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RESEARCH ARTICLE

Learning vocabulary on screen: A content analysis of pedagogical supports in educational media programs for dual-language learners

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ABSTRACT

Educational media is ubiquitous in the lives of young children, promising high-quality programming to equip them with vocabulary knowledge and school readiness. To meet the needs of preschool-aged dual-language learners (DLLs), many educational programs are marketed to promote vocabulary learning in two languages. In this study, we use a content analysis to examine (1) the extent to which these programs focus on vocabulary in two languages, (2) dual-language instructional supports used in media; and (3) the quality of words taught on screen. We analyzed 50 episodes from five leading dual-language educational programs. Using a flow chart and an iteratively-developed codebook, we identified vocabulary clips and screen-based pedagogical supports used in these programs. Results indicate there were strikingly few vocabulary clips in the videos analyzed. Moreover, most of the clips were of simple vocabulary words taught primarily in English rather than Spanish or Mandarin. The most prevalent screen-based pedagogical supports included repetitions, visual supports, and demonstrations. However, there were noteworthy differences in the types of supports by program and language. Findings suggest that the dual-language appeal of programs may serve more as a marketing tool than an instructional tool for vocabulary development. Implications for research in dual-language vocabulary instruction are discussed.

Children today are exposed to technology at a very young age, with educational media becoming increasingly salient in the lives of young children. Around the globe, children's media consumption habits have become integrated into the everyday lives of families (Lemish, 2015). In the United States, preschoolers are spending an average of over two and a half hours on screen per day (Common Sense Media, 2017; Rideout, 2014) watching media programs that are purportedly educational (Fenstermacher et al., 2010). Over the past 10 years, the American Academy of Pediatrics (AAP) has addressed this hike in media usage by recommending against television exposure to children under the age of 2. More recently, the AAP revised their position to allow children as early as 18 months of age to be exposed to "high-quality programming" when viewing with a parent (2016). Despite these revisions, national surveys of media consumption in the United States report that 90% of 24-month-olds are regularly exposed to media, with 78% of media usage deemed educational (Rideout, 2014) and 67% of parents reporting that their children do learn from screen media platforms (Common Sense Media, 2017). Moreover, disaggregated data demonstrate that mobile device access in the United States has increased

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exponentially from 52% of households using tablets, smartphones, and iPads in 2011 to 98% using these devices in 2017 (Common Sense Media, 2017). As the quantity of media consumption continues to escalate, the quality of media must take a front seat on the research agenda (Vaala et al., 2010).

The emphasis on high-quality children's programming in the media marketplace is evident in programs designed to provide preschoolers with learning experiences that increase school readiness and educational outcomes. These programs are designed to cater to the developmental abilities, interests, and educational needs of young children (Vaala et al., 2010). The educational needs of young learners, however, are very diverse, which has resulted in a number of dual-language educational media programs marketed to meet the needs of linguistically diverse children. As described by their creators, the purpose of these programs is to promote language development in young children in both English and the home language. Despite this effort to create media for dual-language learners (DLLs), few have attempted to examine how these programs are designed to support early literacy development in two languages. Recognizing that vocabulary is foundational to literacy development in young DLLs (Hindman & Wasik, 2015; Uccelli & Páez, 2007), this study is designed to examine opportunities for vocabulary learning in two languages in programs that cater to DLLs. Examining learning opportunities on screen will help us better understand what "quality" educational media might look like and allow future research to investigate how these opportunities might promote dual-language vocabulary development.

Vocabulary development in dual-language learners

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 vocabulary development (Hammer et al., 2014). Entering schools with less English vocabulary knowledge than their classmates, DLLs are at risk for encountering challenges in their long-term educational trajectory (Halle, Hair, Wandner, McNamara, & Chien, 2012; Han, 2012). Because vocabulary knowledge is critical for supporting later reading development and comprehension (Hindman & Wasik, 2015), focusing on opportunities for vocabulary development may be central to understanding how to best support the DLL population.

DLLs benefit from consistent exposure to languages (Quiroz, Snow, & Zhao, 2010; Thordardottir, 2011). Children's bilingual vocabulary development is closely related to the breadth of vocabulary words 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. 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 have less English vocabulary knowledge than non-DLLs (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), Hoff et al. (2012) examined the influence of first- and second-language input in bilingual infants and found that L1 and L2 vocabulary development was 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 children to more English than English-bilingual

households (Hammer et al., 2014). Considering the importance of language exposure in two languages, this study was designed to examine opportunities to learn L1 and L2 vocabulary in educational media programs for DLLs.

While content analyses have not examined language exposure or representation in educational media, critical media analyses have investigated representations of gender, class, and race-related messages in children's programming, finding that *Doc McStuffins* and *Dora the Explorer* provide particularly positive messages of girls from minoritized communities (Keys, 2016). Keys (2016) argues that children who see positive representations of themselves in media may feel empowered because their cultures and lived experiences are celebrated. On the contrary, media programs that only portray aspects of a dominant culture transmit and reproduce ideologies that reinforce a dominant ideology (Van Dijk, 2015). Moreover, this reproduction can be seen in various symbols in society, including people's professions, lifestyles, and language use (Bourdieu, 1984). For DLLs, media has the potential to transmit messages of power through language representation on screen (Buckingham, 2013), which is often reserved for hegemonic languages like English and expressed in a program's goal of developing skills in this dominant language.

Instructional supports for dual-language vocabulary learning

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, Peisner-Feinberg, Páez, Hammer, & Knowles, 2014; Collins, 2010; Lugo-Neris, Jackson, & Goldstein, 2010; Takanishi & Le Menestrel, 2017). These strategies have been examined in a variety of contexts with DLLs from varying linguistic backgrounds. Recognizing that 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, August, McLaughlin, Snow, & Dressler, 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; Lugo-Neris et al., 2010). These 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 toward deeper understandings of new words (Vygotsky, 1980).

