32–44. https://doi.org/10.1037/edu0000278

Paivio, A. (1986). Psychological Processes in the Comprehension of Metaphor. *Metophor and Thought*, *163*. Retrieved from https://ci.nii.ac.jp/naid/10029347183/

_____. (2008). The dual coding theory. In S. B. Neuman (Eds.), *Educating the other America* (pp. 227–242). Baltimore, MD: Paul H. Brookes Publishing Co.

_____. (2010). Dual coding theory and the mental lexicon. *The Mental Lexicon*, *5*(2), 205–230.

Paradis, J. (2011). Individual differences in child English second language acquisition: Comparing child-internal and child-external factors. *Linguistic Approaches to Bilingualism*, *1*(3), 213–237. https://doi.org/10.1075/lab.1.3.01par

Pearson, B. Z., Fernandez, S. C., Lewedeg, V., & Oller, D. K. (1997). The relation of input factors to lexical learning by bilingual infants. *Applied Psycholinguistics*, *18*(1), 41–58.

Proctor, C. P., August, D., Snow, C., & Barr, C. D. (2010). The interdependence continuum: A perspective on the nature of Spanish–English bilingual reading comprehension. *Bilingual Research Journal*, *33*(1), 5–20.

_____, Harring, J. R., & Silverman, R. D. (2017). Linguistic interdependence between Spanish language and English language and reading: A longitudinal exploration from second through fifth grade. *Bilingual Research Journal*, *40*(4), 372–391. https://doi.org/10.1080/15235882.2017.1383949

Quiroz, B. G., Snow, C. E., & Zhao, J. (2010). Vocabulary skills of Spanish—English bilinguals: Impact of mother—child language interactions and home language and literacy support. *International Journal of Bilingualism*, *14*(4), 379–399.

Restrepo, M. A., Morgan, G. P., & Thompson, M. S. (2013). The efficacy of a vocabulary intervention for dual-language learners with language impairment. *Journal of Speech, Language, and Hearing Research*, *56*(2), 748–765.

Rice, M. L., Huston, A. C., Truglio, R., & Wright, J. C. (1990). Words from "Sesame Street": Learning vocabulary while viewing. *Developmental Psychology*, *26*(3), 421.

_____, & Woodsmall, L. (1988). Lessons from television: Children's word learning when viewing. *Child Development*, *59*(2), 420. https://doi.org/10.2307/1130321

Rideout, V. (2014). *Learning at home: Families' educational media use in America*. New York: The Joan Ganz Cooney Center.

Rodgers, M. P. H., & Webb, S. (2016). The Effects of Captions on EFL Learners' Comprehension of English-Language Television Programs. *CALICO Journal*, *34*(1), 20–38. https://doi.org/10.1558/cj.29522

Roseberry, S., Hirsh-Pasek, K., & Golinkoff, R. M. (2014). Skype Me! Socially Contingent Interactions Help Toddlers Learn Language. *Child Development*, *85*(3), 956–970. https://doi.org/10.1111/cdev.12166

Ruiz, R. (1984). Orientations in language planning. *NABE Journal*, *8*(2), 15–34.

Salomon, G. (1981). Communication and education: Social and psychological interactions. *People & Communication, 13*, 9-271.

Samudra, P., Flynn, R. M., & Wong, K. M. (2019). Coviewing educational media: Does coviewing help low-income preschoolers learn auditory and audio-visual vocabulary associations? *AERA Open*, *5*(2), 1–12.

_____, Wong, K. M., & Neuman, S. B. (2019). Promoting low-income preschoolers' vocabulary from educational media: Does repetition support memory for learned word knowledge? *Journal of Cognitive Education and Psychology, 18*(2), 160-173. https://doi.org/10.1891/1945-8959.18.2.160

Schmitt, N. (2010). *Researching vocabulary: A vocabulary research manual*. Springer.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Houghton Mifflin and Company.

Sharp, D. L., Bransford, J. D., Goldman, S. R., Risko, V. J., Kinzer, C. K., & Vye, N. J. (1995). Dynamic visual support for story comprehension and mental model building by young, at-risk children. *Educational Technology Research and Development*, *43*(4), 25–42.

Short, D., & Echevarria, J. (2004). Teacher skills to support English language learners. *Educational Leadership*, *62*(4), 8–13.

Silverman, R. (2013). Investigating video as a means to promote vocabulary for at-risk children. *Contemporary Educational Psychology*, *38*(3), 170–179. Retrieved from eue.

_____, & Hines, S. (2009). The effects of multimedia-enhanced instruction on the vocabulary of English-language learners and non-English-language learners in pre-kindergarten through second grade. *Journal of Educational Psychology*, *101*(2), 305–314. https://doi.org/10.1037/a0014217

Singer, J. L. (2014). The power and limitations of television: A cognitive-affective analysis. In *The entertainment functions of television* (pp. 41–76). Psychology Press.

