Investigating video as a means to promote vocabulary for at-risk children

Rebecca Silverman*
University of Maryland, 1308 Benjamin Building, College Park, MD 20742, United States

ARTICLE INFO
Article history:
Available online 19 March 2013

Keywords:
Vocabulary
Video
Multimedia
At-risk
Dual Language Learning

ABSTRACT
Two studies on the role of video on vocabulary learning were conducted in kindergarten classrooms with substantial numbers of children from low-income and Dual Language Learning (DLL) backgrounds. In the first study (n = 78), the effect of video viewing was compared with the effect of book reading on vocabulary learning. In the second study (n = 89), the effect of repeated viewing of video was compared with the effect of single viewing of video on vocabulary learning. Pre-test and post-test receptive and expressive vocabulary measures, which were aligned with the content in the studies, were administered. Analysis of Variance was used to test the effect of condition (i.e., video viewing versus book reading and single versus repeated reading) on children’s word knowledge. Results showed no difference in vocabulary learning between the video viewing and book reading conditions. Findings showed that there was no difference in vocabulary learning between children in the single and repeated viewing condition on the receptive measure, but children in the repeated viewing condition showed higher gains in vocabulary on the expressive measure. No differences were found in either study between children with higher and lower vocabulary knowledge.

© 2013 Elsevier Inc. All rights reserved.

1. Introduction
Young children with limited vocabulary knowledge are at risk for encountering difficulties in reading throughout school (Hemp-hill & Tivnan, 2008; Snow, Porche, Tabors, & Harris, 2007). Due to limited experiences with words in a variety of contexts, children from low socioeconomic backgrounds and children from homes in which English is not the primary language often have substantially lower vocabulary knowledge than their more advantaged peers (Hammer, Farkas, & Maczuga, 2010). Therefore, supporting early word learning, especially for children most at risk of having limited vocabulary knowledge, is an important objective in early childhood education. There is considerable evidence that introducing words through read alouds, particularly repeated read alouds, is an effective way to ameliorate this problem (e.g., Beck & McKeown, 2007; Biemiller & Boote, 2006; Coyne et al., 2010). Given the rich language in books, read alouds are an ideal context for vocabulary instruction (De Temple & Snow, 2003). Recent research suggests that the use of video might be another context ripe for vocabulary instruction in elementary schools, particularly for Dual Language Learners (i.e., DLLs) who are learning English in school and speak a language other than or in addition to English at home (Silverman & Hines, 2009). Videos bring stories alive through sound, action, and zoom shots. Therefore, they offer more multifaceted nonverbal support than books (Kamil, Intrator, & Kim, 2000; Verhallen & Bus, 2010). This nonverbal support may be especially helpful for supporting the word knowledge of children with limited vocabulary. Yet, many teachers shy away from showing video in their classrooms because videos have garnered a reputation as non-instructional babysitters (Hobbs, 2006). What is needed is further research on the use of video in schools to determine the potential of video as a medium for vocabulary instruction.

This paper reports on two quasi-experimental studies investigating the effects of video viewing on vocabulary learning. Both studies use content from educational television programming for children produced by WGBH Boston, an affiliate of the Corporation for Public Broadcasting. The studies are set in kindergarten classrooms in public schools with high numbers of children from low socioeconomic and DLL backgrounds. The first study compares the effect of read alouds and video viewing on vocabulary learning. The second study examines the effect of video viewing once versus three times. Both studies examine differences for children with higher and lower vocabulary knowledge. The small number of classrooms and the short duration of the studies presented here require that the results be seen as exploratory in nature. However, the findings of these studies will add to the limited research base on the use of video to support word learning for at-risk children.

1.1. Theoretical framework
According to the Dual Coding Theory (Paivio, 1986), there are two paths for information processing in the brain. One path processes verbal information and the other processes nonverbal...
information. These two paths operate somewhat independently of each other, and may even have separate memory systems (Reed, 2006). Presenting information verbally and nonverbally distributes the cognitive load of either system (i.e., neither system needs to carry the entire cognitive load on its own), and connecting information across the two systems provides a more complete representation of a concept than could be established through either system alone (Mayer & Moreno, 2003). Thus, coding information verbally and non-verbally results in greater learning and retention over time. Applying the Dual Coding Theory to vocabulary learning, it is likely that hearing a word in spoken context and seeing a visual representation of the word together would provide more support for word learning than either simply hearing the word in spoken context or seeing a visual representation in isolation.

Reading illustrated books to children is one way to connect verbal and visual support for word learning (De Temple & Snow, 2003). However, videos provide not only words and pictures, but also action, zoom shots, and sound effects that may enhance children’s word knowledge. Viewing video, with its many audio and visual affordances, may support children in developing more robust conceptualizations of words than viewing the static pictures in books (Neuman, 1992). Information about words that is presented redundantly (e.g., audio and visual) may support children in learning word meaning more deeply (Mayer & Moreno, 2002). Additionally, features of video such as zoom shots and sound effects may more effectively, perhaps, draw children’s attention to salient information essential to word meaning (Kamil, Intrator, & Kim, 2000). Such saliency may be particularly important for vocabulary instruction when words refer to an action or a specific part of an object that is not easily conveyed through text in print or speech. Nonverbal support for word learning may be especially important for children with limited vocabulary knowledge because these children have fewer words with which to comprehend new words through verbal communication alone (Silverman & Hines, 2009).