Another potential scaffold in dual-language vocabulary learning examined by scholars is the use of a child's mother tongue or L1 in the classroom. Gersten and Baker (2000) stressed the importance of strategically using a child's native language to support second-language vocabulary development. Substantiating Cummins's (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. While consensus on how to *strategically* use a home language in instruction remains unclear, researchers have shown the benefits of providing children with rich explanations of challenging words in their native language (Gersten & Baker, 2000; Uchikoshi & Maniates, 2010).

Visual supports, which include visual representations of vocabulary words, illustrations, demonstrations, or multimedia, can serve as important scaffolds for dual-language vocabulary learning. The need for visuals threads throughout a number of successful interventions in early childhood, suggesting that visuals provide DLLs with the supports needed to make core content comprehensible (Silverman & Hines, 2009; Takanishi & Le Menestrel, 2017). Moreover, studies 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; 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, Morgan, & Thompson, 2013). A study by Restrepo et al. (2013) created a vocabulary intervention for young DLLs and found that repeated dialogic reading and activities that required children to interact with new words facilitated vocabulary acquisition among preschoolers. These interactive activities included story retelling, predicting, writing vocabulary words, story acting, and dialogic reading. Each activity was able to scaffold learning by providing challenging experiences for DLLs to apply 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 (Baker, Gersten, Haager, & Dingle, 2006; Collins, 2010; Lugo-Neris et al., 2010). Moreover, repetition may be an important scaffold 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 (Baker et al., 2006; Takanishi & Le Menestrel, 2017).

The potential for educational media

In today's digital age, multimedia have the potential to serve as a platform for L2 vocabulary learning (Peters & Webb, 2018; Rodgers, 2018), particularly among young DLLs (Neuman, Wong, Flynn, & Kaefer, 2018; Silverman & Hines, 2009; Uchikoshi, 2006; Verhallen, Bus, & de Jong, 2006). Through media, young DLLs are able to access a breadth of vocabulary words in two languages, while potentially gaining a deeper understanding of words through repeated viewings and rich screen-based pedagogical supports (Neuman, Wong, Flynn, & Kaefer, 2018). In 2013, we (Marulis & Neuman, 2013) conducted a meta-analysis to determine the pedagogical features associated with the greatest effects on vocabulary learning. Findings 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.

Furthermore, 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 et al., 2006). Silverman and Hines (2009) conducted a study that examined multimedia instruction on vocabulary outcomes in DLL and non-DLL preschoolers. While non-DLL students had no added benefits from media enhancements, there were positive vocabulary gains for DLL students in both target word and general vocabulary knowledge assessments. Similarly, Verhallen et al. (2006) investigated the influence of multimedia features on L2 reading progress in kindergarteners. Assigning children to experimental and control groups, 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).

Theoretical framework

This study draws from Cummins's (1979) Interdependence Hypothesis to understand how children might learn two languages. Cummins's theory proposes 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, DLLs' competency in their L1 directly influences their competency in the L2 (Cummins, 1979; Genesee, Geva, Dressler, & Kamil, 2006; Proctor, Harring, & Silverman, 2017). Current studies use Cummins's 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, August, Snow, and Barr (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, because vocabulary knowledge represents concepts associated with the word (Stahl & Nagy, 2007), cross-linguistic transfer may also depend on whether children require a vocabulary label for a concept they already know or a new label for a new concept altogether. In this 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 DLL's varying levels of proficiency in each language.

In addition, there are two theoretical premises underlying educational media as an opportunistic platform for vocabulary development in DLLs. First, Paivio's (2008) dual-coding theory proposes that verbal and nonverbal information are processed separately in the brain. When information is transmitted through verbal (i.e., speech) and nonverbal (i.e., visual image) signals, the two systems support each other and are represented more fully, leading to stronger comprehension and greater information recall (Mayer, 1997). This theory applies to young DLLs as multimedia may provide dynamic nonverbal experiences that serve as scaffolds for their vocabulary learning. Second, Neuman's (2009) theory of synergy posits that multimedia presentations can create robust mental representations of content that facilitate recall and deepen understanding. In fact, multimedia characteristics such as sound effects, subtitles, and zoom shots make actions more relevant, which can draw DLLs' attention to details that deepen the understanding of content information.

With the potential to increase language exposure and engage DLLs in rich learning experiences, the current study sought to examine opportunities for language learning in Spanish/English and Chinese/English media programs and to investigate how these programs used empirically based pedagogical supports to teach vocabulary in a first or second language. To better understand the opportunities for language learning in media, a third aim was to analyze the quality of words available to viewers as prior studies reveal mismatches between educational claims of children's media and the developmental needs of intended viewers (Fenstermacher et al., 2010). In this content analysis, we investigated instances of onscreen vocabulary teaching in educational programs for DLLs. The following questions guided our research:

RQ1: To what extent do these programs focus on vocabulary in two languages?
RQ2: When teaching vocabulary, what pedagogical supports are used?
RQ3: What is the quality of words taught on screen?

Method

The following section describes a mixed methods approach in which quantitative and evaluative methods are used to investigate our research questions. More specifically, we use quantitative methods to analyze trends in the sample of educational media and evaluative methods to discern the quality of vocabulary and pedagogical supports on screen.

Sample of educational media

This study used a content analysis to survey the educational media landscape, defined as programs intentionally designed and marketed to prepare children for school (Rideout, 2014). We selected programs from online streaming platforms with the largest coverage of children's educational media for the sample. We applied inclusion criteria to identify all educational programs in Amazon Prime Video, HBO Now, Hulu, and Netflix targeting 0–4-year-old children. There were a total of 182 programs and 4,565 individual episodes in the initial sample.