Slavin, R. E., Madden, N., Calderón, M., Chamberlain, A., & Hennessy, M. (2011). Reading and language outcomes of a multiyear randomized

evaluation of transitional bilingual education. *Educational Evaluation and Policy Analysis*, *33*(1), 47–58.

Soltero-González, L. (2009). Preschool Latino immigrant children: Using the home language as a resource for literacy learning. *Theory Into Practice*, *48*(4), 283–289. https://doi.org/10.1080/00405840903192771

Stahl, S. A., & Nagy, W. E. (2007). *Teaching word meanings*. Routledge.

Stanovich, K. E. (2009). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Journal of Education*, *189*(1–2), 23–55.

Stein, N. L., & Glenn, C. G. (1975). *An analysis of story comprehension in elementary school children: A test of a schema* (p. 2-68). Psychology Press.

Strouse, G. A., O'Doherty, K., & Troseth, G. L. (2013). Effective coviewing: Preschoolers' learning from video after a dialogic questioning intervention. *Developmental Psychology*, *49*(12), 2368–2382. https://doi.org/10.1037/a0032463

_____, Troseth, G. L., O'Doherty, K. D., & Saylor, M. M. (2018). Co-viewing supports toddlers' word learning from contingent and noncontingent video. *Journal of Experimental Child Psychology*, *166*, 310–326. https://doi.org/10.1016/j.jecp.2017.09.005

Takanishi, R., & Le Menestrel, S. (2017). Promoting the educational success of children and youth learning English: Promising futures. *Washington, DC: The National Academies Press. Retrieved October*, *26*, 2017.

Thomas, W. P., & Collier, V. P. (1997). School Effectiveness for Language Minority Students. *NCBE Resource Collection Series, No. 9.*

Thomas, W. P., & Collier, V. P. (2002). A national study of school effectiveness for language minority students' long-term academic achievement. *UC Berkeley: Center for Research on Education, Diversity and Excellence*. Retrieved from https://escholarship.org/uc/item/65j213pt

Thordardottir, E. (2011). The relationship between bilingual exposure and vocabulary development. *International Journal of Bilingualism*, *15*(4), 426–445.

Troseth, G. L., Saylor, M. M., & Archer, A. H. (2006). Young children's use of video as a source of socially relevant information. *Child Development*, *77*(3), 786–799. https://doi.org/10.1111/j.1467-8624.2006.00903.x

Uccelli, P., & Páez, M. M. (2007). Narrative and vocabulary development of bilingual children from kindergarten to first grade: Developmental changes and associations among English and Spanish skills. *Language, Speech, and Hearing Services in Schools*, *38*(3), 225–236.

Uchikoshi, Y. (2005). Narrative development in bilingual kindergarteners: Can Arthur help? *Developmental Psychology*, *41*(3), 464–478. https://doi.org/10.1037/0012-1649.41.3.464

_____. (2006). Early reading in bilingual kindergartners: Can educational television help? *Scientific Studies of Reading*, *10*(1), 89–120. https://doi.org/10.1207/s1532799xssr1001_5

_____. (2014). Development of vocabulary in Spanish-speaking and Cantonese-speaking English language learners. *Applied Psycholinguistics*, *35*(1), 119–153. https://doi.org/10.1017/S0142716412000264

_____, & Maniates, H. (2010). How does bilingual instruction enhance English achievement? A mixed-methods study of Cantonese-speaking and Spanish-speaking bilingual classrooms. *Bilingual Research Journal*, *33*(3), 364–385. https://doi.org/10.1080/15235882.2010.525294

_____, & Marinova-Todd, S. H. (2012). Language proficiency and early literacy skills of Cantonese-speaking English language learners in the U.S. and Canada. *Reading and Writing*, *25*(9), 2107–2129. https://doi.org/10.1007/s11145-011-9347-2

Vaala, S. E., Linebarger, D. L., Fenstermacher, S. K., Tedone, A., Brey, E., Barr, R., … Calvert, S. L. (2010). Content analysis of language-promoting teaching strategies used in infant-directed media. *Infant and Child Development*, *19*(6), 628–648.

Verhallen, M. J. A. J., Bus, A. G., & de Jong, M. T. (2006). The promise of multimedia stories for kindergarten children at risk. *Journal of Educational Psychology*, *98*(2), 410–419. https://doi.org/10.1037/0022-0663.98.2.410

Vygotsky, L. S. (1980). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Walter, S. L., & Davis, P. M. (2005). The Eritrea national reading survey. *Dallas, TX: SIL*.

