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Bringing Science to Life: Third Graders in Action

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Abstract

The authors proposed a method of vocabulary instruction that included technology to reinforce vocabulary recall, as well as appeal to digital natives' (Prensky, 2010) interests. Digital video recorders are inexpensive, readily accessible, and easily operated. As such, the authors facilitated the use of digital recorders in a third grade classroom in order to determine if this type of technology, when used as a pedagogical tool, supported students' retention of content area vocabulary.

Successful learning in content area classrooms is dependent upon students' understanding of content area vocabulary. The introduction of subject matters such as science occurs in elementary classrooms, where complex information is presented to young children in developmentally appropriate manners in order to prepare students for future learning. The crux of these science lessons include specific terminology that can be complicated, yet serve as a foundational tool for the same content area classrooms in the upper grade levels. Due to the nature of vertical curriculum alignment, it is imperative that students develop accurate knowledge of content area vocabulary terms since "the meanings of many words vary from context to context and from subject to subject making academic vocabulary especially difficult to acquire" (National Institute for Literacy, 2007, p. 15).

In a nationwide survey of 349 school districts, it was determined that since the enactment of the 2001 *No Child Left Behind Act*, about 62% of these districts reported an increase in instruction time for both mathematics and language arts in elementary schools. According to the survey, this increase in mathematics and language arts time resulted in a decrease in other subject matters, including science, social studies, art, and physical education (Center on Education Policy, 2007). Therefore, it is necessary to design content area vocabulary activities that peak students' interests in spite of the findings that science receives less instructional time due to increased focus on mathematics and language arts.

Many teachers use both traditional and innovative methods to teach and reinforce content area vocabulary. Traditional methods include the writing of vocabulary words and definitions, the memorization of terms for assessment, and reinforcement of terms through worksheets. Innovative methods include the usage of words in multiple contexts, the illustration of words to prompt visual understanding, and other creative activities tied to recall. "Research findings suggest that there is not a single best way to teach vocabulary; rather, using a variety of techniques that include repeated exposures to unknown word meanings produces the best results" (National Institute for Literacy, 2007, p. 16).

Therefore, the authors propose an additional method of vocabulary instruction that includes technology to reinforce vocabulary recall, as well as appeal to digital natives' (Prensky, 2010) interests. Digital video recorders are inexpensive, readily accessible, and easily operated. As such, the authors facilitated the use of digital video recorders in a third grade classroom in order to determine if this type of technology, when used as a pedagogical tool, supported students' retention of science vocabulary terms.

Literature Review

Vocabulary Instruction

Research supports instructional strategies for teaching vocabulary that can be categorized as one or more of the following: explicit, indirect, multimedia, or association (Vaughn & Linan-Thompson, 2004). The traditional approaches alone, such as defining from a dictionary and using in a sentence have been proven ineffective and do little to engage students (Beck, McKeown, & Kucan, 2002). To engage students, vocabulary needs to be viewed as more than just a school assignment. "In contextualized learning, students have to make informed guesses as to the meaning of a new word in light of available linguistic cues in the context as well as the relevant knowledge in the learner's mind, including general knowledge of the world, awareness of the situation, and relevant linguistic knowledge" (Sun & Dong, 2004, p. 132). The context a word is learned in may determine how successful the learner can recall it. Therefore, learning words in isolation is not as effective as contextualized vocabulary learning (Sun & Dong, 2004). Several studies have shown the positive effects of presenting vocabulary using multiple modalities, such as text, audio, graphics, and video (Al Seghayer, 2001; Neuman & Koskinen, 1992; Duquette & Painchaud, 1996).

Sun and Dong (2004) used a segment of a popular Disney cartoon embedded within a software program to teach English vocabulary to Chinese children. First and second grade students were administered a pre-test on specific English words. Then they interacted with the computer software program, followed by three post-tests: word pronunciation test, word understanding test, and sentence translation test. Sun and Dong found that learning new words in a contextualized manner alone was not sufficient; decontextualized learning support was also needed.

Stahl and Kapinus (2001) stated, "Good vocabulary instruction helps children gain ownership of words, instead of just learning them well enough to pass a test. Good vocabulary instruction provides multiple exposures through rich and varied activities to meaningful information about the word" (p. 14). The notion of enabling students to experience vocabulary in meaningful ways prompted the design of this research project.