In the next phase, we identified programs specifically catered to DLLs. We focused on five programs from the widely disseminated article, "5 Bilingual TV Shows for Preschoolers," published in both Spanish and English by Common Sense Media (Reveron, 2017). We then sifted through the

Table 1. Description of programs included in the sample.

Program	Synopsis	Main Character, Ethnicity	Languages Used	Production Company	Years Released
Dora the Explorer	Dora, a 7-year-old Mexican American girl, and her monkey friend, Boots, go on adventures related to an activity that she wants to partake of.	Dora, Mexican	English and Spanish	Nick Jr. Productions	2000–2014
Go, Diego, Go!	Diego is an 8-year-old Latino boy who rescues animals around the world.	Diego, Latino	English and Spanish	Nickelodeon	2001–2011
Handy Manny	Manny owns a repair shop along with his anthropomorphic talking tools. Using English and Spanish, they help members around the community.	Manny, Latino	English and Spanish	Disney Channel	2006–2013
Maya and Miguel	Maya and Miguel are fraternal twins who go on adventures around their diverse neighborhood.	Maya and Miguel, Mexican-Puerto Rican	English and Spanish	PBS	2004–2007
Ni Hao, Kai-lan	Kai-lan is a Chinese American girl living in California with her family. The story promotes multiculturalism.	Kai-lan, Chinese	English and Mandarin	Nickelodeon	2007–2011

initial sample to select programs that: (a) were accessible on public television networks (e.g., The Disney Channel; Nickelodeon; PBS), (b) had stated objectives for viewers to learn both English and another language, (c) explicitly taught vocabulary words in English and another language, and (d) featured bilingual main characters.

After two phases of sampling, five educational programs were selected for this content analysis: *Dora the Explorer; Go, Diego, Go!; Handy Manny; Maya and Miguel*; and *Ni Hao, Kai-lan* (Table 1). The first three appeared in the Common Sense Media article, and the latter were from the larger sample. Other programs were eliminated primarily because they did not focus on vocabulary learning in two languages or include bilingual main characters.

To determine whether both languages were promoted, we read descriptions on the back of DVDs and synopses on official Web sites. In the *Go, Diego, Go!* series, for example, all DVDs state: "Diego helps kids learn: all about [English animal names], sound identification skills, … and Spanish language skills, too!" It is important to note that the language used on the DVDs was English, suggesting they are geared, in part, toward elective bilinguals—native speakers of English who elect Spanish as a second language. Regardless, marketing strategies have influenced viewers to think of these shows as bilingual, resulting in Common Sense Media, the national leader of media reviews in the United States, making the following statement about *Dora the Explorer; Go, Diego, Go!*; and *Handy Manny*: "If you want your kids to speak both English and Spanish, the following bilingual TV shows can support your efforts by helping preschoolers learn new words and phrases in both languages" (Reveron, 2017, p. 1).

The sample consisted of 396 episodes, with a combined running time of 9,814 minutes. Ten episodes were randomly selected from each of these five programs. The final sample of 50 programs covered 1,189 minutes of screen time and represented 12.1% of the total running time in the subsample.

Codebook

Dual-coding theory (Paivio, 2008) was the paradigm used to develop a codebook and examine vocabulary learning opportunities on screened media. First, we developed a flow chart (Figure 1) to systematically identify vocabulary clips in educational media that included verbal and/or nonverbal (i.e., visual) sources of input. We then used a codebook (Figure 2) to classify these vocabulary clips by screen-based pedagogical support and examine how dual-language vocabulary is presented in media.

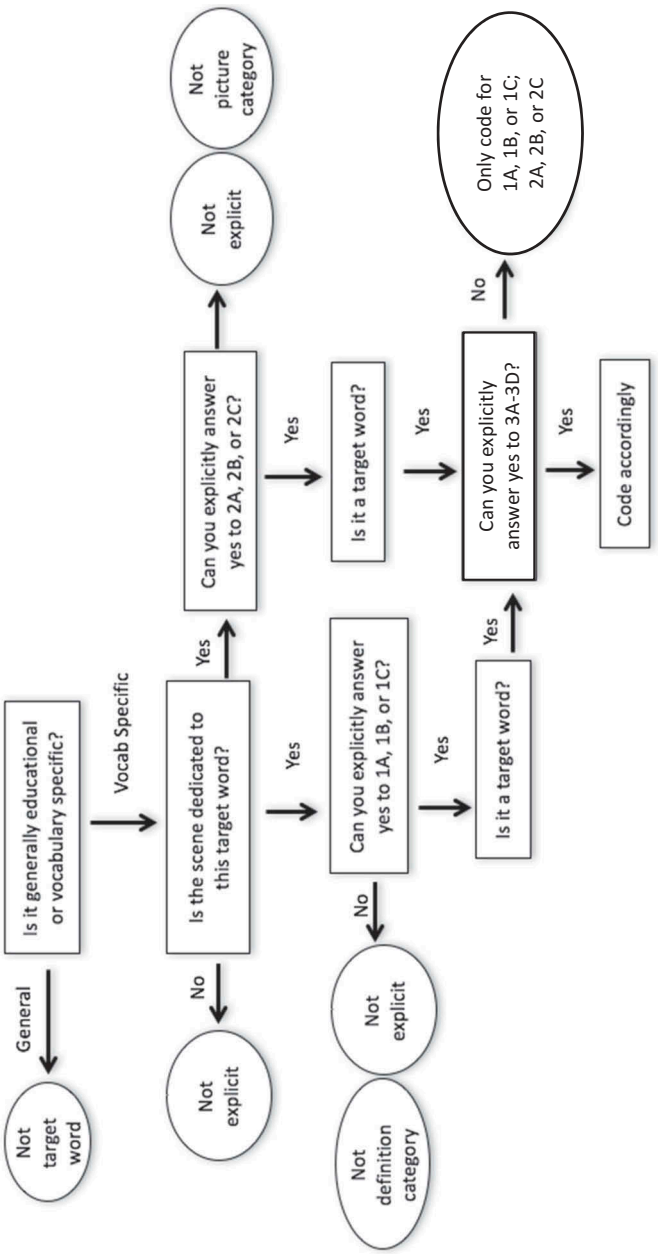

Figure 1. Flow chart used to identify vocabulary clips and screen-based pedagogical supports.