Wigfield, A., & Guthrie, J. T. (2000). Engagement and motivation in reading. In M. K. Kamil, P. B. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of Reading Research* (Vol. 3, p. 403–422). Routledge.

Wilson, D. M. (2011). Dual language programs on the rise. *Harvard Education Letter*, *27*(2), 1–2.

Wong, K. M., & Neuman, S. B. (2019). Learning vocabulary on screen: A content analysis of pedagogical supports in educational media programs for dual-language learners. *Bilingual Research Journal*, *42*(1), 54–72. https://doi.org/10.1080/15235882.2018.1561551

_____, & Samudra, P. (in press). L2 vocabulary learning from educational media: Extending dual-coding theory to dual-language learners. *Computer Assisted Language Learning*. doi: 10.1080/09588221.2019.1666150

Woodley, H. H. (2015). Empowering Language and Learning with Muslim Immigrant Youth. In Y. S. Freeman & D. E. Freeman (Eds.), *Advances in Research on Teaching* (Vol. 24, pp. 233–263). Emerald Insight. https://doi.org/10.1108/S1479-368720150000024011

APPENDIX A

PARTICIPANT CONSENT FORMS

Dear Parent/Guardian,

We are engaged in an exciting project to better understand how children learn from digital media. To learn more about this, we would like to read a story to your child and engage them in one to two video clips (about 7 minutes in length). We would then play some games with him or her to learn what they like most about the program, and what they can learn from it. At the end of the activities, we provide educational gifts to your center so they may enhance your child's experiences at school.

Your child's participation in this project is strictly voluntary. Please let us know by **[insert date]** if you permit your child to participate in this project. At the same time, if we do not hear from you by the deadline, we will assume that your child has your permission to participate in these activities.

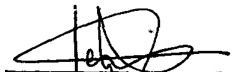
You may refuse to participate or withdraw at any time. In addition, if there is anything about this project or your participation that is unclear or that you do not understand, or if you have questions or wish to report a research-related problem, please feel free to contact me at 212-992-6731, sbneuman@nyu.edu or kevinwong@nyu.edu, 239 Greene Street, NY, NY 10003.

Circle: I grant / I do not grant permission for my child to participate in this project.

Child's Name	Classroom	Signature	Date

Thank you for your participation and we look forward to working with your wonderful child.

Best Regards,



Susan B. Neuman
Professor

Kevin M. Wong
Co-Investigator

APPENDIX B

LANGUAGE ENVIRONMENT QUESTIONNAIRE (STUDY 3)

Dear Parent/Guardian, 亲爱的家长/监护人

We are engaged in an exciting project to better understand how children learn English and Mandarin from digital media. To learn more about this, we would like to read a story to your child and engage them in four video clips (about 2 minutes in length). We would then play some games with him or her to learn what they like most about the program, and what they can learn from it. At the end of the activities, we provide educational gifts to your center so they may enhance your child's experiences at school. 我们现在开展一个非常令人兴奋的研究项目，旨在更好地了解小孩子如何从数字媒体中学习英文和中文。为了更多地了解，我们将会给您的孩子读一个故事，然后让他们观看四个短视频片段（大约 2 分钟时间）。然后我们会与他/她玩一些游戏，来了解他们最喜欢的整个过程中的哪个部分，以及他们从中学习到了什么。在所有的活动结束后，我们会为您孩子的学校提供教育类的礼物，可能对您的孩子在学校的学习有更多帮助。

Your child's participation in this project is strictly voluntary. Please return this signed and completed form by **March 28, 2019**. 您孩子的在全过程中的参与是完全属于自愿的。请您填写这表格并签字，在 2019 年 3 月 28 日前返还这张表格。

You may refuse to participate or withdraw at any time. Feel free to indicate that you do not wish to have your child participate in the project below. In addition, if there is anything about this project or your participation that is unclear or that you do not understand, or if you have questions or wish to report a research-related problem, please feel free to contact me at kevinwong@nyu.edu, 239 Greene Street, NY, NY 10003. 在这个项目进行过程中的任何时间点，您可以随时选择退出。如果您不希望您的孩子参与到项目当中，请不要有任何拘束，直接在下方进行意向选择。此外，如果您对这个研究项目或项目参与有任何的不明白的地方，或者您对于这个项目有任何问题或希望提出与研究有关的疑惑，请随时与我联系。我的邮箱：kevinwong@nyu.edu，地址：239 Greene Street, NY, NY 10003。

Circle: I grant / I do not grant permission for my child to participate in this project.
请圈出：我允许/不允许我的孩子参与到这个项目中。

Child's Name 孩子姓名	Grade 年级	Signature 签名	Date 日期

Thank you for your participation and we look forward to working with your wonderful child.
非常感谢您的参与。我们期待与您孩子在此次项目中的合作。

