Teaching vocabulary using multimedia: the case of U.S. international students

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Abstract

The study examined the use of multimedia in teaching of vocabulary. For the past decades, the use of technology in the language classrooms has been an important aspect of language instruction. Sixty participants (40 females and 20 males), studying in the United States, participated in this study. Stratified sampling using nationality as a stratification variable was used to select participants. The first independent variable used was 'use of pictures', with two levels: *still* versus *animation,* and the second independent variable was 'knowledge type', with two levels: *receptive* versus *productive*. The dependent variables were participants' scores derived from vocabulary tests obtained from pre-test and post-test. The results revealed that there was a positive correlation between the use of *still* and *animated* pictures in teaching vocabulary, while the dependent *t*-tests revealed that there was a significant difference between retention of *still receptive* knowledge and *still productive* knowledge, also between *animated receptive* knowledge and *animated productive* knowledge.

Keywords: Multimedia, vocabulary, receptive, productive, still, animation.

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1. Introduction

The need to expand students' vocabulary has ever been increasing. For the past decades, the teaching of vocabulary using multimedia has grown substantially, with focus on teaching of vocabulary using computers (Levy, 1997; Muyskens, 1997; Pennington, 1996; Warschauer, 1996; Warschauer & Healy, 1998). Since the advent of technology, learning communities such as educational institutions constantly redefine new language learning paradigms, broad enough to incorporate technology in the classroom. To this end, technology in the language classrooms has been noted for the improvement of interactive, creative, problem-solving, speaking, writing, listening and reading skills (Becta, 2004; Lindquist et al., 2007; Liu et al., 2003; Zurita & Nussbaum, 2004). Within these skills, vocabulary is an essential component. The use of technology in the language classrooms has been found to enhance students' achievement, engagement and the overall students' participation in language learning (Cobb, Heaney, Corcoran & Henderson-Begg, 2010; Markett, Sanchez, Weber & Tangney, 2006). Researchers such as Harnad (1991) and Warschauer (2003) compare the digital experiences of today's students to the paradigm shift caused by the prevalence of new technologies; these technologies persistently influence students' language learning preferences and consistently shift epistemological paradigms. Ever since the adoption of technology to the classrooms, there have been multiple techniques for teaching language, including vocabulary.

1.1. Multimedia

The combination of text, sound, graphics, video or animation to teach vocabulary is becoming a common aspect of instructional practice in language learning. Most of the language learning software of these days consists of hypermedia (Fotos & Browne, 2013). However, the use of multimedia is highly debated in terms of whether or not it benefits students. Studies such as Lewalter (1997), Weidenmann (2002), Hoffler and Leutner (2007) and Ilhan and Oruc (2016) have supported the use of multimedia. This has led some language teachers to develop their materials and present them using multimedia. The teachers' creation of tailored learning materials allows the teacher to develop materials that suit both the context and cognitive levels of the students. Also, students are able to learn independently and autonomously. Although the ability of courseware to provide corrective feedback is more limited than in the classroom, multimedia has been found to have educational benefits such as developing students' ability to self-assess, self-monitor, increase motivation and other benefits (Balasubramanian & Saminathan, 2016; Lee, Hsiao & Ho, 2014).

1.2. Dual coding

Dual coding was proposed by Paivio's (1990). It posits that human cognition is operated by two systems; verbal and non-verbal systems. The systems contain visual (imagens) and verbal codes (logogens), with each activated by pictures or words. The logogens according to Paivio (1990) are located in the verbal system, while imagens are in the non-verbal system. While these codes function independently, according to Paivio (1990), they collaborate in the process of language learning. Studies such as Paivio and Dilley (1968) and Sadoski (1985) reveal that pictures serve as stimuli to retain vocabulary. In other words, using pictures buttress the receptive vocabulary domain, leading to vocabulary retention than when pictures are not used. Mayer and Sims (1994), in their review of dual coding, concluded that vocabulary learning occurs when students use information presented in two or more formats; visual presentation of animation and verbally presented illustrations. Thus, using digital dynamic images with a word and expression, according to Mayers' and Sims (1994) enhances vocabulary learning.