A. Do SBPS explicitly state the definition of the vocabulary word?

Guppy Girl: Gill, look! It's a lost city subway!
Narrator Guppy: [popping out from behind a pillar] A subway is an underground train.
Guppy Girl: That will get us to the temple fast! Hurry!

B. Do SBPS discuss features, give examples, or tell the category of the vocabulary word?

Guppy Boy: This is our Big Bubble Building cake design. Now we need to find the cake shapes that match these three shapes.
Guppy Girl: Let's start with the biggest piece.
Guppy Boy: It has four sides. See… 1, 2, 3, 4.
Guppy Girl: So the cake shape we need to match has to have four sides.
Guppy Boy: Exactly. And I happen to have two shapes with four sides right here: a square and a **rectangle**.
Guppy Girl: Which of these shapes matches the big piece with four sides? [pause]
Goldfish: This one.
Guppy Boy: Right, the rectangle has two short and two long sides just like the picture. **It's a rectangle** and it goes right here.

C. Do SBPS use another language to define the vocabulary word?
(i.e. using Spanish to translate vocabulary word *or* to give a full definition)

✓: Feliz cumpleanos *means* happy birthday in Spanish!
×: Feliz cumpleanos, Dora! I hope you have a happy birthday!

Figure 2. Sample of the explicit definitions category of screen-based pedagogical supports (SBPS) in the codebook.

Vocabulary clips

A *vocabulary clip* was defined as a learning experience in which an English, Spanish, or Mandarin vocabulary word was explicitly taught through verbal or visual support. Many vocabulary clips were embedded within the narrative of a cartoon episode, making them challenging to identify. In some instances, multiple words might be explicitly taught in a clip. In response, we developed a flow chart—a tool to guide coders through a pathway of decision making—to facilitate this identification process (Figure 1). We identified the beginning of a vocabulary clip by locating the moment when a verbal and/or nonverbal representation of the word first occurred on screen (Paivio, 2008). We concluded a vocabulary clip at the end of the scene. This allowed us to examine the degree of language exposure in each language (Hammer et al., 2014) and set the groundwork for our second level of coding.

Coding of screen-based pedagogical supports

A codebook was used to classify pedagogical supports that promoted vocabulary acquisition on screen (Table 2). These supports included both verbal and nonverbal cues on screen media that served as sources of input (Paivio, 2008). To create the codebook, the first author watched a total of

Table 2. Details of each screen-based pedagogical support in the codebook.

1. Explicit Definitions
A. Explicitly state the definition of the vocabulary word. (Carlo et al., 2004; Lugo-Neris et al., 2010)
B. Discuss features, give examples, or tell the category of the vocabulary word. (Collins, 2010; Lugo-Neris et al., 2010)
C. Use another language to define the vocabulary word. (Collins, 2010; Gersten & Baker, 2000)
2. Visual Support
A. Use a visual image of the word or visual effect around the word. (Paivio, 2008; Takanishi & Le Menestrel, 2017)
B. Demonstrate the function of the vocabulary word. (Neuman's, 2009; Takanishi & Le Menestrel, 2017)
3. Viewer Attention and Interaction (with categories 1 or 2)
A. Say something or point to something to get viewers' attention. (Silverman & Hines, 2009; Verhallen et al., 2006)
B. Use sound effects to get viewers' attention. (Silverman & Hines, 2009; Verhallen et al., 2006)
C. Repeat the vocabulary word three or more times to get viewers' attention. (Baker et al., 2006; Hammer et al., 2014)
D. Ask viewers to participate and engage with the vocabulary word (e.g., guess the word, repeat the word after a character, copy an action). (Restrepo et al., 2013)

20 episodes, four from each program, to identify an initial set of screen-based pedagogical supports for vocabulary learning. Screen-based pedagogical supports were defined as cues on screen that strategically elicited children's attention and conveyed pedagogical intent (Neuman, Wong, Flynn, & Kaefer, 2018). He identified a total of 28 pedagogical supports, discussed these codes with the research team, and then coded another five episodes. After another round of discussion, the team collapsed the 28 pedagogical supports into nine supports (Table 2), which were informed by theory and practice, described in the following. The research team used these nine screen-based pedagogical supports to code the sample.

The three theoretically informed categories of screen-based pedagogical supports included: (a) *explicit definitions*, (b) *visual supports*, and (c) *viewer attention and interaction* (Table 2). The first category, *explicit definitions*, included three pedagogical supports. Reflecting the extant literature on pedagogical supports for DLLs, all supports in this category provided clear, direct definitions of words in either language (Carlo et al., 2004; Collins, 2010; Gersten & Baker, 2000) or provided viewers with rich explanations of the words (Collins, 2010; Lugo-Neris et al., 2010). For example, in an episode of *Ni Hao, Kai-lan*, Kai-lan explains the word "bossy" by saying, "Being bossy means Boo Boo is making all the choices! And telling his friends what to do!"

The second category, *visual supports*, included visual effects and demonstrations to scaffold a deeper understanding of vocabulary words (Silverman & Hines, 2009; Takanishi & Le Menestrel, 2017). For example, in *Go, Diego, Go!*, Click the Camera shows an illustration of an iguana. When the vocabulary word, *iguana*, is said, the camera zooms into Click's belly (the camera lens), showing viewers an isolated, clear image of an iguana. Visual supports are critical components of vocabulary learning, as they provide nonverbal input (Paivio, 2008) and help generate mental representations of objects that facilitate deeper word knowledge (Neuman's, 2009). Supports from this second category did not require an explicit definition to teach a vocabulary word, as images had the potential to teach vocabulary on their own.