Kevin M. Wong
Principal Investigator

Susan B. Neuman
Professor

Please take a moment to complete the following questions about your child. (circle)
请花几分钟时间完成以下的关于您孩子的几个问题。（画圈）

1. How much English do you (parents) speak? 您的英文程度？

0% English 英文 (no understanding 完全不懂)	**25% English** 英文 (short sentences 短句)	**50% English** 英文 (can express yourself 可以表达自己)	**75% English** 英文 (can have discussions 可以参与讨论)	**100% English** 英文 (very comfortable 非常自如)

1b. How much Chinese (Mandarin) do you speak? 您的中文（普通話）程度？

0% Chinese 中文	**25% Chinese** 中文	**50% Chinese** 中文	**75% Chinese** 中文	**100% Chinese** 中文

2. How much English do you (parents) speak with your child? 您与孩子说多少英文？

0% English 英文	**25% English** 英文	**50% English** 英文	**75% English** 英文	**100% English** 英文

2b. How much Chinese (Mandarin) do you speak with your child? 您与孩子说多少中文（普通話）？

0% Chinese 中文	**25% Chinese** 中文	**50% Chinese** 中文	**75% Chinese** 中文	**100% Chinese** 中文

3. How much English does your child speak? 您的孩子说多少英文？

0% English 英文	**25% English** 英文	**50% English** 英文	**75% English** 英文	**100% English** 英文

4. How much Chinese (Mandarin) does your child speak? 您的孩子说多少中文（普通话）？

0% Chinese 中文	**25% Chinese** 中文	**50% Chinese** 中文	**75% Chinese** 中文	**100% Chinese** 中文

5. What literacy and language activities does your child do **at home** *in English*? (circle)
您的孩子在家做什么与英文文学或者语言相关的活动？（画圈）

Activities 活动	Everyday 每天	at least once a week 每周至少一次	almost never/never 几乎没有/从来没有
a) Reading/looking at books 阅读	2	1	0
b) On a computer 电脑	2	1	0
c) Watching TV 看电视	2	1	0
d) Storytelling 讲故事	2	1	0
e) Singing songs 唱歌	2	1	0

6. What literacy and language activities does your child do **at home** *in Mandarin*? (circle)
您的孩子在家做什么与中文文学或者语言相关的活动？（画圈）

Activities 活动	Everyday 每天	at least once a week 每周至少一次	almost never/never 几乎没有/从来没有
a) Reading/looking at books 阅读	2	1	0
b) On a computer 电脑	2	1	0
c) Watching TV 看电视	2	1	0
d) Storytelling 讲故事	2	1	0
e) Singing songs 唱歌	2	1	0

APPENDIX C

STUDY 1 PROTOCOL (SCREEN-BASED PEDAGOGICAL SUPPORTS)

Participant ID# _____

Name: _____

Class: _____

Video order: A → B / B → A (circle one)

Assessor: _____ (initial)

Administration Protocol

Start by selecting a child to participate. You can go by a classroom list or simply pick a child who seems to be in need of some activity. Be sure to sit in a quiet area of the school library.

First administer the PPVT and screening pretest.

1) *Introduction*. Tell the child, "We're going to watch some short cartoon clips today. Then I'm going to answer ask you some questions, so make sure you watch carefully."

2) *Test*. Tell the child, "Now we're going to watch the cartoon clips. Remember to listen carefully."

3) After completing the assessment, praise the child and return them to their classroom.

STEP 1: SCREENING TOOL

Please put a ✓ (Yes/Correct) or ✗ (No/Incorrect) according to what students say.

1._____Shelter*

2. _____ Caterpillar*

3._____ Square*

4._____ Circle

5. _____Ring

6. _____Athlete*

7. _____Key*

8. _____Foot

9. _____Whisk*

10._____ Elbow

11. _____ Hurricane*

12. _____Vegetables

13. _____ Grater*

14._____ Comfort*

15. _____ Bees

16. _____ Airplane*

17. _____ Dog

18. _____ Pumpkin*

19. _____ Bell

20. _____Dusk*

*If children say any words with an (*), finish this step and terminate the test. They will be excluded from the study.