Technology Integration in Content Areas

This research study involved third graders' use of digital video recorders to support learning in the classroom; however, there is not a great deal of literature to describe that specific type of technology integration. As a result, this survey of the literature includes various types of technology integration in the content areas of science rather than a specificity of digital video records. As Doppen (2004) asserts, the use of technology is an appropriate teacher's tool, and "as teachers learn to bridge the use of technology and constructivist approaches to teaching and learning, [the content areas] can engage students more meaningfully" (p. 252).

The use of podcasts was studied by researchers in a fourth grade classroom in Pelzer, South Carolina (Lipscomb, Guenther, & McLeod, 2007). According to the research,

> A "powerful aspect of this medium is that podcasts can be created by anyone, including young students. All it takes is a microphone and a script for students to become 'stars' in their own right. While [content area] teachers have used similar activities in the past, never before has it been so simple for students to have their work so easily created and disseminated." (p. 122)

The possibilities for this type of learning are endless. Science students can create podcasts to explain the importance of conservation in their own communities or to advertise the appropriate ways to recycle waste in the local area. The value of this type of learning is two-fold. First, it captures students' attention through the use of technology. Secondly, it integrates the sciences and the social studies into other learning contexts. After all, Conderman and Woods (2008) reported that the only way to fully support science is to integrate and stress its usefulness in everyday context.

In an example of using a video to support learning, science students were given a video illustrating the concept of *light*; however, the video's audio was in Spanish (Lorenzo, Hand, & Prain, 2001). The students had to create a script in English to describe the images in the video. The researchers described how the students' own understanding of the concept of light increased as they had to work to describe the process to others, namely, their peers.

Vincent and van't Hooft (2007) found that when teachers integrate technology in content area classrooms, it resulted in assignments that tapped into technology savvy students' interests because they perceived technology to be an essential aspect of life. Therefore, technology should be an essential aspect of content area lessons.

Methodology

This research study took place in a third grade classroom at a small, private school in central Texas. The class consisted of twenty students of varying ethnicities, and all parents gave consent for their children to participate. Data collection for the study occurred during the last two months of the 2010-2011 school year and consisted of several types of data sources, including the students’ creation of a vocabulary video. These videos (also referred to as the “activity”) were planned, scripted, and filmed by the third graders. The authors attempted to answer several research questions:

1. How will creating a video as a curriculum assignment affect elementary students’ comprehension and retention of vocabulary terms demonstrated in the video activity, if at all?
2. How will creating a video as a curriculum assignment affect elementary students’ attitudes about using technology for learning, if at all?
3. When given an open-ended assignment on the subject of science and social studies vocabulary, what themes will emerge from student-created videos?

Both quantitative and qualitative data were collected. For the quantitative data, two surveys (pre- and post-activity) were given to the third grade students. The survey questions were organized in a Likert-scale format and addressed students’ attitudes of using technology for learning. Students’ responses on the two surveys (both pre- & post-surveys) were anonymous with no identifying markers used to match surveys to one another. Instead, the quantitative data were analyzed by looking at the overall responses in each survey using a paired t-test. Responses were totaled for each item scored, and a mean was calculated.

The qualitative data emerged from the students’ vocabulary videos. In addition, the pre- and post-surveys included open-ended questions pertaining to the students’ comments and concerns both before and after completing the activity. This data was coded for keywords and used for anecdotal records.

In addition to the activity and surveys, two vocabulary assessments were given to the students. The pre-test was administered before the partners chose a word to digitally-define, and the post-test was administered after all videos had been created and watched by all students in the class.

The vocabulary terms were chosen by the classroom teacher from the third grade science textbooks adopted by the school and used in the classroom. All vocabulary terms had already been covered by the teacher at some point during the 2010-2011 school year. These terms became the word list from which partners chose a term to digitally define in the activity. While the pre- and post-vocabulary assessments were scored by the authors, the assessments were submitted anonymously by the students since the researchers were concerned with the analysis of overall class comprehension levels rather than specific student comprehension levels. Correct answers were given one point, while incorrect and blank responses were awarded zero points. Descriptive analysis, including mean, median, and mode, were then calculated for pre-assessment and for post-assessment. Those scores were then compared from pre- to post-assessment.

Each of the vocabulary videos differed from one another in final appearance as students were encouraged to creatively define and illustrate a science vocabulary word (chosen from the word list) through the use of digital images. Therefore, the images captured in each of the videos included images of the students, voice recordings of the students, images of inanimate objects, and/or any number of images or recordings relevant to the definition of the science vocabulary word. This, in turn, meant that these projects were not anonymous as to the student-creator of the project.