The final category, *viewer attention and interaction*, included four pedagogical supports that engaged young DLLs in vocabulary learning experiences: attention-directing cues (Silverman & Hines, 2009), using sound effects (Verhallen et al., 2006), repetitions (Hammer et al., 2014), or inviting the viewers to participate or engage with the vocabulary word (Restrepo et al., 2013). For example, in *Dora the Explorer*, Dora invites viewers to help pull her friend out of a ditch. She turns her head to look at the viewers and says, "I need your help to pull Boots up the sand slide. Will you

help me pull? [pause] Great! Put your hands out in front of you and grab the rope! Now pull! Pull! Pull! Pull!" Dora engages children's attention by looking at them, asking them a question, pausing for an answer, and instructing them on how to execute the vocabulary word, *pull*. She also repeats the word five times. Supports in this category were always coded in conjunction with category 1 (explicit definitions) and/or category 2 (visual supports) because attention-directing cues may effectively draw viewers' attention toward specific words but do not necessarily teach viewers the words.

Coding for quality of words

DLLs have a universal capacity for dual-language development in early childhood. Bilingual development begins with an early discrimination between languages and sounds, which then develops into an understanding of word segmentation, early word learning, and vocabulary development in two languages (Takanishi & Le Menestrel, 2017). DLLs build these vocabularies from novel word exposure in each language (Hammer et al., 2014; Hoff et al., 2012), which has prompted researchers to examine high-frequency words (Nation, 2013) and academic words (Coxhead, 2000) as specific vocabulary that can equip DLLs with words they will likely encounter in academic settings. Word quality and word selection in educational media are therefore critical to code for in screen-based vocabulary instruction. Children need to learn words that are sophisticated, useful, and outside of the everyday lexicon of young children (Beck, McKeown, & Kucan, 2013; Coxhead, 2000; Nation, 2013). Yet there is currently no consensus on specific words or word lists that might be particularly appropriate for preschool-aged DLLs. Following a study (Wright & Neuman, 2013) that examined vocabulary quality in reading curricular materials, we coded vocabulary words according to three different frameworks to triangulate for word quality in each language. Each framework examined a different aspect of word quality, which we explain in the following. In addition, although there are instances where a word might be more difficult in one language (e.g., *rapid* in English as a challenging synonym of *fast* that is uncommon among preschoolers) than in another language (e.g., *rápido* in everyday Spanish, equivalent to *fast* in English, and common among Spanish-speaking preschoolers), there are currently no resources that compare word quality across multiple languages.

Dale-Chall list. Chall and Dale (1995) created a list of the 3,000 most common words by fourth graders. Attention to vocabulary outside these common words, also known as *sophisticated words* (Wright & Neuman, 2013) or high-frequency words for English learners (Nation, 2013), have demonstrated long-term benefits to vocabulary knowledge and comprehension for low-income children in the preschool years (Hammer et al., 2014).

Word tiers. Beck et al. (2013) developed a heuristic for identifying appropriate vocabulary words for instruction, categorized into three tiers. These include Tier 1 words that are basic and learned without instruction (e.g., *apple, sad, eat*); Tier 2 words that mature language users know in a variety of contexts (e.g., *strenuous, magnify, amphibian*); and Tier 3 words that are difficult, content-specific (e.g., *photosynthesis, refinery*). Although words from Tiers 2 and 3 align with Coxhead's (2000) academic word lists, Beck et al. recommend teaching Tier 2 words to cultivate mature, literate language users. Moreover, Calderón et al. (2005) emphasize that Tier 1 words are important for DLLs, though Tier 2 and 3 words should also be taught.

Words worth teaching list. Biemiller (2009) created a list based on the age of acquisition and the types of words that might accelerate vocabulary acquisition. These mimic Nation's (2013) high-, mid-, and low-frequency word lists for learning vocabulary in a new language. Biemiller categorizes words as (1) easy, known by most children by the end of second grade; (2) words that should be taught before second grade, known by 40%–80% of the children; (3) words that should be taught

before sixth grade, known by 40%–80% of the children; and (4) difficult words, known by fewer than 40% of the children by the end of Grade 6.

Reliability

Two research assistants were trained to independently code *vocabulary clips* according to the flowchart. These assistants were Master's degree candidates proficient in Spanish and specialized in dual-language learning. Codes from *Ni-hao Kai-lan* were checked by the first author, who was proficient in Chinese. A total of five episodes (10% of sample) were selected for independent coding. Interrater reliability was established at 0.873 for identifying vocabulary clips. Disagreements and areas of uncertainty were flagged and resolved through further discussion. A second level of coding yielded an interrater reliability of 0.821 for screen-based pedagogical supports and 0.95 for word quality on the Beck and McKeown heuristic. Unlike this heuristic, interrater reliability was not required of the Dale-Chall or Biemiller frameworks because they were clear-cut word lists.

Analyses

First, we examined the prevalence of vocabulary clips in educational media programs for DLLs to understand exposure to two languages. We used descriptive statistics of the number of words per show and duration of vocabulary clips in each language (RQ1) and collapsed means to examine differences in vocabulary by program. Next, we examined pedagogical supports for vocabulary learning (RQ2) by looking at the means and standard deviations of pedagogical supports by language and program. Finally, we used three different lists to examine word quality (RQ3).

Results

In the following results, we discuss some of the overall patterns of educational media programs for DLLs and consider the extent to which these programs focus on vocabulary in two languages. Afterward, we move to screen-based pedagogical supports and word quality to describe some of the defining characteristics used in these programs.