STEP 2 Pre-test: PPVT

Record the PPVT on the appropriate PPVT answer sheet

STEP 3: Watch Videos (Rounds A)

STEP 4: Post-Tests (Rounds A)

Round A, Post-test 1: VOCABULARY IN CONTEXT

Put ✓ (Yes/Correct) or ✗ (No/Incorrect) according to what students say. Say,…
****NOTE: Make sure you are using the correct series.*

1. Point to Shelter. _____
2. Point to Hurricane. _____
3. Point to Caterpillar. _____
4. Point to Square. _____
5. Point to Comfort. _____
6. Point to Athlete. _____

Round A, Post-test 2: VOCABULARY IN NEW CONTEXT

Put ✓ (Yes/Correct) or ✗ (No/Incorrect) according to what students say. Say,…
****NOTE: Make sure you are using the correct series.*

1. Point to Shelter. _____
2. Point to Hurricane. _____
3. Point to Caterpillar. _____
4. Point to Square. _____
5. Point to Comfort. _____
6. Point to Athlete. _____

STEP 3: Watch Videos (Rounds B)

STEP 4: Post-Tests (Rounds B)

Round B, Post-test 1: VOCABULARY IN CONTEXT

Put ✓ (Yes/Correct) or ✗ (No/Incorrect) according to what students say. Say,…
****NOTE: Make sure you are using the correct series.*

1. Point to Key. _____
2. Point to Pumpkin. _____
3. Point to Dusk. _____
4. Point to Whisk. _____
5. Point to Grater. _____
6. Point to Airplane. _____

Round B, Post-test 2: VOCABULARY IN NEW CONTEXT

Put ✓ (Yes/Correct) or ✗ (No/Incorrect) according to what students say. Say,…
****NOTE: Make sure you are using the correct series.*

1. Point to Key. _____
2. Point to Pumpkin. _____
3. Point to Dusk. _____
4. Point to Whisk. _____
5. Point to Grater. _____
6. Point to Airplane. _____

APPENDIX D

STUDY 2 PROTOCOL (INSTRUCTIONAL CONTEXTS)

Student Number: _____

ANSWER SHEET

Child Name _____

Age _____ Birthdate _____(MM/DD/YY) Gender _____

School_____ Classroom teacher _____ Room No. ____

Ethnicity/Race

_____

ELL ____(check) If ELL, what is their home language _____

ALEQ home language survey:
Have you collected the LEQ from the teacher? ____ (check)
Does the LEQ have the same student number? ____ (check)
Does the PPVT form have the same student number? ___ (check)

	Round A	Round B	Round C
Assessor (initials)			
Date of Assessments			
Complete (Y/N)			

Notes from assessment:

STEP 1: SCREENING TOOL

Please put a ✓ (Yes/Correct) or ✗ (No/Incorrect) according to what students say.

1._____Adventure*

2. _____ Audience*

3._____ Author*

4._____ Balloons

5. _____Glasses

6. _____Sculpture*

7. _____Actor*

8. _____Hand

9. _____Jump rope

10._____ Elbow

11. _____ Rubbish*

12. _____Fruit

13. _____ Boots

14._____ Lyrics*

15. _____ Hive

16. _____ Forehead

17. _____ Cat

18. _____ Conductor*

19. _____(Bell/Green) Pepper

20. _____Materials*

*If children say any words with an (*), finish this step and terminate the test. They will be excluded from the study.

STEP 2 Pre-test: PPVT

Record the PPVT on the appropriate PPVT answer sheet

STEP 3: Watch Videos (Rounds A, B, and C)

STEP 4: Post-Tests (Rounds A, B, and C)

Round A, Post-test 1: WORD IDENTIFICATION

Put ✓ (Yes/Correct) or ✗ (No/Incorrect) according to what students say. Say,…
****NOTE: Make sure you are using the correct series.*

1. Point to Author. _____
2. Point to Conductor. _____
3. Point to Rubbish. _____
4. Point to Conductor. _____
5. Point to Author. _____
6. Point to Rubbish. _____

Round A, Post-test 2: WORD MEANING 1

Please write down the picture number that the child points to (1, 2, 3). Also note the following: self-correct (SC), no response (NR), doesn't know (DK), asks question (Q).

Say, "Point to the one that…"

1. ...is old and unwanted. _____
2. ...creates stories. _____
3. ...tells musicians what to do. _____

e.g.,

1 2 3

Round A, Post-test 3: WORD MEANING 2

Please circle whether the child answered yes or no or don't know.

1. **Author**
   a. Would an author write about a princess? (YES / NO)
   b. Would an author work at a hospital? (YES / NO)
2. **Conductor**
   a. Does a conductor wash clothes? (YES / NO)
   b. Does a conductor stand in front of musicians? (YES / NO)
3. **Rubbish**
   a. Do you put rubbish in your bed? (YES / NO)
   b. Do you put rubbish in a trash can? (YES / NO)

Round B, Post-test 1: WORD IDENTIFICATION

Put ✓ (Yes/Correct) or ✗ (No/Incorrect) according to what students say. Say,…
****NOTE: Make sure you are using the correct series.*

1. Point to Audience. _____
2. Point to Sculpture. _____
3. Point to Materials. _____
4. Point to Audience. _____
5. Point to Materials. _____
6. Point to Sculpture. _____

Round B, Post-test 2: WORD MEANING 1

Please write down the picture number that the child points to (1, 2, 3). Also note the following: self-correct (SC), no response (NR), doesn't know (DK), asks question (Q).