Upon completion of the project, the researchers analyzed the third grade students' vocabulary videos for the creative illustration of content area vocabulary through the use of technology. Each project was analyzed by the researchers for common themes and uses of creativity, with no identifying connections between participants and each of the pre- and post-surveys and/or pre- and post-vocabulary assessments.

Findings

A paired t-test was conducted on students' technology attitudes and assessment of vocabulary comprehension. Results showed improvement in attitudes, as well as vocabulary comprehension; however, data concerning comprehension was significantly greater at the p<.01 level. The paired-samples test is shown in Table 1.

Table 1

Pre & Post Activity Comparisons of Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference: Lower	Upper			
Pair 1	Pre10Score - Post10Score	-1.000	1.237	.291	-1.615	-.385	-3.431	17	.003
Pair 2	AMean – PostAMean	-.156	.952	.224	-.629	.318	-.693	17	.497

Correlations of data were also run using bivariate analysis. Data employed in the correlational analysis included prior use of video cameras, attitudes, and whether or not the student would like to create more videos for classroom assignments. A significant correlation at the 0.05 level was identified between students who wanted to create more videos for classroom assignments and post-assessment scores. This is especially interesting since students did not receive their scored assessments, nor were the scores from the pre- or post-assessments shared. An additional correlation was reported between the pre- and post-assessments (at the 0.01 level), which should not be surprising since success on a pre-test should be indicative of success on the subsequent test of the same material. This does, however, suggest a high level of retention. The bivariate correlations analysis of significant variables is located in Table 2.

Table 2

Correlations

		CreateMore	Pre-Assessment	Post-Assessment
CreateMore	Pearson Correlation	1	.322	.534*
	Sig. (2-tailed)		.193	.023
	N	18	18	18
Pre-Assessment	Pearson Correlation	.322	1	.878**
	Sig. (2-tailed)	.193		.000
	N	18	18	18
Post-Assessment	Pearson Correlation	.534*	.878**	1
	Sig. (2-tailed)	.023	.000	
	N	18	18	18
* Correlation is significant at the 0.05 level (2-tailed).				
** Correlation is significant at the 0.01 level (2-tailed).				

Almost two-thirds of the students scored six, seven, or eight out of ten on the pre-assessment (61.2%), and on the post-assessment two-thirds (66.6%) scored eight or nine. The mean score for the class went from 7.22 to 8.22 out of ten. 66.8 percent of the students passed the pre-assessment at a 70% passing rate, which increased to 83.3% passing the post-assessment. A visual representation is depicted in Figure 1.