Representation of languages in dual-language media programs

We examined vocabulary word occurrence in three ways (see Table 3). From the sample of 321 vocabulary clips, we noted an average of 6.4 (SD = 6.4) English vocabulary words per episode. In contrast, only 1.6 (SD = 3.6) Spanish or Mandarin vocabulary words were explicitly introduced per episode. Of the 321 vocabulary clips, 15.6% were presented in Spanish or Mandarin, exposing a notable discrepancy in the representation of words taught per language in programs.

Second, looking to the duration of vocabulary clips, the 50 programs provided an average of 161.4 (SD = 196.1) seconds of explicit vocabulary instruction per episode. From the 1,189 minutes of video analyzed, vocabulary clips occurred 11.0% of the time in any given episode. Disaggregating duration by language, this 11.0% also represented the percentage of time devoted to English vocabulary as Spanish/Mandarin words were never taught without English. Rather, Spanish/Mandarin vocabulary words occupied 2.5% of any given dual-language episode.

Third, Table 3 highlights the between-program variation in number of words per episode and vocabulary clip durations. Means and standard deviations of vocabulary clips indicated that, on average, *Dora the Explorer* and *Go, Diego, Go!* had almost two to four times more vocabulary clips than *Ni Hao, Kai-lan* and *Handy Manny* respectively. Looking to the duration of vocabulary instruction on screen, we found similar differences between programs. In fact, almost one-third of the *Go, Diego, Go!* program was devoted to vocabulary, while *Maya and Miguel* dedicated 0.5% of

Table 3. Means and standard deviations of vocabulary clips by program (N = 321).

By Show	English Vocab Words Taught	Partner Language Vocab Words Taught	Time for Vocab Teaching (sec)	% Vocab Time per Episode
Overall	6.4 (6.4)	1.6 (3.6)	161.4 (196.1)	11.0% (13.1)
Dora the Explorer	8.8 (3.8)	1.7 (3.0)	185.8 (94.6)	12.7% (6.2)
Go Diego Go!	16.8 (2.2)	1.1 (3.3)	476.8 (196.0)	32.0% (12.9)
Handy Manny	2.4 (2.6)	0.3 (3.4)	42.9 (47.5)	3.0% (3.3)
Maya and Miguel	0.4 (0.7)	1.9 (5.1)	6.6 (11.1)	0.5% (0.8)
Ni Hao, Kai-lan	3.7 (2.1)	0 (0)	96.6 (38.9)	7.0% (2.8)

Table 4. Means and standard deviations of screen-based pedagogical supports by language and program (N = 743).

Strategy by Category	English	Partner Language	*Diego*	*Dora*	*Handy Manny*	*Kai-lan*	*Maya Miguel*
1. Explicit Definition:							
A. Direct definition	5.6 (23.0)	0 (0)	2.4 (15.3)	2.2 (14.9)	45.8 (50.9)	2.7 (16.4)	8.5 (23.8)
B. Rich explanations	2.0 (14.0)	0.2 (0.7)	0 (0)	0 (0)	14.6 (32.3)	5.4 (22.1)	8.5 (23.3)
C. L1 Use	11.8 (32.4)	10.9 (4.6)	6.5 (24.8)	7.9 (27.1)	0 (0)	48.6 (50.7)	7.0 (19.8)
2. Visual Support:							
A. Visual effects	40.5 (49.2)	3.1 (4.0)	41.1 (49.3)	46.1 (50.1)	41.7 (50.4)	29.7 (46.3)	4.1 (10.7)
B. Demonstrations	32.4 (46.9)	4.3 (4.5)	39.9 (49.1)	33.7 (47.5)	0 (0)	18.9 (39.7)	4.7 (11.4)
3. Viewer Attention/Interaction:							
A. Attention-directing cues	11.5 (32.0)	1.9 (3.2)	6.5 (24.8)	15.7 (36.6)	8.3 (28.2)	27.0 (45.0)	5.6 (12.2)
B. Sound effects	11.5 (9.6)	0.6 (2.0)	4.2 (20.0)	24.7 (43.4)	4.2 (20.4)	18.9 (39.7)	6.2 (12.7)
C. Repetition	41.7 (49.4)	5.0 (4.7)	53.6 (50.0)	34.8 (47.9)	16.7 (38.1)	24.3 (43.5)	7.7 (13.8)
D. Interaction	15.6 (35.8)	1.1 (2.5)	20.2 (39.8)	15.3 (31.0)	0 (0)	7.2 (18.7)	12.2 (15.6)

each episode to vocabulary instruction. Interestingly, while the three Nickelodeon productions of *Dora the Explorer; Go, Diego, Go!*; and *Ni Hao, Kai-lan* allotted more time toward vocabulary instruction than the other two programs, there were still large discrepancies of vocabulary learning experiences among the three shows. In sum, there are striking differences in frequency of explicit vocabulary clips and amount of time devoted to vocabulary according to program. These results indicate that there were few explicit vocabulary episodes throughout the video clips analyzed.

Screen-based pedagogical supports in dual-language media programs

Our second research question examined screen-based pedagogical supports across all programs to understand how they approach vocabulary teaching. A total of 742 pedagogical supports were coded. We first looked at supports by the three categories. As a whole, visual supports and viewer attention/interaction were the most prevalent supports in educational media. Explicit definitions, however, were very limited, representing 5.4% of the coded pedagogical strategies. In other words, explicit definitions rarely served as pedagogical supports in educational media programs for young DLLs.

Looking at the nine subcategories, the most salient pedagogical supports used were repetition, visual effects, and demonstrations (Table 4). Repetitions occurred when the vocabulary word was repeated three or more times. This was frequently used to reinforce vocabulary. Visual effects occurred when an isolated image of the vocabulary word filled the entire screen, helping children draw a clear association between the image and the vocabulary word. A visual effect also occurred when the image of a vocabulary word was surrounded or highlighted by a shape

Figure 3. Example of attention-directing cues in *Ni Hao, Kai-lan*. [Text bubble added by authors].

