The Effects of Student Created Videos on Vocabulary Knowledge

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Abstract
This quasi-experimental study investigated the effects of student created multimedia videos on vocabulary acquisition, vocabulary longevity, and perceptions about vocabulary learning for middle school students. Findings suggest that both types of technology improve vocabulary learning, although one is not better than the other. On the posttests, the treatment group had higher mean scores and over time lost less vocabulary words than the control group, however, these findings were not significant. However, the use of multimedia video technology can improve students' motivation for learning vocabulary words.

Introduction
Vocabulary acquisition is a core component of literacy development and important for academic success as the depth and breadth of a student's vocabulary is a predictor of his or her ability to understand a variety of texts (Anderson & Freebody, 1981; Beck, McKeown, & Kucan, 2002). As such, vocabulary is essential to language learning and comprehension for readers of all ages. Vocabulary knowledge is also linked to student success in school. Unfortunately, children enter school with meaningful differences in vocabulary based on the amount and types of words they hear at home; this difference can last a lifetime if not remedied (Baker, Simmons, & Kame'enui, 1998; Hart & Risley, 1995). It is up to the school to help bridge the gap and assist students in increasing word knowledge at all grade levels. To do so, educators must move beyond traditional vocabulary practices (looking up and copying definitions) that do little to foster vocabulary growth (Beck, McKeown, & Kucan, 2002; Cunningham, 2009; Graves, 2006) and embrace vocabulary learning based on research, such as emphasis on learning words in context, providing multiple representations of words, active participation by students in word learning (Hirsch, 2003; Stahl, 1999), and particularly for the sake of this study, the use of technology to teach vocabulary (Ali, Sipra, Ahmad, 2017; Dina & Ciornei, 2013; Mustafa, Sain, & Razak, 2012).

While there has been a great deal of research on various forms of technology to teach vocabulary to English language learners (Liu, 2016; Mahdi, 2018; Hirshel & Fritz, 2013; Ali et al., 2017; Huang, 2015), there is far less research on technology aided vocabulary learning for students learning vocabulary in their native language, particularly at the middle school level and higher, and even less research on student authoring of multimedia materials for learning vocabulary

(Nikolova, 2002; Pritchard and O'Hara, 2009). Vocabulary instruction continues to be a staple in the PK-12 school setting, especially since it has become a focal point of the Common Core State Standards and is a part of many high stakes state assessments. As technology changes and continues to have a presence within the school setting, it is important to continue to investigate the impact of different types of technology on vocabulary acquisition as well as to study how educators are using technology for vocabulary learning in their classrooms. The present study, which investigates the use of student-created multimedia technology to learn vocabulary by middle school learners, hopes to add to the limited research in this area.

Literature Review
Technology Aided Vocabulary Acquisition
The emergence of technology has brought new ideas about teaching vocabulary and has been found to be an effective tool for vocabulary learning since it has the capacity to present vocabulary in multi-modal ways using text, audio, video, graphics, animation, and interactivity. The idea that technology with multimedia enhancements might stimulate vocabulary learning is supported by the dual-coding theory (Paivio, 1991). This theory suggests that when information is simultaneously conveyed verbally and non-verbally, both systems work together to enable better recall of information than if the information was conveyed separately. Thus, the use of multimedia enhancements can provide students with visual and verbal input as they are learning vocabulary, which might better stimulate word learning. Although some scholars argue that multimedia enhancements could interfere with learning by diverting attention away from the content, Neuman (1997) has suggested that multimedia enhancements provide students with tools to help them process verbal information. Despite the growing support for the use of multimedia technology to support vocabulary acquisition, research in this area has been limited.

Much of the research comparing traditional vocabulary learning with technology aided learning has been conducted with second language learners. For example, Hirschel and Fritz (2013) reported higher gains in vocabulary learning for the treatment group using Computer Assisted Language Learning (CALL) technology as compared to the control group who were taught using paper and pencil methods. Comparably, Mustafa, et al. (2012) investigated the impact the internet had on learning vocabulary and found the second language learners in the experimental group that read text online and completed online vocabulary activities significantly outperformed the comparison group who studied the material using paper text.