While providing verbal and nonverbal information about words is one way to support children’s vocabulary acquisition, repetition is another way to encourage children’s word learning. Research suggests that children’s word learning increases with multiple, meaningful encounters with words (e.g., Jenkins, Stein, & Wysocki, 1984; Nagy, Anderson, & Herman, 1987; Stahl, 2003). With each exposure, children’s memory for the connections between words and their referents strengthens incrementally (Nation, Long, & Richards, 2007). Young children and DLL children who may need additional time to process the language they hear need multiple opportunities to associate words and their meanings (De Temple & Snow, 2003; Penno, Wilkinson, & Moore, 2002; Sénéchal, 1997). Combining multiple exposures with both verbal and nonverbal information may be particularly supportive for children who need extra support with vocabulary learning. Studies on reading books to children have shown positive effects for repeated reading (Biemiller & Boote, 2006), and research suggests that repeated exposures to video may also promote vocabulary learning (e.g., Verhallen, Bus, & de Jong, 2006). However, research is needed to replicate and extend findings on the effects of repeated video viewing on vocabulary learning with different populations and content.

1.2. Effects of video viewing on vocabulary

Research on vocabulary instruction through read alouds suggests that instructional practices such as acting out and illustrating words, defining words, contextualizing words, and analyzing words are related to children’s vocabulary growth (Silverman & Crandell, 2010). In fact, Nagy and Scott (2000) suggest that focusing on the multidimensionality of words may prove optimally supportive of children’s word learning. Given the potential of video for showing various aspects of words through audio, visual, and action features, it is no wonder that researchers have explored whether using video might support word learning. For example, Wright et al. (2001), studying the effect of television viewing by children ages two to five, found a strong correlation between children’s viewing of educational programs and their vocabulary knowledge. Similarly, Rice, Huston, Truglio, and Wright (1990) found that viewing Sesame Street at age 3 had positive effects on the vocabulary of children at age 5. Additionally, Uchikoshi (2006) found that bilingual kindergarten children who watched Arthur and/or Between the Lions at home grew faster in vocabulary than their peers who did not watch these shows at home. Accordingly, some school-based interventions have begun to incorporate the use of video (e.g., Chambers et al., 2008; Neuman, Newman, & Dwyer, 2011).

However, this line of research does not shed light on how viewing video compares to listening to books as contexts for word learning. While many studies show an advantage of video over print presentations (e.g., Furnham, De Siena, & Gunter, 2002; Molen & Voort, 2000; Xin & Rieth, 2001), other studies suggest that learning is equal across these media (e.g., Neuman, 1992), and still other studies indicate that live reading of print leads to more learning than video (e.g., Terrell & Daniloff, 1996). Two studies, in particular, are relevant to the present research. On the one hand, Verhallen et al. (2006), working with 5-year olds learning Dutch as a second language, found that children’s language skills improved more after viewing electronic books that included animated features (i.e., video, sound, and music) than after viewing electronic books with static pictures (i.e., similar to printed text). On the other hand, Korat and Shamir (2007), comparing listening to adults read a printed text versus listening to an electronic book with kindergarten children from low and middle socioeconomic status (SES) backgrounds in Israel, found that children in both intervention groups improved in vocabulary and both gained more than a control group, but children in the two intervention groups did not differ in vocabulary learning. Given the discrepancies in the extant research base on how print and video media compare as contexts for vocabulary learning, more research is needed along these lines.

1.3. Repetition and video-viewing

Following studies that show positive effects on children’s vocabulary of repeated exposure to picture books during read alouds (Biemiller & Boote, 2006), researchers have investigated the effects of repeated exposure to electronic books that include video. For example, in their study comparing electronic books with static pictures versus animation, Verhallen et al. (2006) found that, “The added value of multimedia books was strengthened over sessions” (p. 410). In another study comparing effects of repeated exposure, Korat and Blau (2010) evaluated effects of multiple readings of an electronic storybook, which included “dynamic visuals that dramatize story details . . . as well as extra music and film effects that may bring the story content to life” (p. 453), with preschool and kindergarten children from lower and middle socioeconomic groups. Children in the experimental condition experienced the electronic storybook three or five times. There were differential effects by grade level and economic background. For kindergarten children, there was an effect of repeated reading over children in a control condition on vocabulary learning, but there was no difference for three versus five readings. Pre-kindergarten children from low-income backgrounds improved in word knowledge over the controls after five readings whereas pre-kindergarten children from middle-income homes improved in word knowledge over the controls after only three readings. Given the divergent effects
of repeated exposure to electronic books that include video seen in these studies, further research is needed.

1.4. Effects of video-viewing and task type

Given that studies on vocabulary instruction show differential learning on receptive and expressive vocabulary (e.g., Sénéchal, 1997), some studies have investigated whether the effects of video-viewing on vocabulary depends on the task with which vocabulary is measured. For example, Verhallen and Bus (2010) examined the effect of digital storybooks on the vocabulary learning of 5-year-old children from low-income, immigrant backgrounds using receptive and expressive vocabulary tasks. Children were presented with digital storybooks with static pictures or video images over the course of four sessions. In the receptive task, children were presented with three pictures and one spoken word and asked to choose the picture that matched the word. In the expressive task, children were presented with a picture from the storybook and a cloze sentence about the picture to complete. There was no difference between the static picture and the video conditions on the receptive task, but there was a difference on the expressive task such that children in the video condition grew more in word knowledge than children in the static picture condition. The authors surmised that static pictures are sufficient for initial understanding of words, which may be captured through receptive tasks, but video is more supportive of deeper word knowledge, which may be captured through expressive tasks. Interestingly, the authors found that words were learned either on the receptive task or the expressive task, but not often on both at the same time, indicating that these measures tap word learning in different ways. To fully estimate the effect of video, these authors suggest, both receptive and expressive assessment tasks should be used. However, few studies on video and vocabulary learning have assessed vocabulary with both expressive and receptive measures. Therefore, additional research is needed using both task types.