Say, "Point to the one that…"

1. ...is created by someone. _____
2. ...needs to stay quiet. _____
3. ...is used to make things. _____

e.g.,

1 2 3

Round B, Post-test 3: WORD MEANING 2

Please circle whether the child answered yes or no.

1. **Audience**
   a. Does an audience sit in a movie theater? (YES / NO)
   b. Does an audience sit on a train? (YES / NO)
2. **Sculpture**
   a. Can a sculpture be made of Play-doh? (YES / NO)
   b. Can a sculpture talk to you? (YES / NO)
3. **Materials**
   a. Can materials be put together? (YES / NO)
   b. Can materials be eaten? (YES / NO)

Round C, Post-test 1: WORD IDENTIFICAITON

Put ✓ (Yes/Correct) or ✗ (No/Incorrect) according to what students say. Say,…
****NOTE: Make sure you are using the correct series.*

1. Point to Adventure. _____
2. Point to Lyrics. _____
3. Point to Actor. _____
4. Point to Lyrics. _____
5. Point to Adventure. _____
6. Point to Actor. _____

Round C, Post-test 2: WORD MEANING 1

Please write down the picture number that the child points to (1, 2, 3). Also note the following: self-correct (SC), no response (NR), doesn't know (DK), asks question (Q).

Say, "Point to the one that…"

1. ...someone sings. _____
2. ...dresses up in a costume. _____
3. ...is new and exciting. _____

e.g.,

1 2 3

Round C, Post-test 3: WORD MEANING 2

Please circle whether the child answered yes or no.

1. **Lyrics**
   a. Can someone ride lyrics? (YES / NO)
   b. Can someone sing lyrics? (YES / NO)
2. **Adventure**
   a. Is brushing your teeth an adventure? (YES / NO)
   b. Is looking for buried treasure an adventure? (YES / NO)
3. **Actor**
   a. Do actors cook food for people? (YES / NO)
   b. Do actors pretend to be someone else? (YES / NO)

VOCABULARY LEARNING BY CONTEXT PROTOCOL

GENERAL PROCEDURE:

There are a total of <u>5 steps</u> for each participant.

The student will be excluded based on:

1. Screening tool

The student will be assessed on:

2. PPVT (Pre)
3. < Watch Video Clips > (Rounds A, B, C)
4. Post-test Vocabulary Measures for each Round (3 in each round; 9 total):
    a. Word Identification
    b. Word Meaning 1
    c. Word Meaning 2

ASSESSORS WILL NEED:

- Class list
- Computer
- Earphones
- Earphone cleaner
- Administrative protocol
- Child Answer Sheet
- LEQ home language survey for teachers

ADMINISTRATION PROTOCOL

The teacher will choose a child to participate in the study, which will take place in the quiet library.

"Hi, my name is _____. I'm going to be working with you today and we're going to do a few things. First, I'm going to show you some pictures and ask you some questions about things you like. Then we're going to watch some videos. Then I will ask you some questions about the video. It is okay if you don't know all the answers, just do your best."

STEP 1: SCREENING TOOL

"First we're going to play a game with some pictures. I'm going to show you some pictures and I want you to tell me what they are."

Say, "What is this?"

Show each picture on the screen. Please record the child's response on the answer sheet. If the child does Not Respond (NR), record that and move on to the next picture. If the child names any of the target words, finish this assessment, tell them they did a great job and return them to their class. They cannot be in the study if they know any of the target (*asterisk) words.

STEP 2: PPVT

See PPVT Instructions

STEP 3: VIDEO WATCHING (Rounds A, B, and C)

"Now we are going to watch some videos….."
Provide cleaned headphones to students and make sure they can hear what is on the computer. Adjust volume if necessary.

WATCH VIDEOS

<u>STEP 4</u>: VOCABULARY ASSESSMENTS
(Rounds A, B, and C)

Post-test 1. WORD IDENTIFICATION

"Now I'm going to say a special word, and I want you to point to the picture of that special word. Ok?"
Record each answer on the child's answer sheet.
Say, "Point to…"

<See answer sheet for each Round's order>

Post-test 2: WORD MEANING 1

"Now I'm going to ask you some questions, and you're going to point to the picture that matches. Ready?"

Say, "Point to the one that…."

<See answer sheet for each Round's order>

Post-test 3: WORD MEANING 2

"Now I'm going to ask you some yes or no questions. If you think the answer is no, say "no" and shake your head no like this. If you think the answer is yes, say "yes" and nod your head like this. Ok? Ready to start?"