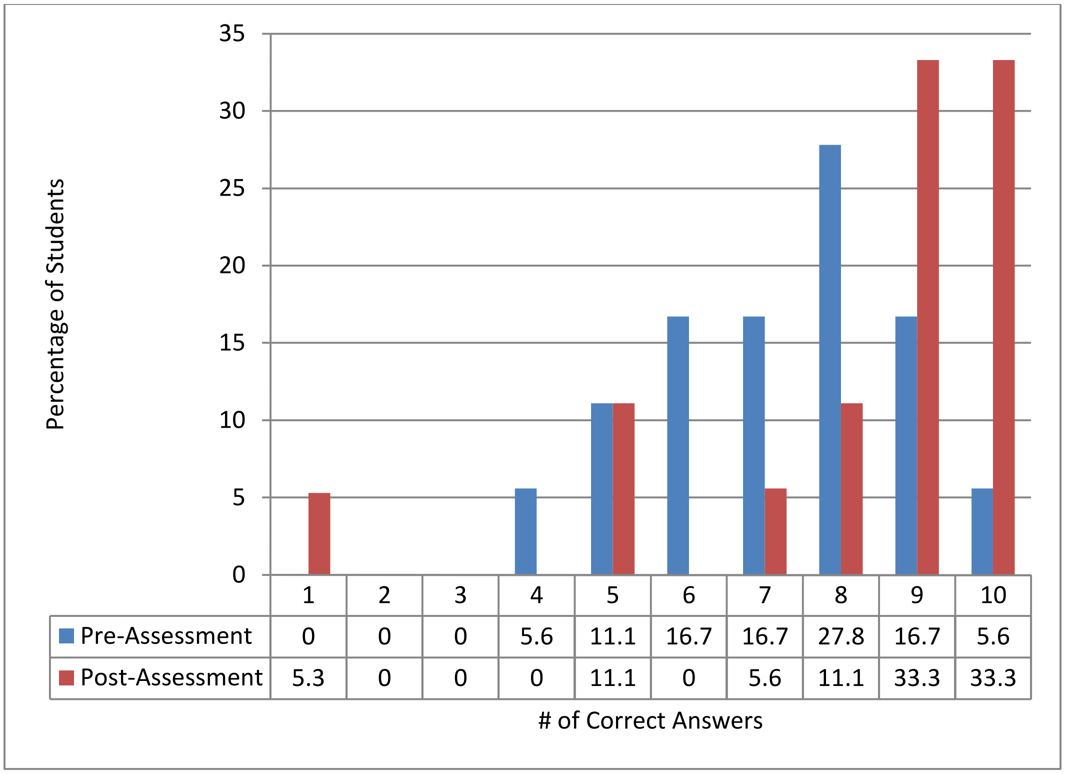

Figure 1. Pre- & post-assessment scores.

In addition to the survey data and pre and post vocabulary assessments, the authors also had access to the rich qualitative data that emerged from the students' vocabulary video projects and open-ended survey responses. Since the class of twenty students paired with one another to plan, produce, and film the vocabulary videos, ten projects were created. These projects were analyzed and coded for themes that emerged via similarities amongst the submissions through the process of "making meaning" of the students' projects (Fish, 1980; Crotty, 1998; Patton, 2002). The emergent data from both the vocabulary videos and the open-ended survey responses was then sorted and arranged into a meaningful sequence for further analysis (Glesne, 1998). After analysis of students' projects, two themes began to emerge: Home-School Connections and Active Participation.

Home-School Connections

The researchers found that when given the opportunity, students create connections between home and school. Students were instructed to bring materials to support their chosen vocabulary term, and part of the research project included an analysis of the particular props chosen by the students to bring from home to support the learning activity. Since the instructions were open-ended, the researchers were unsure of the types of props the students would choose to include in the video.

However, in an analysis of the props brought to school by the students to incorporate in the vocabulary videos, it became apparent they used items easily accessible from their own bedrooms and toy collections. During the analysis, these types of items were coded as "childhood props," and examples included dolls, costumes, balls, and stuffed animals.

Active Participation

The research study was purposely designed to elicit full student participation. This was achieved by keeping the cooperative learning groups small with only two students per group. Therefore, when students were paired up to create a vocabulary video, every group member actively participated in one or more aspects of the final project. This included writing the script, bringing props to school, starring in the video, and/or handling the digital video recorder. All videos were either filmed by a student within the group or by another classmate.

While all students did actively participate in the creation of the vocabulary videos, most groups had one student who emerged as the leader within the group. This was evident in observing the students while they planned and recorded the videos.

In addition, the post-survey posed open-ended responses to students concerning the best and worst aspects of the project, as well as what they would do differently if given another opportunity to create a vocabulary video. Overwhelmingly, students responded that the best part of the project was producing and filming a vocabulary video.

Conclusion and Implications

As the findings from this study suggest, students' attitudes concerning technology use in school may increase after using technology, such as video creation, to complete a curricular assignment. Although the gains in attitudes were not significant, it is plausible that more usage of technology could lead to more significant improvement. One area of great significance was the increase in vocabulary comprehension scores from pre-activity to post-activity.
As Harmon, Hedrick, and Fox (2000) stated,

> Study of science and social studies texts indicated that textbook authors need to reconsider how they present vocabulary instruction. Including a list of new words at the start of the chapter, then defining these in the text and glossary is not enough for students to make a huge leap from new label to using terms to comprehend new concepts. (p. 3)

Another conclusion can be drawn from the significant correlation between students wanting to create future videos for classroom assignments and their post-assessment scores. The more successful a student was on comprehending the vocabulary terms presented in the videos, the more likely they were to want to create more videos. In addition, positive correlations between pre- and post-assessment scores suggest greater retention of vocabulary comprehension, and an increase from 67% passing on the pre-assessment to 83% passing on the post-assessment is significant educationally speaking, if not statistically speaking.

Technology benefits content area curriculum, and therefore, must be integrated (Harris, 1997). In this particular technology-integrative learning activity, students had the opportunity to incorporate items from home to connect to the vocabulary word chosen. These connections supported the students' active learning of vocabulary, thus resulting in higher retention.

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