The use of pictorial, audio, or video multimedia and hypertext glosses have been found to be useful in second language vocabulary learning as well (Ali, et al., 2017; Kabooha & Elyas, 2018; Rahimi & Allahyari, 2019; Teng, 2020; Wang & Lee, 2021). In fact, Marzban (2011) found that when picture, audio and video glosses are presented together, vocabulary learning is more effective. For instance, an experimental study using multimedia E-flashcards with fifth grade students learning Chinese as a foreign language found that students using the E-flashcards outperformed students using only paper flashcards on both immediate and delayed posttests (Li & Tong, 2019). Similarly, Khiyabani, Ghonsooly, & Ghabanchi (2014) found multimedia vocabulary learning "had a positive effect on retention of vocabulary knowledge" (p. 1) of second language high school students. The use of multimedia vocabulary instruction has also been found to impact students' use of memory and cognitive strategies (Rahimi & Allahyari, 2019).

The research on students learning vocabulary in their own language is much more limited in scope. Several studies relating to vocabulary learning for students with disabilities find that multimedia instruction is an effective instructional method for teaching vocabulary (Kennedy, Deshler, & Lloyd, 2015; Kuder, 2017). Research on typically developing children finds mixed results. For example, Huang (2015) examined the effectiveness of a vocabulary software on second grade students' vocabulary development and found that students using the software program outperformed students not using the program. Marpaung and Situmeang (2020) also found positive results when tenth grade students used authentic materials coupled with multimedia to learn vocabulary versus just authentic materials alone. The use of interactive mobile games has also been found to be successful for vocabulary learning with young children (Dore, Shirilla, Hopkins, Collins, et. al., 2019). Conversely, Chen and Chan (2019) found no significant difference in vocabulary learning using augmented reality flashcards versus regular flashcards for young children, ages 5 and 6. The limited scope of research in this area suggests that more research on the use of technology to learn vocabulary with typically developing children of all grade levels is needed.

Student Authoring of Multimedia Materials for Learning Vocabulary
Since this study uses technology as a mediator in vocabulary learning, it is similar to some of the technology research mentioned above; however, this study is inherently different in that instead of using a prepackaged vocabulary software program or app, it requires students to use multimedia technology to create their own representations of vocabulary.

There is limited research on vocabulary learning in this manner. The literature does suggest that student authoring of materials using technology positively impacts higher levels of thinking (Rodriguez, Frey, Dawson, Liu, & Rotzhaupt, 2012; Yang & Wu, 2012), increases understanding of content (Campbell, Heller, & Pulse, 2020; Kearney & Schuck, 2006; Wang, Hwang, Yin, & Ma, 2020), and improves student motivation and attitudes towards learning and the subject (Bowman & Plaisir, 1996; Campbell, Heller, & Pulse, 2020; Campbell & Cox, 2018; Kubota, 1999). The vocabulary studies where students create vocabulary representations using technology have found positive results (Nikolova, 2002).

A study by Bekleyen and Yilmaz (2011) used Jing, a computer program where users can take a picture from the computer monitor and add text, color, and other graphics to that picture, to learn vocabulary. During the study, college freshmen enrolled in the English Language Teaching department were given vocabulary words and asked to use Jing to add pictures they associated with the words and then share these with friends. Findings indicated that participants had a substantial increase in their vocabulary post-test scores as well as positive attitudes about using computers in vocabulary learning.

Nikolova (2002) compared vocabulary knowledge between two groups of college students learning first year French that required student authoring of materials to learn vocabulary. In the study, the control group learned vocabulary using a text already annotated with sound, text and pictures, while the treatment group was asked to create a multimedia module using self-selected text, sound and pictures to annotate vocabulary words on a computer. The study found that

students learned vocabulary significantly better when they were able to create the instructional module themselves.