1.5. Effects of video-viewing and students’ characteristics

In line with research that shows differential effects of vocabulary instruction depending on student characteristics (e.g., Silverman, 2007, Silverman & Crandell, 2010), some studies have evaluated whether there are differential effects of video-viewing. For example, Dockrell, Braisy, and Best (2007) found differential effects of video viewing depending on whether children were older or younger. These researchers conducted a study of the learning of science vocabulary introduced through educational video with two groups of children. One group consisted of 4 and 5 year olds and the other group consisted of 6 and 7 year olds. In this study, older children and children with greater pre-test knowledge learned more words than younger children and children with less pre-test knowledge of the words. In another study comparing word learning through video with children who have more and less vocabulary knowledge, Silverman and Hines (2009), working in pre-kindergarten through second grade classrooms with monolingual English speaking and DLL children, compared the vocabulary learning of children who heard read alouds with the vocabulary learning of children who heard the same read alouds and watched video clips related to those read alouds. Results showed that the vocabulary learning of monolingual English children, who had higher pre-test vocabulary knowledge, was the same regardless of condition, but the vocabulary learning of DLL children, who had lower pre-test vocabulary knowledge, was greater in the condition with read alouds and video than the condition with read alouds alone. Together, these studies suggest that there may be differential effects of video-viewing for students with more and less vocabulary knowledge, but none of these studies specifically investigated the role of prior vocabulary knowledge on the effects of video-viewing. Future research is needed in this direction.

1.6. The present studies

Despite this growing body of research on the use of video to promote vocabulary, further research is needed to begin to converge on findings about the role of video in vocabulary learning. There is not enough research to reach firm conclusions about whether videos are comparable to books as media for vocabulary learning, whether the effect of repeated viewings of video is similar to the effect of repeated readings of books on children’s vocabulary, whether the effects of video viewing differ for receptive and expressive vocabulary, and whether the effects of video depend on children’s background characteristics. The studies presented here aim to add to the research base on the role of video in vocabulary learning.

The two studies discussed here were conducted in kindergarten classrooms in the Mid-Atlantic region of the United States. Most of the children in the studies were from low-income and/or DLL backgrounds. The studies were implemented with funding from and in collaboration with WGBH Boston, the Corporation for Public Broadcasting affiliate that produces the educational children’s television programs Martha Speaks and Arthur, which were used for content in both studies. Martha Speaks and Arthur are both based on children’s books. The Martha Speaks television series targets vocabulary development by explicitly defining and reusing key words related to story themes. The Arthur television series focuses on language and literacy development through tightly-woven narratives. The author of this manuscript is a consultant for Martha Speaks, but she conducted the studies as an independent researcher. WGBH funded the studies to add to the research base on the use of multimedia for building language and literacy.

The following research questions guided the studies discussed here:

Study One. How does the effect of listening to books compare with the effect of viewing video on kindergarten children’s learning of target words introduced in the study? Does this depend on whether word learning is assessed through a receptive or an expressive task? Does this depend on students’ general vocabulary knowledge as measured on a norm-referenced assessment?

Study Two. What is the effect of single viewing versus repeated viewings (i.e., three viewings) on kindergarten children’s learning of target words introduced in the study? Does this depend on whether word learning is assessed through a receptive or an expressive task? Does this depend on students’ general vocabulary knowledge as measured on a norm-referenced assessment?

2. Study one

2.1. Methods

To answer the first research question on comparing listening to books and viewing video, a study was conducted in kindergarten classrooms at two elementary schools. Teachers from six classrooms volunteered to participate in the study (i.e., four from School A and two from School B). Ninety percent of students in School A and 23% of students in School B received Free and Reduced Meals (FARMS), an indicator of low-socioeconomic status. Fifty-two percent of students in School A and 31% of students in School B were considered Limited English Proficient (LEP). All students in the classrooms of participating teachers took part in the intervention, but parental consent to assess children was obtained from only...
70% of all children in participating classrooms. The final sample included 78 students. There were two between-subjects conditions in the study: Listening to Books and Viewing Video. Classrooms were randomly assigned to condition such that there were three classrooms per condition (i.e., two classrooms per condition in School A and one classroom per condition in School B).

2.2. Sample

Information about the background of children in the sample was obtained from surveys completed by parents or guardians. The racial background of the children was identified as 4% White, 17% Black, 72% Hispanic, 1% Asian, and 6% other. Thirty-three percent of the sample spoke English only (EO), and 77% of the sample was DLL, which in this study meant that parents or guardians reported that the home language was a language other than English. The majority of children who spoke a language other than English at home spoke Spanish (92%). Similar to other studies on early language and literacy among Hispanic DLLs (e.g., Mancilla-Martinez & Lesaux, 2011), data on mother’s education was collected as a measure, albeit a crude one, of socio-economic status. Of the students whose parents responded to the question on mother’s education (n = 68), 56% of the students had mothers with a high school diploma or less education; 29% had a high school degree plus some college or trade school; and 15% had a 4-year college degree or more education. There were more girls (55%) than boys in the sample. There were 36 students in the book condition and 42 in the video condition. See Table 1 for demographics by condition.