2. Related literature

Knowledge of a word has been conceptualised in alternative ways. Dale (1965) devised the earliest conceptualisation of word knowledge, which addressed the extent of a person's understanding of a word. Since then, there are other conceptualisations of word knowledge. The alternative conceptualisations include, but are not limited to, the following: dimensional knowledge, continuum-based word knowledge, contextualised and decontextualised word knowledge, and partial and comprehensive word knowledge (Wagner, Muse & Tannenbaum, 2007). Nagy and Scott (2000) presents five key aspects of word knowledge: *incrementality*—words are known to varying degrees of complete knowledge; *polysemy*—words have multiple meanings, and context must be used to determine the word meaning; *multidimentionality*—words cannot be represented in a single linear continuum; *interrelatedness*—words are represented by a configuration of relation of semantic network of words, and *heterogenuity*—different kinds of words require different kinds of word knowledge.

2.1. Still and animation

Most studies conducted in learning vocabulary using *still* and *animated* pictures compare the retention of vocabulary words when taught using either *still* or *animation.* Most often, the hypotheses in these studies are that the latter (*animation*) is effective than the former (*still*). However, these studies have yielded different results and, therefore, arrived at different conclusions, respectively. Studies, such as Hidrio and Janet (2002), Mayer (2001), Rieber (1990) and Rieber, Tzeng and Tribble (2004) show positive effect of *animation*. On the other hand, studies such as Mayer, Hegarty, Mayer and Campbell (2005), Lowe (2004) and Schnotz and Grozondiel (1999) show negative effect. As a result different conclusions have been reached regarding the use of *still* versus *animated* pictures. Some of the conclusions are that when using *still* pictures, learners interpret and remember the content of the text. They recall the vocabulary because of the combination of verbal and pictorial information, particularly if the pictures relate to the test items. On the other hand, conclusions about using *animated* pictures in the teaching of vocabulary are that *animated* pictures are effective if motion is a **critical** attribute of the presented concept, and it is used to cue or draw the viewers' attention to that critical aspect.

2.2. Receptive and productive knowledge

Quite often students use receptive knowledge to recognise the aspects of vocabulary knowledge through reading and listening. However, for speaking and writing, students need productive knowledge (Wagner et al., 2007). The prospects of either understanding a text or expressing oneself, entirely depends on the extent to which a student expanded his/her receptive and productive vocabulary knowledge base. The most common measure of vocabulary assesses both receptive or productive vocabulary, and correlation between these two (receptive and productive) variables that stands out in most literature. Typically, receptive vocabulary benefits if series of pictures are presented. The student hears a word and points to the correct picture. In productive vocabulary, the learner hears the word and provides its verbal definition (Wagner et al., 2007). Both receptive and productive knowledge domains are important in learning not only new vocabulary but the entire language discourse.

2.3. Present study

Different conclusions reached regarding the use of *still* and *animated* pictures, including the retention of target words are perhaps an impetus behind repeated studies examining this phenomenon. This study examined if there was a significant difference between teaching vocabulary using *still* and *animated* pictures. Also, if there was a correlation between vocabularies taught by *still*

versus *animated* pictures. That is, the study examined the relationship between these two variables. Since learning a word involves retaining and recalling it for productive function, the study also investigated if the test type (i.e., *receptive* versus *productive*) influenced participants retention of receptive and productive target vocabulary words.

3. Research design

This repeated measure design was conducted at a Midwestern American University. Following all research ethics, 60 participants volunteered to participate in the study. There were 40 females and 20 males, all studying English as a foreign language. Most of the participants were between the ages of 17 and 25 years and were coming from seven different countries; Saudi Arabia, China, South Korea, Taiwan, Colombia, Japan and Iran.