<See answer sheet for each Round's order>

APPENDIX E

STUDY 3 PROTOCOL (HOME LANGUAGE SUPPORTS)

ORDER 1

Student ID (from tracking sheet):_____ School/Classroom:_____
Date:_____

VIDEO 1 POSTTESTS

POST-TEST 1: IMMEDIATE POST ASSESSMENT

"We're going to play a game. I'm going to ask you a few questions. Let's see if you can answer them!"

1. This is where people go to skate. It is a…	+ □ - □ (rink)
2. This person is moving very smoothly. What is he doing?	+ □ - □ (glide/gliding)
3. This person is very shaky and cannot stand straight. He is…	+ □ - □ (wobbly)
4. Point to glide (3)	+ □ - □
5. Point to the rink (2)	+ □ - □
6. Point to wobbly (1)	+ □ - □

POST-TEST 2: RECEPTIVE VOCABULARY

"Now I'm going to say something and I want you to point to the picture that matches. Ready?"

1. Point to the rink (2)	+ □	- □
2. Point to glide (3)	+ □	- □
3. Point to wobbly (1)	+ □	- □
4. Point to the one where she skates smoothly (1)	+ □	- □

5. Point to the one where she is shaking from side to side (2)	+ □	- □
6. Point to the one where people go to roller skate (3)	+ □	- □
7. Joe feels like he is going to fall. Which one is he? (2)	+ □	- □
8. John put on his roller skates. Where should he go? (3)	+ □	- □
9. Sarah never falls when she roller skates. Which one is she? (1)	+ □	- □

TEST 3: EXPRESSIVE VOCABULARY

"Now, I'm going to ask you about what some words mean. You can look at the pictures."

1. Where is this? (rink)	+ □	prompt □	- □
2. What is she doing? (gliding / glide)	+ □	prompt □	- □
3. What is he doing? (wobbling / wobbly)	+ □	prompt □	- □
4. What is another word for skating smoothly? (gliding / glide)	+ □	prompt □	- □
5. What is another word for shaky? (wobbly)	+ □	prompt □	- □
6. What is another word for a skating place? (rink)	+ □	prompt □	- □
7. What does wobbly mean?	Write student response:		
8. What does rink mean?	Write student response:		
9. What does glide mean?	Write student response:		

VIDEO 2 POSTTESTS

POST-TEST 1: IMMEDIATE POST ASSESSMENT

"We're going to play a game. I'm going to ask you a few questions. Let's see if you can answer them! Are you ready?"

1. This statue that is very cold is called a…	+ □ - □ (ice sculpture)
2. If you can see through something, it is…	+ □ - □ (transparent)
3. This person is doing something with tools. What is he doing?	+ □ - □ (carving / carve)
4. Point to carve (2)	+ □ - □
5. Point to transparent (1)	+ □ - □
6. Point to the ice sculpture (3)	+ □ - □

POST-TEST 2: RECEPTIVE VOCABULARY

"Now I'm going to say something and I want you to point to the picture that matches. Ready?"

1. Point to the ice sculpture (3)	+ □	- □
2. Point to transparent (1)	+ □	- □
3. Point to carve (2)	+ □	- □
4. Point to the one that you can see through (2)	+ □	- □
5. Point to the one that means cutting something (1)	+ □	- □
6. Point to the big shape made out of ice (3)	+ □	- □
7. Max likes to cut large shapes. Which one is Max? (3)	+ □	- □
8. Sally saw a really big and cold statue. What did she see? (2)	+ □	- □
9. Matt can see through the cube. Which cube did he see? (1)	+ □	- □

TEST 3: EXPRESSIVE VOCABULARY

"Now, I'm going to ask you about what some words mean. You can look at the pictures."

1. What is this? (ice sculpture)	+ □	prompt □	- □
2. Why can you see through the glass? (it's transparent)	+ □	prompt □	- □
3. What is he doing? (carving / carve)	+ □	prompt □	- □
4. What is another word for something that is see-through? (transparent)	+ □	prompt □	- □
5. What is another word for cutting? (carving / carve)	+ □	prompt □	- □
6. What is another word for an ice statue? (ice sculpture)	+ □	prompt □	- □
7. What does carve mean?	Write student response:		
8. What does ice sculpture mean?	Write student response:		
9. What does transparent mean?	Write student response:		

VIDEO 3 POSTTESTS

POST-TEST 1: IMMEDIATE POST ASSESSMENT

"We're going to play a game. I'm going to ask you a few questions. Let's see if you can answer them! Are you ready?"