2.3. Intervention

The videos for the intervention included four 11-min stories from Martha Speaks and four 11-min episodes from Arthur, in broadcast version format. (Note that broadcasts include two of these 11-min stories per half-hour show, but only one 11-min story was shown each day in this study.) The books for the intervention were developed by the research team. Each scene was given a new page in the book. Screenshots from the videos chosen to be optimally representative of the theme were used as illustrations. Dialogue from the script was incorporated verbatim in the books. Stage direction was kept verbatim where appropriate or re-written into narration when needed to make the story flow. For example, whereas the script indicates where each character speaks, the book includes phrases such as, “Martha says”, and whereas the script includes notes such as “Martha enters”, the book includes more book-like narration such as “Martha walks in”. In this way, the videos and the books contained similar content. The exact definition and number of repetitions for target words were held constant across the book and video conditions. Lesson plans for the videos and the books included an introduction and a closure. Lesson plans for books also included three to five questions to be asked during reading to maintain student engagement. There was no instruction while students were watching the videos.

Research assistants (RAs), who delivered the intervention in classrooms during their regularly scheduled read aloud time, were instructed not to add instruction during the book reading or the video viewing. The intervention consisted of eight lessons. In the video condition, students watched each of four videos two times (one per day). In the book condition, students listened to each of four books two times (one per day). The same stories, whether in book or video format, were read or viewed in the same order in each condition. Thus, all children experienced eight sessions of Martha Speaks stories and eight sessions of Arthur stories. The intervention began with 2 days of one Martha Speaks story followed by 2 days of one Arthur story followed by 2 days of one Martha Speaks story and so on.

Three words from each story (24 words total) were chosen as target words. These words were all “Tier Two” words in Beck, McKeown, and Kucan’s (2002) conceptualization in that they were all sophisticated words that are useful for children to know for comprehension. In the Martha Speaks series, each story primarily targets five words that are thematically related and extensively supported through definitions, use across contexts, systematic repetitions, and visual and audio support where applicable. For the purposes of this study, three of the five target words per story that were most closely connected to the theme were chosen for assessment. In Arthur, particular vocabulary words are not specifically targeted; however, each episode of Arthur includes a number of sophisticated words related to the theme of the story. For this study, three Tier 2 words per Arthur story that were most central to the theme were chosen for assessment. Words chosen from Martha Speaks are as follows: sibling, similar, identical, quarrel, bicker, negotiate, therapy, patient, treatment, interview, comprehend, and conversation. Words chosen from Arthur were: emergency, prepared, supplies, construction, model, design, extraordinary, unbelievable, realistic, chop, gardener, and orchard. On average, words in Martha Speaks were used nine times in each story and words in Arthur were used three times in each story, and the number of word repetitions was kept constant across condition (i.e., book or video).

2.4. Measures

Two measures were administered in this study: the Peabody Picture Vocabulary Test IV (PPVT; Dunn & Dunn, 2007), a general measure of vocabulary, and the Target Vocabulary Assessment (TVA), a measure of words from the stories in the intervention. The PPVT was administered to all children at pre-test only. This receptive measure of vocabulary knowledge is norm-referenced. Standard scores (M = 100, SD = 15) were used in analyses. The PPVT is correlated with the Clinical Evaluation of Language Fundamentals-4 Core Language Composite (.73 for ages 5–8), the Expressive Vocabulary Test-2 (average correlation of .82), and the Group Reading Assessment and Diagnostic Evaluation Total Test Score (.58).

The Target Vocabulary Assessment (TVA) was administered at pre- and post-test to measure children’s knowledge of the target words in the intervention. In this study, the TVA contained a receptive yes/no subtest and an expressive definition subtest. All 24 target words were tested on each subtest. The yes/no subtest consisted of two questions per word. The response to each question was either yes or no. The questions required students to listen carefully to the context and identify the correct use of the word. For example, for the word sibling, the following two questions were asked: (a) “If you have a grandfather, is he your sibling?” and (b) “If

<table>
<thead>
<tr>
<th>Note: Parents of only 87% of the sample reported on Mother’s Education.</th>
<th>Read aloud (%)</th>
<th>DVD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>English only students</td>
<td>21</td>
<td>25</td>
</tr>
<tr>
<td>Dual Language Learners</td>
<td>75</td>
<td>79</td>
</tr>
<tr>
<td>Black</td>
<td>8</td>
<td>24</td>
</tr>
<tr>
<td>Hispanic</td>
<td>78</td>
<td>67</td>
</tr>
<tr>
<td>Other Race</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Mother’s Education: High School Diploma or Less</td>
<td>50</td>
<td>61</td>
</tr>
<tr>
<td>Mother’s Education: Some College or Trade School</td>
<td>41</td>
<td>19</td>
</tr>
<tr>
<td>Mother’s Education: Four Year College Degree or More</td>
<td>9</td>
<td>19</td>
</tr>
</tbody>
</table>
you have a sister, is she your sibling?” Responses to different sets of questions were yes/yes, yes/no, or no/no. Students had to get both questions correct to get one point on the assessment. So, 48 questions (i.e., two per target word) were asked, but the range for the subtest was 0–24. However, half of the items were discarded due to poor reliability of the yes/no measure. All items with a correlation of less than .10 with the total at pre-test were removed from the dataset. Cronbach’s alpha before removing the items was .53 at pre-test and .73 at post-test. After removing items, Cronbach’s alpha was .66 at pre-test and .74 at post-test. Note that analyses were run with and without removed items, and results were the same. Analyses presented here were conducted on the dataset with items removed because the measures were more reliable in this dataset. The correlation between the pre- and post-pre-test no test was .28. The correlation of the yes/no test with the PPVT standard score was .10 at pre-test and .55 at post-test. Overall, the yes/no measure in this study was problematic due to less than optimal reliability and validity.