A study that asked students to create their own digitized flashcards found similar results (Bakla and Çekiç, 2017). During the study, the investigators examined the difference that an online vocabulary memorization tool, *Memrise[1]*, had on upper-intermediate English as a Foreign Language learners. Students in the experimental group using *Memrise* created their own digitized flashcards where they were able to add images, audio, and text, while students in the control group participated in traditional vocabulary activities without the use of technology. While findings indicated that both groups significantly improved vocabulary scores from pre- to post-test, the results of post-tests indicated a significant difference between that of the experimental group and the control group favoring the experimental group. The authors attribute the experimental performance to the features of *Memrise* that permitted students to upload multimedia enhancements relevant to the vocabulary words they were learning.

A study by Pritchard and O'Hara (2009) looked at the effects of student authoring of hypermedia projects on vocabulary development of middle school, ESL students. During the study, students created PowerPoint slides that contained target vocabulary words and used images, text, and sound to explain the words. The study found that the hypermedia authoring had positive effects on vocabulary understanding, student engagement, and attitudes toward content vocabulary learning. The authors indicated that "the procedures used in this study represent a viable instructional model for teachers in similar settings because hypermedia authoring as described above has the potential to improve both students' understanding of target vocabulary and their attitudes toward vocabulary instruction" (p. 26).

Current Study
This research study used Animoto[2], a web-based multimedia video maker. Since there is a lack of research on students' use of multimedia technology to create their own representations of vocabulary words, this study will add to the limited literature that currently exists. The research questions are as follows:

1. Does the use of student created representations of vocabulary using multimedia technology improve vocabulary acquisition for students?
2. Does the use of student created representations of vocabulary using multimedia technology impact longevity of vocabulary learning in students?
3. What are students' perceptions of learning vocabulary using multimedia technology versus learning vocabulary with a traditional vocabulary technology program?

Methods
A quasi experimental pretest posttest control group design was used to explore the implications student created multimedia technology had on students' vocabulary acquisition. Two intact classrooms of students were used for the study; one class was assigned as the treatment group and the other class was assigned as the control group. Prior to the treatment, participants were given a pretest to establish a baseline and to ascertain equality of variances in terms of vocabulary performance. A posttest was given one week following the treatment and a delayed posttest was given three weeks following the first posttest. The pretest and posttests consisted of

20 vocabulary words. Students were given a definition and were asked to select one word from four choices that corresponded to the definition. Both posttests included the same vocabulary words, which were rearranged randomly, so as to minimize the practice-effect. The treatment lasted two days.

Participants
Participants for this study, conducted during the fall of 2019, included English speaking 7th grade students enrolled in two separate sections of an accelerated English language arts classroom in a public school in western Pennsylvania. While 34 students participated in the study, data is only being reported for the 26 students who were present for all phases of the data collection. Of those 26 students, 16 (61.5%) were female and 10 (38.5%) were male. One section of students received the treatment (53.8%, $n=14$) and the other section of students became the control group (46.2%, $n=12$).

Treatment
The vocabulary used for the study were twenty English words taken from SadlierConnect[3], Level 7B for 7th grade, an online vocabulary program the school uses for their vocabulary curriculum. As previously stated, a vocabulary pretest was administered to students prior to the treatment during the English Language Arts classes, which are 84 minutes in length.

The treatment for the study was the use of Animoto, a free multimedia technology that allows the user to create videos. The classroom teacher created free accounts for each student within the treatment group. For this research, students in the treatment group used Animoto to create representations of the vocabulary words in video form. To standardize the Animoto vocabulary videos, each video, which was built by students by creating a series of blocks, was required to contain the following elements, as represented below:

> Block 1: Vocabulary word with its written definition and narration of the word and definition by the student.

> Block 2: Two to three student-selected images related to the vocabulary word as well as narration by the student explaining how the images are connected to the vocabulary word.

> Block 3: A list of student selected synonyms for the vocabulary word narrated by the student.