1. 这种在风里会旋转的玩具叫做…	+ ☐ - ☐ (纸风车)
2. 当她一圈一圈的移动，她在…	+ ☐ - ☐ (旋转)
3. 这个人很激动。她感到…	+ ☐ - ☐ (兴奋)
4. 指出兴奋(3)	+ ☐ - ☐
5. 指出纸风车 (1)	+ ☐ - ☐
6. 指出旋转 (2)	+ ☐ - ☐

POST-TEST 2: RECEPTIVE VOCABULARY

"Now I'm going to say something and I want you to point to the picture that matches. Ready?"

1. 指出纸风车 (3)	+ ☐ - ☐
2. 指出旋转 (1)	+ ☐ - ☐
3. 指出兴奋 (2)	+ ☐ - ☐
4. 指出表示转圈圈的那一个 (2)	+ ☐ - ☐
5. 指出表示十分激动的那一个 (1)	+ ☐ - ☐
6. 指出当你吹气它会旋转的玩具 (3)	+ ☐ - ☐
7. 小明很激动因为今天是他的生日。哪一个是小明? (2)	+ ☐ - ☐
8. 小娜得到了一个会在风中旋转的新玩具。她的玩具是什么? (1)	+ ☐ - ☐
9. 小琳是一个喜欢转圈圈的舞者。哪一个舞者是她? (3)	+ ☐ - ☐

TEST 3: EXPRESSIVE VOCABULARY

"Now, I'm going to ask you about what some words mean. You can look at the pictures."

1. 这是什么? (纸风车)	+ ☐ prompt ☐ - ☐
2. 它在做什么? (它在旋转 / 旋转)	+ ☐ prompt ☐ - ☐
3. 她感到怎么样? (兴奋)	+ ☐ prompt ☐ - ☐
4. 转圈圈又可以叫做什么? (旋转)	+ ☐ prompt ☐ - ☐
5. 感到激动又可以叫做什么? (兴奋)	+ ☐ prompt ☐ - ☐
6. 在风中会旋转的玩具又叫做什么? (纸风车)	+ ☐ prompt ☐ - ☐
7. 兴奋是什么意思?	Write student response:
8. 纸风车是什么意思?	Write student response:
9. 旋转是什么意思?	Write student response:

VIDEO 4 POSTTESTS

POST-TEST 1: IMMEDIATE POST ASSESSMENT

"We're going to play a game. I'm going to ask you a few questions. Let's see if you can answer them!"

这个人正在做一种运动。他在做什么?	+ ☐ (太极)	- ☐
2. 这个人感到有些生气。她感到…?	+ ☐ (挫败)	- ☐
3. 这个人在做一些事情来感到平静。她在做什么?	+ ☐ (冥想)	- ☐
4. 指出冥想 (3)	+ ☐	- ☐
5. 指出挫败 (1)	+ ☐	- ☐
6. 指出太极 (2)	+ ☐	- ☐

POST-TEST 2: RECEPTIVE VOCABULARY

"Now I'm going to say something and I want you to point to the picture that matches. Ready?"

1. 指出太极 (1)	+ ☐	- ☐
2. 指出挫败 (3)	+ ☐	- ☐
3. 指出冥想 (2)	+ ☐	- ☐
4. 指出你想要感到平静时做的那一个(3)	+ ☐	- ☐
5. 指出是一种运动的那一个 (1)	+ ☐	- ☐
6. 指出表示有一些生气的那一个 (2)	+ ☐	- ☐
7. 小兰的妈妈没有给她糖果。她感到怎么样? (1)	+ ☐	- ☐
8. 小李十分平静和安静。哪一个是他? (3)	+ ☐	- ☐
9. 小明喜欢在早晨做运动。哪一个是小明? (2)	+ ☐	- ☐

TEST 3: EXPRESSIVE VOCABULARY

"Now, I'm going to ask you about what some words mean. You can look at the pictures."

1. 这是什么? (太极)	+ ☐ prompt ☐ - ☐
2. 他感觉怎么样? (挫败)	+ ☐ prompt ☐ - ☐
3. 他在做什么? (她在冥想 / 冥想)	+ ☐ prompt ☐ - ☐
4. 感觉到有一点些生气又叫做? (挫败)	+ ☐ prompt ☐ - ☐
5. 保持平静又可以叫做什么? (冥想)	+ ☐ prompt ☐ - ☐
6. 一种中国人早晨做的运动又叫做什么? (太极)	+ ☐ prompt ☐ - ☐
7. 冥想是什么意思?	Write student response:
8. 太极是什么意思?	Write student response:
9. 挫败是什么意思?	Write student response:

After posttest is complete, staple it to the child's pretest and PPVT.
Then put the combined packet in the "completed posttests" tray in Kevin's office.