The definitions subtest required students to provide an oral definition for target words. For example, the test administrator said, “What is a sibling?” Then, the administrator wrote down the student’s response verbatim. Later, definitions were scored by two trained research assistants. Definitions were scored on a scale from 0–3 with 0 representing no knowledge of the word demonstrated and 3 representing deep knowledge of the word demonstrated. Thus, while there were 24 items on this subtest, the range for this assessment was 0–72. Inter-rater reliability (Cohen’s Kappa) was .94. See Appendix A for the scoring rubric for this subtest. Cronbach’s alpha on the definition task was .83 at pre-test and .86 at post-test. The correlation of the pre- and post-definition tasks was .69. The correlation with the standard score of the PPVT was .73 at both pre- and post-test.

2.5. Analyses

Descriptive statistics were explored, and chi-square and Analysis of Variance (ANOVA) tests were used to examine differences by condition. Analyses investigated whether assumptions of ANOVA were met. Finally, separate ANOVAs were conducted on gain scores for each subtest (i.e., yes/no test and definition). Note that Analyses of Covariance (ANCOVA) with post-test measures as outcomes and pre-test measures as covariates were also conducted, and the results were the same. Analyses with gain scores are presented here in order to ease interpretation of the amount of gain children showed in word learning, which will be discussed later in the paper. Analyses investigated the main effects of group (i.e., book versus video), PPVT (i.e., standard score), and language background (i.e., English only or DLL) as well as the interaction between group and PPVT. PPVT was entered as a continuous variable. Thus, if an interaction between PPVT and group were to be identified, the interpretation would be that the effect of group differed for children with higher or lower scores on the PPVT, which represents students’ level of general vocabulary knowledge.

2.6. Results

Descriptive statistics by condition are displayed in Table 2. A chi-square test showed that there was no difference by condition on whether children were DLL ($X^2 = 13, p = .71$). Analysis of Variance (ANOVA) revealed that there was also no difference by condition on the PPVT ($F(1,77) = 2.08, p = .15$), pre-test yes/no subtest ($F(1,77) = 0.07, p = .79$), or post-test definition subtest ($F(1,77) = 1.13, p = .29$). The average of the sample on the PPVT ($M = 91.38, SD = 13.99$) was substantially lower than the norm ($M = 100, SD = 15$), suggesting that, in general, the sample was low in vocabulary knowledge.

On the yes/no subtest, there was an effect of PPVT ($F(1,77) = 13.67, p < .01$), but there was no effect of group ($F(1,77) = .31, p = .58$) or language background ($F(1,77) = .24, p = .63$) and no effect of the interaction between group and PPVT ($F(1,77) = .06, p = .81$). The least square mean for gain was 1.38 in the book group and 1.35 in the video group. Post-hoc tests suggest that this difference is non-significant ($p = .97$), and the effect size (Cohen’s $d$) between the two groups was near 0. On the definition subtest, there was no effect of group ($F(1,77) = .62, p = .43$), PPVT ($F(1,77) = .28, p = .07$), or language background ($F(1,77) = .64, p = .43$), and there was no effect of the interaction between group and PPVT ($F(1,77) = .44, p = .51$). The least square mean for gain was 6.94 in the book group and 6.15 in the video group. Post-hoc tests suggest that this difference is non-significant ($p = .59$). The effect size of the book group over the video group was .12.

2.7. Summary

Results from this study suggest that there was no difference between books and videos on children’s vocabulary learning. There was no difference depending on whether the assessment was receptive or expressive or whether children had higher or lower vocabulary knowledge. Note that a picture vocabulary test based on the PPVT was also developed for the study, but the reliability and validity of the measure was so low that results are not reported in this paper, but analyses on the picture measure also showed no effect of condition.

3. Study two

3.1. Methods

The second study reported here served to address the question of whether repeated viewing of videos is effective for promoting...
vocabulary knowledge. Eighty-nine kindergarten students from six classrooms at two elementary schools (i.e., School C and D) participated in the study. These schools were different from the ones used in study one. Therefore, there are some differences in sample characteristics. At School C, 84% of students received FARMS and 54% were LEP. At School D, 74% received FARMS and 40% were LEP. Three classrooms per school participated in the study. Classrooms were randomly assigned to one of two conditions. Conditions were counterbalanced across schools to mitigate school effects. Conditions were one viewing and three viewings. Children in the one viewing condition watched one half-hour episode of educational television per day for 15 days. For the first 10 days, children watched ten different episodes from another popular educational television series, *Arthur*. For the final 5 days, children in the one viewing condition watched five different episodes of *Martha Speaks*. Children in the three viewings condition watched the five half-hour *Martha Speaks* shows three times each. The episodes were shown in sequence for the first 5 days and repeated in the same order for the second 5 days and then the third 5 days. Students were pre-tested and post-tested on a Target Vocabulary Assessment (TVA) of the words from the *Martha Speaks* shows. The showing of *Arthur* before the five *Martha Speaks* shows in the one viewing condition was intended to control for the overall time children spent viewing educational television in school. Post-testing occurred immediately following final viewing in each condition so minimal time lapsed between viewing and assessment.

### 3.2. Sample

Again, data on students were collected through surveys to parents and guardians. Sixty-four (64%) percent of the sample was Hispanic, 32% Black, 1% Asian, and 3% other. Sixty-eight (68%) percent spoke a home language in addition to or other than English. The majority of children who spoke a home language in addition to or other than English spoke Spanish (93%). Fifty-five percent of the sample was female. There were 49 students in the one viewing condition and 40 in the three viewings condition. For mother’s level of education, of the students whose parents responded (n = 76), 40% of the students had mothers with a high school diploma or less education; 30% had a high school diploma plus some college or trade school; and 12% had a 4-year college degree or more education. See Table 3 for demographic characteristics by condition.