> Block 4: A short video clip and narration by the student telling how the video is related to the vocabulary word.

> Block 5: A student-created sentence using the vocabulary word within that sentence narrated by the student.

> Block 6: One to three student-selected images related to the vocabulary word as well as narration by the student telling how the images are connected to the vocabulary word.

Block 7: The vocabulary word with its definition (and narration of the word and definition by the student.

Additionally, each vocabulary video was required to contain a soundtrack selected by the student; students selected music that they felt connected to the meaning of the vocabulary word they were assigned. For example, a word like macabre might include a soundtrack with eerie music. Sound bites were found in the Animoto library or students could select sound bites from the internet. The soundtrack was played in the background throughout the video.

Students in the control group used their regular vocabulary program, SadlierConnect, to learn and practice the vocabulary words.

Procedures
On day one of the treatment, both the treatment and control groups were given a list of identical vocabulary words found on the pretest along with their definitions. Words and definitions were verbally reviewed with both groups.

Students in the treatment group were provided instructions on how to use Animoto and were shown an example of a vocabulary video made with a word not contained on their vocabulary list. Students were then given a district assigned laptop with internet access and one vocabulary word from the pretest list. Students accessed their teacher created Animoto accounts and spent the remainder of the class period creating vocabulary videos. The classroom teacher and researcher assisted students as needed with technology issues and vocabulary questions related to the task. Students who finished their vocabulary videos early were given an additional word, so that students created videos for all twenty vocabulary words by the end of the 84-minute class period. During the second day of the treatment, students spent class time finalizing and editing their Animoto videos and sharing their vocabulary videos with peers. While each student shared his/her videos, other students were asked to take notes. No grades were assigned to any of the work.

Following the verbal review of the vocabulary words and definitions, students in the control group were given the remainder of the 84-minute class time and class time on day 2 of the treatment to practice their vocabulary using SadlierConnect Vocabulary Workshop Level B. For their practice, students used the following sections of the Student Practice portion of the website:

Choosing the Right Word: Students have to select between 2 given vocabulary words to complete the sentence.

Synonyms and Antonyms: Students write in a word from their vocabulary list that is most similar or most different to a word in boldface within a sentence.

Completing the Sentence: Students select among one of the twenty vocabulary words to complete the sentence.

Online Practice Test: Students are given a definition and have to select the correct word from among four vocabulary word choices. This test is similar in nature to the posttests that were given during this study.

No vocabulary instruction or practice was given for either the treatment or control groups between the treatment and the first vocabulary posttest, which was given one week following the initial vocabulary instruction. Students in both groups were told not to study for the posttest; the posttest was not graded. Three weeks following the initial posttest, both groups were given an unannounced delayed posttest of the same vocabulary words.

Data Analysis
Students received one point for each correct answer on the pretest, posttest, and delayed posttest. Each test was worth 20 points. Descriptive statistics were run to determine mean and standard deviation scores. Independent t-tests were used to compare the control and treatment groups means as well as means within groups.

Results
Several analyses were run to determine the effect that student created multimedia videos had on vocabulary learning as well as students' perceptions of learning with this type of technology. Descriptive and inferential statistics for the pretest, posttest, and delayed posttest are presented below.

Pretest
A pretest was administered at the beginning of the study to determine equivalence of groups and to provide a baseline for comparison to the posttest and delayed posttest. On the pretest, the control group (n=14) had a mean of 17.07 (SD=2.11, SEM=.57); the treatment group had a mean of 16.25 (SD=3.02, SEM=.87). The mean scores were out of 20 points. To ascertain equity of variances, Levene's Test of Equality was run. Results indicate (p=.103, with a=0.05) that variances were homogeneous. An independent sample t-test was used to compare pretest mean scores of the control and treatment groups, which was helpful to assure that both groups were at similar levels of vocabulary understanding at the onset of the study. Results show no statistically significant difference between the two groups (p=.425).