(e.g., a rectangle or cloud), capturing children's attention. In sum, the screen-based pedagogical supports used most in these programs included repetition, visual effects, and word demonstrations.

In addition to the most frequently occurring pedagogical supports, we examined how these supports differed by program, noting their similarities and differences across the three categories. Means and standard deviations for each pedagogical support within each program are shown in Table 4.

There were striking differences in explicit definitions used between programs. Most notably, there were differences in the use of L1. *Ni Hao, Kai-lan* used this pedagogical support most, accounting for 48.6% of the pedagogical supports in that program. For example, in *Dora the Explorer*, Dora says:

> We've gotta tell the baby penguins to *leap* with us. In English, we say, "Let's *leap* now." In Spanish, we say, "*Saltemos ya*." Can you say, "*saltemos ya*?" ¡Muy bien! Let's tell the baby penguins to *leap* by saying, "*Saltemos ya*!"

Surprisingly, there was less use of L1 for vocabulary teaching in *Dora the Explorer* (7.9%), *Go, Diego, Go!* (6.5%), and *Handy Manny* (0%), despite recommendations to watch these shows for dual-language development (Reveron, 2017).

In the second category, there were noticeable differences by program. Visual effects were most frequently used as a pedagogical support in *Go, Diego, Go!; Dora the Explorer*; and *Handy Manny*. Visual effects were also frequently used when teaching vocabulary in two languages. For example, in an episode of *Handy Manny*, Manny has a conversation with his tools about a racecar, the vocabulary word. A visual image of a racecar appears as he talks to the tools. He exclaims, "*Un coche de carerras*!" followed immediately by "A racecar!," associating the visual with the vocabulary word. In addition, *Go, Diego, Go!* and *Dora the Explorer* distinguished themselves from other programs by using demonstrations to support vocabulary learning.

Finally, in the viewer attention and interaction category, pedagogical supports varied significantly between programs. One pedagogical support unique to the *Ni Hao, Kai-lan* program, for example, was the use of attention-directing cues (i.e., verbal and physical cues) to draw children's attention toward a vocabulary word. These occurred when a character like Kai-lan pointed to an image and asked viewers to look at something. In Figure 3, Kai-lan engages children with the interjection (i.e.,

Table 5. Word quality across all programs (N = 321).

Word Level	# Vocab Words Taught	% Vocab in Sample
Dale-Chall list:		
Common	204	63.6
Sophisticated	117	36.4
Biemiller Words Worth Teaching list:		
Easy	135	42.1
Teach before Grade 2	17	5.3
Teach before Grade 6	15	4.6
Difficult	7	2.2
Not found on list	147	45.8
Beck & McKeown Word Tier:		
1	211	65.7
2	6	1.9
3	104	32.6

verbal cue), "Hey!" and then moves her hand (i.e., physical cue) toward the visual representation of the vocabulary word.

One other pedagogical support that varied by program was the use of repetition. Programs that paid particular attention to repetition included the three Nickelodeon programs, *Go, Diego, Go!; Dora the Explorer*; and *Ni Hao, Kai-lan*. Repetitions occurred at least three times and in some instances were used to teach vocabulary in two languages.

These results indicate that the most salient screen-based pedagogical supports in the video clips analyzed included visual effects, demonstrations, and repetitions. Each of these supports varied by program.

Vocabulary word quality in dual-language media programs

Word quality was measured by three indicators, demonstrating that approximately two-thirds of the 321 vocabulary clips were "common," "easy," or "basic" words (Table 5). In fact, only 1.9% were considered "sophisticated," and 5.3% reflected words that children should learn before Grade 2. Although these second-tier words denote vocabulary that children will learn in school, they were not well represented in media programs for young DLLs. Moreover, most of the vocabulary episodes in these programs were simple words taught primarily in English.

Discussion

This study examined a content analysis of existing programs that focused on DLLs. The study recognized the linguistic needs of children whose language is not English and investigated opportunities for them to learn English and maintain their home language through media. We chose programs that were specifically designed to facilitate English language development and enhance the native language of viewers. We found that despite being marketed as programs that promoted language development, there was a paucity of opportunity for children to learn vocabulary. Of the 1,189 minutes of programming examined, only 11.0% of any given episode was devoted to explicit vocabulary instruction.

Moreover, our findings question whether these programs were intended for DLLs because of the unequal representation of vocabulary words in each language. While 11.0% of any given program provided explicit vocabulary instruction in English, only 2.5% of programs provided vocabulary instruction in Spanish or Mandarin. This disparity in language representation serves as an example of the prominent role that English possesses in the educational media marketplace. Although marketed for bilingual language development, English appears to reestablish itself as the dominant language at the expense of learning a minoritized language. The imbalanced exposure to each

language provides English with the upper hand, reproducing the hegemony of English and ascribing importance to speakers of this language in society (Bourdieu, 1984; Van Dijk, 2015).

Dual-language development is influenced by the amount of exposure to each language (Hammer et al., 2014) and the interconnections between the two languages (Cummins, 1979; Proctor et al., 2010). Cummins's (1979) threshold hypothesis suggests that children learning a second language can benefit from their L1 if they are somewhat proficient in it (i.e., beyond a basic threshold). Moreover, the strength of cross-linguistic transfer exists on an interdependence continuum (Proctor et al., 2010) and is influenced by the languages represented on screen and the linguistic skills needed to understand them. In the preschool years, variation in dual-language exposure largely explains variation in children's vocabulary abilities in two languages (Quiroz et al., 2010; Thordardottir, 2011). Considering the importance of consistent language exposure in two languages, findings from this study suggest that educational media programs may consider having a more balanced representation of languages to foster dual-language development in preschoolers.