### 3.3. Intervention

Research assistants (RAs) showed half-hour programs during children’s regularly scheduled read aloud time. RAs introduced the show and asked a couple of questions about the show (e.g., what happened in the show, did you like the show) after it had been viewed. Four words per half-hour episode that were thematically related to the content of the show were chosen as target words. Two of the target words were supported extensively in the show. These words were defined explicitly and used, on average, eleven times per episode in supportive contexts. Words given extensive support were the following: retrieve, locate, unfortunate, adopt, prejudice, aversion, tradition, ancestors, therapy, and mood. Two target words per episode were given limited support. These words were used five times per episode, on average, but not explicitly defined. Words given limited support were the following: front, missing, harsh, belong, ignore, against, community, cousin, pain, and worse. In the *Martha Speaks* shows, words given extensive support are typically more difficult than words given limited support since it is likely that more difficult words need more support than easier words. As can be seen from the list of words, the words given limited support are somewhat easier than the words given extensive support. However, all words could be considered Tier 2 words in that they are important for mature language users and not necessarily acquired through everyday conversation (especially for children who are LEP, of whom there were many in this study) (August, Carlo, Dressler, & Snow, 2005; Beck et al., 2002).

### 3.4. Measures

The PPVT-4 was administered at pre-test. Standard scores were used in analyses. A Target Vocabulary Assessment (TVA) consisting of a yes/no subtest and a definition subtest in the same format as in Study One was administered at pre-test and post-test. There were 20 words tested on each subtest (i.e., yes/no and definition). Thus, the range for the yes/no subtest was 0–20 and the range for the definition subtest, which was scored on a scale of 0–3, was 0–60. Cronbach’s alpha was .80 for the yes/no pre-test, .81 for the yes/no post-test, .74 for the definition pre-test, and .84 for the definition post-test. The correlation between the pre- and post-test yes/no tests was .64, and the correlation between the pre- and post-test definition tests was .84. The correlations between (a) the PPVT-4 standard scores and (b) the yes/no pre- and post-tests and the definition pre- and post-test were -.16, -.02, .74, and .69, respectively. Inter-rater reliability on the definition subtest was .92.

### 3.5. Analysis

The same method of analysis employed in study one was used in this study.

### 3.6. Results

Descriptive statistics by condition, displayed in Table 4, were explored. A chi-square test showed no difference by condition on whether children were DLL (χ² = 3.25, p = .07). However, ANOVA revealed that there was a difference by condition on the PPVT (F(1,88) = 8.98, p < .01). Children in the three viewings condition had higher PPVT scores than children in the one viewing condition. Yet, there was no difference between conditions on pre-test yes/no subtest (F(1,88) = 0.49, p = .48) or pre-test definition subtest (F(1,88) = .76, p = .39). The average of the sample on the PPVT (M = 91.35, SD = 13.23) was substantially lower than the norm (M = 100, SD = 15), but, as noted, the sample was unbalanced. Controlling for PPVT in analyses served to mitigate the difference between conditions, but the unbalance on the PPVT between the conditions is a limitation of the study. Shapiro–Wilk tests on the outcomes under investigation suggested that the gain scores on

**Table 3**

<table>
<thead>
<tr>
<th></th>
<th>One viewing (%)</th>
<th>Three viewings (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>English only students</td>
<td>25 (n = 49)</td>
<td>42 (n = 60)</td>
</tr>
<tr>
<td>Dual Language Learners</td>
<td>75 (n = 49)</td>
<td>58 (n = 60)</td>
</tr>
<tr>
<td>Black</td>
<td>22 (n = 49)</td>
<td>43 (n = 60)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>73 (n = 49)</td>
<td>53 (n = 60)</td>
</tr>
<tr>
<td>Other Race</td>
<td>4 (n = 49)</td>
<td>5 (n = 60)</td>
</tr>
<tr>
<td>Mother’s Education: High School Diploma or Less</td>
<td>54 (n = 49)</td>
<td>42 (n = 60)</td>
</tr>
<tr>
<td>Mother’s Education: Some College or Trade School</td>
<td>29 (n = 49)</td>
<td>47 (n = 60)</td>
</tr>
<tr>
<td>Mother’s Education: Four Year College Degree or More</td>
<td>17 (n = 49)</td>
<td>11 (n = 60)</td>
</tr>
</tbody>
</table>

Note: Parents of only 89% of the sample reported on Mother’s Education.
the yes/no test were not normally distributed (W = .98, p = .40), but the gain scores on the definition test were normally distributed (W = .96, p = .02). Assumptions for independence and homogeneity of variance were met for both analyses (i.e., on the yes/no outcome the gain scores on the definition test were normally distributed.

The next step was to conduct ANOVAs on gain scores for each subtest (i.e., yes/no and definition). Note that, as in Study 1, we also conducted analyses using Analysis of Covariance and found the same results. Analyses investigated the main effects of group (i.e., one versus three viewings), PPVT, and language background (i.e., English only or DLL) as well as the interaction between group and PPVT. On the yes/no subtest, there was no effect of group (F(1,88) = .00, p = .95), PPVT (F(1,88) = 1.86, p = .18), or language background (F(1,88) = 1.46, p = .23), and there was no effect of the interaction between group and PPVT (F(1,88) = .03, p = .86). The least square mean for gain was .68 in the one viewing group and .31 in the three viewing groups. Post-hoc tests suggest that this difference is non-significant (p = .61). The effect (Cohen’s d) of the one viewing over the three viewing group was .12. On the definition subtest, there was an effect of group (F(1,88) = 8.65, p < .01) and PPVT (F(1,88) = 5.78, p = .02), but there was no effect of language background (F(1,88) = .91, p = .34) or the interaction between group and PPVT (F(1,88) = .01, p = .94). The least square mean was 1.93 for the gain of the one viewing group and 3.54 for the three viewings group. The post-hoc contrast suggests the group difference was significant (p = .02), and the effect size (Hedge’s g) of three viewings over one viewing was .58.