Posttest Results
To determine the impact the student created and shared multimedia videos using Animoto had on vocabulary acquisition, the posttest results of the control and treatment groups were compared. On the posttest, the control group had a mean score of 18.64 (SD=1.55, SEM=.41) while the treatment group had a mean score of 18.66 (SD=1.66, SEM=.48); mean scores were out of 20 points. An independent samples t-test, run to determine if there were statistically significant differences between the mean vocabulary scores of the control and treatment group, found a p value was .970 indicating that there is no statistically significant difference between the two groups.

Although no statistically significantly significant difference was found between the control and treatment groups from pretest to posttest, a paired t-test found that there was a statistically significant difference within each group from the pretest to the posttest. For both groups, the p

value is less than 0.05: control (p=.030); treatment (p=.008), which indicates that, despite the treatment, both groups significantly improved vocabulary acquisition from pretest to posttest.

Delayed Posttest Results
The unannounced delayed posttest was administered three weeks following the first posttest. An independent sample t-test was performed to determine if the student created and shared multimedia videos using Animoto had an impact on students' vocabulary acquisition over time. The treatment group (M=18.00, SD=2.08) had a slightly higher mean than the control group (M=17.64, SD=0.63), but there was no statistically significant difference between the two groups (p=.827).

A paired samples t-test was run to determine if there was lasting vocabulary acquisition within each group from the first posttest to the delayed posttest. Results indicated that the treatment group (posttest 1: M=18.67, SD= 1.67; posttest 2: M=18, SD=2.09) retained more words than the control group (posttest 1: M=18.64, SD=1.55; posttest 2: M=17.64, SD=2.37), but no statistically significant differences between the first posttest and the delayed posttest for each group were found.

Student Perceptions of Vocabulary Learning
At the conclusion of the study, students in the treatment group (n=12) were given a survey that contained several items that asked them about their motivation and beliefs regarding vocabulary learning with SadlierConnect and Animoto technology. Response options included 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), 5 (strongly agree). Students, on average, reported they are more motivated to learn vocabulary using the student created multimedia platform or Animoto (*M*=4.00, *SD*=.08) as compared to the static technology format, Sadlier (*M*=2.42, *SD*=1.08). Similarly, students, on average, believe they can learn vocabulary better using a multimedia platform (*M*=3.83, *SD*=.58) over the SaddlierConnect technology (*M*=2.92, *SD*=1.24). A paired t-test was run to determine if there were significant differences between the groups. Results show a statistically significant difference between motivation to use Animoto and motivation to use SadlierConnect, in this case, indicating that more students are motivated by Animoto than Sadlier. No significant difference was found between the two platforms with regards to students' beliefs about how they best learn vocabulary.

Discussion
The aim of this study was to investigate the implications of student created multimedia videos on vocabulary acquisition, longevity of vocabulary learning, and students' perceptions using multimedia technology to learn vocabulary. One of the goals of the study was to determine if student mediated vocabulary instruction with technology was more effective than vocabulary instruction where students use technology in a more passive manner. For this study, the use of Animoto permitted students to have some control over the content they used to understand presented vocabulary words.

Findings of the pretest indicate that students' understanding of the vocabulary words initially was very high and that students in both groups scored similarly on the pretest. Students in the treatment group started with an understanding of approximately 81% of the words, with 3 of the students receiving a perfect score on the pretest. Similarly, students in the control group began

with an understanding of approximately 85% of the words, with 3 students receiving a perfect score in the pretest. The high initial scores created a small learning gap, which may have impacted the results. However, both groups showed significant improvement from pretest to posttest, where the treatment group gained an average of 2.42 words and the control group gained an average of 1.57 words. These results indicate that the use of both Animoto and SaddlierConnect impacted vocabulary acquisition. These results are similar to other research on the effect of technology on vocabulary learning (Ali et al., 2017; Li & Tong, 2019; Lin, Hsiao, Tseng, & Chan, 2014). In terms of longevity of students' vocabulary learning for each group, results from the delayed posttest were not significant. The treatment group lost an average of .6667 words whereas the control group lost an average of 1 word. The limited number of words lost indicates high levels of vocabulary acquisition over time, which is positive.