Table 1. Students' demographic information

Country of origin	Participant/s	Gender M	Gender F	Age
Saudi Arabia	10	3	7	20–25
China	12	4	8	17–25
South Korea	7	5	2	18–25
Taiwan	11	2	9	17–25
Colombia	5	1	4	20–25
Japan	6	3	3	17–25
Iran	9	2	7	19–25
Total	60	20	40	–

Some participants had come to study English, after which they would return to their respective countries to pursue different academic programmes such as medicine, engineering, teaching, mining and many more, while others were enrolled in this course for admission to U.S. universities. Even though the participants would pursue different programmes later; as a prerequisite, they had to enroll in the Department of Linguistics and do language modules to improve in English. This programme was mandatory for many international students. The course duration was 4 weeks after which they wrote an Internet-based test in English as a foreign language. This test is mainly in the family of Graduate Record Examinations® General Test, Graduate Management Admission Test®, National Council of State Boards of Nursing NCLEX® Examination tests, which are a prerequisite for university entry in most universities in the United States.

3.1. Pre-test

For the pre-test, hundred (120) vocabulary words were selected and given to the participants to check whether or not they knew or were familiar with their meanings. The main objective for this exercise was to isolate vocabulary words the participants did not know, so that these vocabulary words could be used as treatment in the study. During the pre-test, participants circled 'yes' or 'no' next to the given vocabulary words in the instrument. For words they did not know their meanings but had a slight idea what the words may mean, participants were asked to circle 'vague'. Eventually, the pre-test yielded 82 unknown noun vocabulary words, which were later, used for both *still* and *animation* treatments. Forty-one (41) words were randomly assigned for *still* treatment while the other 41 were assigned for *animation* treatment. No vocabulary word was assigned for both treatments; each treatment had new experimental words. Overall, the pre-test took about half an hour to complete.

3.2. Treatment 1 (still pictures)

Since this was a repeated measure design, two treatments were given to the same participants. The first treatment constituted of 41 unknown vocabulary words taught by using *still* pictures. During the treatment, each word was taught, accompanied by a *still* picture. For instance, participants would see the word 'apple' on a PowerPoint slide and then a picture of an apple would be projected on the next slide. Then they would listen to the pronunciation of the word 'apple' from an American native speaker of English. Precisely, participants would see the word, see its picture and listen to its pronunciation. To bolster retention, the process was repeated twice for each word.

3.3. Treatment 2 (animated pictures)

The second treatment focused on the remaining 41 unknown noun vocabulary words. As noted, these words were different from the first batch used in the first treatment. A similar process of treatment was followed, in which a vocabulary word was presented through a PowerPoint slide. However, this time, an animated picture of the vocabulary word would be shown and then they would listen to the pronunciation of the word. Again, to ensure the treatment conditions were similar, the pronunciation of the vocabulary words in both treatments was done by the same American speaker of English. The second treatment also took about half an hour. The time interval between treatment 1 and 2 was a week.

3.4. Post-tests

After the treatment, a post-test was administered to check participants' receptive and productive knowledge of the target English words. For instance, after the first treatment, participants were given a post-test which included all 41 words they learned using *still* pictures. In this instance, a picture of a *still* 'Eagle' would be shown through a PowerPoint slide, and each participant would choose and circle the name of the object from a list of given options, e.g., *Parrot, Woodpecker, Eagle* or *House Sparrow*. After circling the correct noun, participants would formulate one short sentence in which the noun is used correctly, e.g., *An eagle is a bird with a sharp eyesight*. The same process was done during the post-test for the second treatment. The only difference was that in the second post-test only *animated* pictures were shown. Even in this post-test, participants had to formulate sentences, representing the productive knowledge type. Each correct response was scored 1 and a wrong response was scored 0, rendering a minimum score of 0 and maximum score of 41 for each test.