Besides language exposure, children are more likely to acquire vocabulary in two languages through high-quality vocabulary instruction. Our study identified nine screen-based pedagogical supports that reflect the literature on high-quality vocabulary instruction for DLLs. We found that not all pedagogical supports were well represented on screen. Most notably, educational programs rarely provided explicit definitions or rich explanations of new vocabulary words to viewers. Direct definitions of words, particularly in a child's second language, serve as important scaffolds for children to build and deepen their understanding of new vocabularies (Carlo et al., 2004; Lugo-Neris et al., 2010). Moreover, rich explanations of vocabulary words (e.g., discussing features or presenting examples of words) scaffold and extend children's knowledge of words from one specific context to multiple contexts (Collins, 2010; Lugo-Neris et al., 2010). Because children build three-dimensional understandings of words over time, it is critical for media programs to provide vocabulary instruction that allows viewers to explore various facets and applications of new vocabulary words. Importantly, shifting our attention from the screen context to the viewing context, parents play a critical role in providing vocabulary supports to children when "coviewing" media with them. The role of adults in extending children's vocabulary should not be understated. Still, more work is needed to better understand the current state of mixed results on whether coviewing benefits learning from media (Samudra, Wong, & Flynn (under review); Strouse, O'Doherty, & Troseth, 2013).

While some pedagogical supports were better represented in this content analysis than others, we uncovered noteworthy discrepancies among the nine screen-based pedagogical supports according to language. For English vocabulary words, all nine pedagogical supports were used. For Spanish/Mandarin vocabulary words, however, only 75% of the pedagogical supports were used. Using a variety of instructional strategies is important because it increases the likelihood of meeting the diverse linguistic and learning needs of young children. While some approaches might introduce a new word to DLLs, other approaches might scaffold a deeper understanding of a particular word (Buysse et al., 2014). Previous content analyses have examined language-promoting teaching strategies in infant-directed media (Fenstermacher et al., 2010) and vocabulary instruction in *Sesame Street* (Larson & Rahn, 2015). Findings from this study focus on dual-language vocabulary development for DLLs across multiple programs and suggest that educational media might consider maximizing the use of pedagogical approaches to facilitate vocabulary learning in two languages.

The third research question of this study investigated the quality of words in educational media programs for DLLs. Findings suggest that, whether in English or Spanish, children are exposed to words that are common, simple, and prevalent in their everyday lives. In other words, although exposure to simple Tier 1 words is important for DLLs (Calderón et al., 2005), children are not watching programs with high-leverage vocabulary words that are challenging and central to long-term literacy development (Coxhead, 2000; Nation, 2013). Common Sense Media recommended three of the five programs in this study to "help kids learn new words and phrases in English and Spanish" (Reveron, 2017, p. 1). Yet this content analysis has uncovered discrepancies in L1 and L2

exposure, a lack of pedagogical approaches to teach non-English words, and a range of vocabulary words that does not stretch children's vocabulary knowledge. These limited opportunities for young DLLs to expand vocabulary knowledge in two languages undermine the potential of educational media to establish a literacy foundation, promote reading development, and facilitate linguistic transfer.

Overall, the current study deepens our understanding of what educational media programs are doing to support vocabulary learning in DLLs. While some studies have begun to examine how multimedia facilitate vocabulary acquisition in young learners (Neuman, Wong, Flynn, & Kaefer, 2018; Silverman & Hines, 2009), future studies may consider investigating the influence of specific screen-based pedagogical supports on vocabulary learning in young DLLs. Research has established a positive influence of educational screen media on early literacy (Uchikoshi, 2006) and vocabulary development (Silverman & Hines, 2009), yet we do not have a firm grasp of the specific screen-based supports that directly affect vocabulary development in DLLs. This study offers a fine-grained understanding of the mechanisms on screen that might influence language learning in young children, moving research toward uncovering the "promise" of media.

Limitations and conclusion

Despite the thoroughness of our work, there are a few limitations. First, the results are naturally limited by the few programs in the sample. We analyzed a total of five programs, represented by 50 episodes. These were, however, the programs that matched our sampling criteria, which was further substantiated by Common Sense Media. Still, a second limitation of the study is that we took the claims of programs and articles at face value and did not fully explore the intent behind media producers or creators of each program. Future research might consider interviewing writers and production teams to better understand their visions for dual-language development through media. Considering the discrepancy between L1 and L2 representation in this content analysis, we suspect producers might say these programs are geared toward families of elective bilinguals who have English as an L1 and hope to acquire Spanish or Mandarin as an L2. It is thus important to interpret findings with this consideration in mind. Finally, a third limitation of the study concerning word-quality assessment is the assumption that word difficulty in one language is equally challenging in another language. Moreover, we use three sources to create a construct for word quality, which are based on monolingual language development in preschoolers. A specific list of words that compares word quality across multiple languages and that applies models and assumptions of bilingual vocabulary development is much needed. Still, considering there was a paucity of vocabulary clips in non-English languages, it appears that word selection in the programs as a whole were relatively simple and unchallenging.

Taken together, the results of our study suggest that educational media programs for DLLs do not have a balanced representation of languages to maximize language exposure in two languages or a variety of pedagogical supports to meet the needs of these learners. Despite what we now know about effective vocabulary instruction for young children (e.g., using explicit instruction and rich explanations), there were strikingly few instances of such practices in these programs. Moreover, although marketed to parents of culturally and linguistically diverse children as programs that promote bilingualism, only a scarcity of Spanish or Mandarin vocabulary ever appeared on screen. It seems then that the "dual-language" element of these media programs may serve more as a marketing tool than an instructional tool for vocabulary development, minimizing opportunities for bilingual vocabulary and later literacy development. With the potential for educational media to engage children with high-quality instruction, our study suggests that educational media programs may fall short of providing young DLLs with the comprehensive vocabulary instruction needed to be ready for school.

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