Although both groups improved scores from pretest to posttest, when comparing the two groups' vocabulary acquisition, findings were not as promising. The initial posttest found no significant differences in vocabulary acquisition between the treatment and control groups indicating that student created multimedia videos did not impact vocabulary learning any greater than the use of the SadlierConnect program. Results are similar for the delayed posttest that found no significant difference in means between the two groups. These findings could be due to the fact that this study compared students' use of two different types of technology, one multimedia in nature and the other static in nature. Most previous research compares technology versus non-technology treatments on vocabulary learning; thus, it is difficult to determine whether these findings are consistent with the literature or not.

Additionally, while each student in the control group used technology to practice all twenty of the vocabulary words, due to the time constraints of creating the multimedia videos, each student in the treatment group created one or two of the vocabulary words and shared those words with peers who viewed the student created videos and took notes on what they observed. Thus, the control group had more interactions with all of the words than did the treatment group, which could have impacted the results. Research on vocabulary learning indicates that multiple exposure to words is an important factor in word learning, especially when seeing the word in different contexts (Hirsch, 2003; Stahl, 1999).

Despite the lack of evidence for increased vocabulary acquisition for the treatment group, this group did report stronger motivation for learning with Animoto over the SadlierConnect. These results are consistent with the research on motivation for vocabulary learning with technology (Chen & Chan, 2019; Huang, 2015; Huang, Yang, Tosti, & Su, 2016). However, there were no significant differences in students' beliefs about which program they felt would help them remember vocabulary words better, although students reported beliefs about learning with the multimedia tool, Animoto, were slightly higher than SadlierConnect. The minimal difference between the two programs might have to do with the limited time students had to create the vocabulary videos. Perhaps extended use and learning with the multimedia tool would have garnered more positive beliefs.

This study has several limitations that may have impacted results that need discussion. First, the study was small, involving only two classrooms of students who were enrolled in accelerated English language arts. Students within this type of classroom gain entry due to high academic

scores on statewide testing and high scores in the prior year English language arts course. As stated earlier, many of the participants in the study had a strong initial grasp of the selected vocabulary words, which may have impacted results. The results may have differed if participants were students in a general education English language arts classroom or if the vocabulary words were more difficult at the onset.

Next, due to the parameters of the school structure, the treatment time was brief, only two days. We know that effective vocabulary acquisition, one that builds deep understanding of words, requires word repetition and multiple representations of words in various contexts over time. As such, vocabulary instruction must "lead students to deeply engage in thinking about the word meanings" (Shanahan, 2015, 26). Unfortunately, due to time constraints, students were not afforded opportunities for deep engagement with each word. A lengthier treatment time would have permitted each student to create his/her own video for each word, thus giving them opportunities to formulate a variety of definitions and contexts for each word.

Conclusion

Although there is not clear evidence that student-created multimedia vocabulary videos can improve vocabulary learning or vocabulary longevity any better than a web based online technology program, the study showed that both types of technology can improve vocabulary learning. Moreover, student created multimedia technology can be a positive motivator in student vocabulary learning. These findings are important as educators consider how to best use technology for learning, particularly for learning vocabulary. Continued research on the use of multimedia technology to learn vocabulary as well as research that investigates how student-created artifacts and student mediated learning impact vocabulary acquisition is an important part of better understanding how to use technology to teach vocabulary.

Endnotes

[1] Memrise is a language learning tool. Information can be found here: https://www.memrise.com/

[2] Animoto is a web-based multimedia video maker. that uses a storyboard framework that allows users to insert images, text, audio, and short videos. Information can be found here: https://animoto.com/

[3] SadlierConnect is an online vocabulary program practice site that is not multimodal. Instead, it offers vocabulary practice in the form of worksheets, games, and quizzes in an online format. Information can be found here: https://www.sadlierconnect.com/login.html

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