### 3.7. Summary

Results suggest that repeated viewings of video were helpful for vocabulary learning, however this effect was only seen on an expressive and not a receptive task. As in study one, there was no difference depending on whether children had higher or lower vocabulary knowledge. As in Study 1, a picture test based on the PPVT was also used in this study, but the low reliability and validity of the measure precluded its inclusion here. Analyses on that measure showed no effect of condition.

### 4. Discussion

As society becomes more and more infused with multimedia, researchers are investigating ways to harness different media for instructional purposes. Previous research suggests that video shows promise as a medium through which to support the vocabulary of children at risk for reading difficulty (Silverman & Hines, 2009; Verhallen & Bus, 2006; Verhallen et al., 2006). However, additional research is needed to more fully understand the role of video in vocabulary learning. The studies presented here provide evidence for how viewing video compares to listening to books and how single viewing compares to repeated viewing for supporting word learning. The studies also investigated differential effects of video viewing on receptive and expressive vocabulary and for children with higher and lower vocabulary knowledge. Instruction was intentionally absent in each study so that the role of video as a medium could be explored. The studies were set in schools with high numbers of children from low-income and Dual-Language Learning (DLL) backgrounds. In general, children in the study showed low vocabulary knowledge, suggesting they were at-risk for experiencing reading difficulty later in school.

The first study shows that, without rich instruction, read alouds and video have the same effect on vocabulary learning. This suggests that different forms of content delivery may be equal in the affordances they provide for vocabulary learning for at-risk children. This finding is in line with findings from Korat and Shamir (2007), but it is contrary to the finding of Verhallen et al. (2006) that animated storybooks were more supportive of children’s vocabulary than storybooks with static pictures. There are a few key differences between the studies that may be implicated in explaining the different findings. First, in the present study, research assistants read the books and in the Korat and Shamir (2007) study live teachers read the books whereas in the Verhallen et al. (2006) study the books were presented on a computer. Perhaps presentation via a live reader is more effective than via a computer even when there are only static pictures to support the book reading. Therefore, compared to a live reader, multimedia may not be more effective at promoting vocabulary. Second, the level of the words and the content differ between the studies. For example, the words in the Verhallen et al. (2006) study (e.g., the Dutch words for grass and carpet) seem less difficult, in general, than the words in the present study (e.g., similar and negotiate) and in the Korat and Shamir (2007) study (e.g., greased and container). It could be that the difference between read alouds and video viewing depends on the difficulty of the words and content. This should be explored in future research. Finally, the assessments were different across the studies. In the Verhallen study, children were presented with a picture and asked to complete an orally presented sentence with an appropriate word. In the present study and in the Korat and Shamir (2007) study, there was no picture support. Evaluating the use of video through assessments that incorporate pictures may result in different findings than evaluating video using measures that do not include such nonverbal support. Assessment will be discussed further below, but, clearly, more research is needed to understand how books and video compare as contexts for vocabulary learning.
The second study was focused on the role of repeated viewings for vocabulary learning. Research shows that repeated readings of books through read alouds leads to greater gains in vocabulary than single readings of books for children in kindergarten (Biemiller & Boote, 2006). The question was whether this effect is applicable to video viewing as well. In other words, does viewing videos multiple times support learning words just as listening to books multiple times supports word learning? In this study, the effect of repeated viewing was seen on the expressive but not the receptive task used to measure vocabulary. On the expressive task, children who viewed the videos three times gained more than children who viewed the videos once. This finding is in line with research by Verhallen et al. (2006) and Korat and Blau (2010) that repeated viewings of digital storybooks with animation promoted children’s vocabulary learning more than single viewing.

The finding that there was a difference between single and repeated viewing on the expressive but not the receptive task warrants further discussion. The receptive task administered in the study required students to listen to words and respond with a yes or no signal as to whether the word made sense in the given context. Thus, there may be classroom effects that are not taken into consideration. Across the two studies presented here, the effects across conditions were nominal. In study one, children gained 10–12% in word knowledge on both the receptive and expressive measures and in both the read aloud and the video condition. In study two, children showed a 2–3% gain in word knowledge in the one viewing and a 7% gain in the three viewing condition on the expressive measure. While this is in line with research that suggests that read alouds without robust word explanations lead to roughly 9% gain in vocabulary, the gains are nowhere near the 20–40% gains that have been achieved through intensive vocabulary intervention (Biemiller & Boote, 2006). It is clear that the experience of listening to a book or watching a video alone cannot adequately support word learning and that instruction on word meanings is needed. Given that research shows how differences in instruction during read alouds result in differences in vocabulary learning (Silverman, 2007; Beck et al., 2007; Coyne et al., 2010; Smith and Dickinson, 1994), it is possible that differences in how video is used in combination with instruction to support vocabulary will also result in differences in word learning. Indeed, in the study by Silverman and Crandell (2010), ELL and non-ELL children gained 17–18% in a read aloud condition with robust instruction but without video support, and non-ELL children gained 17% and ELL children gained 28% in a read aloud condition with video support. While the studies discussed here do not address combining the use of video with rich instruction, they provide an initial indication that video may be at least equal to read alouds as a starting point for vocabulary instruction and repeated viewings of videos may be better than single viewings of videos for supporting vocabulary learning. Future research should continue to explore the role of video in supporting word learning under various conditions and with children from diverse backgrounds.

While this work lays the foundation for future research on the use of video to promote vocabulary, several limitations of the current studies should be highlighted. First, each of these studies was small-scale and quasi-experimental. The small number of classrooms in each study precluded the use of hierarchical linear modeling. Thus, there may be classroom effects that are not taken into account. In fact, random assignment of classrooms to conditions resulted in much lower PPVT scores in the one viewing compared to the three viewings condition in study two. And, pre- to post-test gains were not consistent across classrooms within condition. Though the analysis took these differences into account, future studies with random assignment to condition will determine the reliability of these results. Furthermore, future research should
explore classroom-level variables that could have an impact of the effects of video-viewing. For example, the number of behavior problems in a class could detract from student attention during video-viewing. Or, the level of attention classroom teachers pay to vocabulary in general could heighten student awareness of new words during video viewing. An additional limitation of the studies related to the design is the low rate of participation. In the transient environments in which the host schools were set, the lack of parental involvement may have led to reduced rates of parental permission. Children whose parents provided permission for participation may be somewhat different from children whose parents did not respond or provide permission for participation, which may have resulted in selection bias in the study.

The studies conducted here are also limited because they took place in classrooms with whole class viewing. Children may have been more distracted at school than they would have been in the privacy of their own home. Therefore, findings from these studies cannot be generalized to home viewing. Additionally, the videos were not supported instructionally as they would be in optimally effective classrooms. A study by Michel and Roebers (2008) suggests that just as explicitness of support for vocabulary learning seems to be important, so too does instructional reinforcement outside of the actual video. These researchers found that previewing and summarizing video for reinforcement supported the content recall of the 6 and 8 year old German children with whom they were working. Clearly, a limit of this study was that no instructional supports were provided. Future research should explore the effect of instructional supports on vocabulary learning through video. The studies are also limited in that they did not look at the effects of video on vocabulary across different kinds of content and with children of different ages and backgrounds. The studies only investigated the effect of video through the shows Martha Speaks and Arthur, and the studies were only conducted with a small number of kindergarten classrooms with high numbers of children from low-income and/or DLL backgrounds. Other content may prove more or less supportive of vocabulary learning, and children of different ages and backgrounds may respond more or less to the content at hand.

Finally, a major limitation of the studies was the reliance on researcher-developed measures that were aligned to the content in the studies. Given that the studies were short-term, it was not expected that gains would be seen on norm-referenced measures. Even though the yes/no format had been used successfully in other studies (e.g., Silverman & Crandell, 2010; Beck et al., 2007), the yes/no measure in study one had poor reliability and the yes/no measure in both studies was not correlated with the PPVT, the norm-referenced measure of general vocabulary knowledge used in the studies. Thus, results from the yes/no test should be considered cautiously, and future research on the effects of video and repeated viewings on receptive vocabulary should be explored further in future research. Further, since the yes/no measure was given right before the definition task, it is possible that the yes/no measure primed children’s responses to the definition task. This priming could have resulted in more correct or, given that the correct answer to some yes/no questions was no, incorrect answers due to the order of assessment administration. Vocabulary researchers must consider innovative, reliable, and valid ways of tapping children’s word knowledge and measuring incremental gains over a short period of time for use in research and in classroom practice.

5. Conclusions

The definition of literacy is expanding to various forms of multimedia. Thus, research is needed on the educational benefits of different types of content delivery. One area that shows promise of capitalizing on different types of multimedia is vocabulary instruction. Given that multidimensional and engaging instruction in vocabulary is most effective, the sound effects, lighting, and other camera features of video that can enhance stories may prove to be supportive of vocabulary learning. The research presented here suggests that, without instruction and within the context of the given content, listening to read alouds and viewing video are equally effective at promoting word knowledge; and repeated viewings of video are more effective than single viewings of video at supporting expressive vocabulary learning. Building on these studies as well as previous studies in the research literature, future research should continue to consider the role of video in vocabulary learning.

Appendix A. Examples of the coding scheme for the definition subtest

<table>
<thead>
<tr>
<th>Rating</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>General guidelines</td>
<td>Do not know the word. “Don’t know, no response, I don’t know”</td>
<td>Have seen or heard the word. Partially correct/incorrect. Opposites. Phonological mistakes</td>
<td>Know something about it, Can relate it to a situation. Synonyms. Gives an example of when it happens, but doesn’t give an explanation of word. Incorrect Multiple Meanings</td>
<td>Know it well, can explain it, use it. Decontextualized, adult-like definition. (Like a dictionary)</td>
</tr>
<tr>
<td>Study 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Similar</td>
<td>Smaller. Sick. You’re unhappy. If you want to share</td>
<td>When it’s different. Sibling. People in your family</td>
<td>Alike. Something is the same. If someone looks like you a little bit</td>
<td>When two things are similar, parts of them are the same. They’re kind of alike. Almost alike</td>
</tr>
<tr>
<td>Quarell</td>
<td>Like crawling on the floor. You swirl around</td>
<td>Somebody that quarrels with you. It means you like someone. To be mad at someone when they eat your piece of cake while you were watching TV</td>
<td>Means that you can’t share together. To fight. When somebody is not your friend and they said something about you</td>
<td>Quarrel is when you have an argument</td>
</tr>
<tr>
<td>Study 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ancestors</td>
<td>Ants.</td>
<td>Like family</td>
<td>People who lived a long time ago. Your grandfather</td>
<td>Ancestors are people who lived before you who are related to you</td>
</tr>
<tr>
<td>Therapy</td>
<td>Taking care of somebody. Go to see the doctor. When you are sick</td>
<td></td>
<td>If you are hurt and you need to get fixed</td>
<td>Therapy is what you call it when you’re trying to cure a disease or heal a wound. Or when you just make someone feel better</td>
</tr>
</tbody>
</table>
References