4. Data analysis

Since this was a purely quantitative study, data were analysed using statistical methods, exclusively. Mainly a dependent *t*-tests and Pearson's correlation *r* coefficient were used for data analysis. There were two main independent variables in the study: pictures and Knowledge. Each independent variable had two levels, i.e., Pictures: *still* versus *animated* and Knowledge: *receptive* versus *productive*. Given the nature of these variables, they were assigned nominal values. On the other hand, dependent variables were calculated as participants' scores on each vocabulary test. That is, scores for each participant per test (pre and post) were summed up. Thus, these tests yielded two sets of scores for each and every participant. The scores were derived from *still* receptive and productive knowledge and *animated* receptive and productive knowledge.

4.1. Results

The purpose of the first research question was to investigate if there was a significant difference between teaching vocabulary using *still* and *animated* pictures. The mean for *animation* was slightly higher (M = 12.53, SD = 4.43) than the mean for *still* (M = 12.12, SD = 3.97, t = (59) = −537, p > 0. 599)

(two-tailed). It should be noted that the difference of 0.46 in the means was not statistically significant. The second research question examined if there was a significant correlation between *still* and *animated* pictures with regard to receptive and productive knowledge of new vocabulary words. The correlation between *still* and *animated* scores was found significant, $r(58) = 0.772$, $p < 0.001$ *(two-tailed).* This positive correlation revealed a relationship between these two variables. That is, a majority of students benefitted from both *still* and *animated* treatments. Basically, those students who benefited from *still* pictures also benefitted from *animated* pictures in terms of receptive and productive knowledge. The third research question examined whether or not the test type (i.e., *receptive* versus *productive*) influenced participants retention of vocabulary words. For this analysis, the dependent *t*-test revealed a significant difference between the retention of words using *still* receptive, ($M = 8.12$, $SD = 2.18$) and *still* productive ($M = 4.00$, $SD = 2.52$), $t (59) = 6.69$, $p < 0.001$ *(two-tailed)*. That is, participants' retention of the target words taught through *still* pictures was significantly better in receptive knowledge than in productive knowledge. Also, there was a significant difference observed between *animated receptive* and *animated productive*. The mean for animated receptive *(M = 8.71*, $SD = 1.69$) was higher than the mean for animated productive ($M = 3.82$, $SD = 3.30$), $t (59) = 7.19$, $p < 0.001$ *(two-tailed)*.

5. Discussion

As revealed by literature on multimedia (i.e., Hidrio & Janet, 2002; Lowe, 2004; Mayer, 2001; Mayer et al., 2005; Rieber, 1990; Rieber et al., 2004; Schnotz & Grozondiel, 1999), different conclusions have always been reached, regarding the effectiveness of *still* versus *animated* pictures. Also, this study does not report a statistical significant difference between teaching using *still* and *animated* pictures, even though a slight difference in the means was noted. However, the positive correlation results revealed that using multimedia for instruction impact learning of vocabulary in the sense that students are able to learn much better if both *still* and *animation* are used. That is, almost the same level of success in teaching new vocabulary can be achieved using both *still* and *animated* pictures. As seen in this study, students benefitted from the use of both *still* and *animated* pictures, suggesting that teachers of English can vary their vocabulary teaching strategies by using both *still* and *animated* pictures to realise a maximum benefit on vocabulary teaching.

Regarding if the test type influenced the retention of vocabulary words; the study revealed better retention of receptive knowledge in both *still* and *animated* pictures. Even though students showed that they understood the meaning of the vocabulary words, they still produced ungrammatical sentences, revealing that productive knowledge demands more than just seeing or hearing a word twice as it happened in this study. As noted by Wagner et al. (2007), knowing a word includes dimensional knowledge, continuum-based word knowledge, contextualised and decontextualised word knowledge, and partial and comprehensive word knowledge. These types of vocabulary knowledge allow students to use vocabulary words in both obligatory and non-obligatory contexts, effectively. Ultimately, knowing a word in all these dimensions perhaps would require students' frequent exposure to the word in different contexts. That said, there is no doubt why the retrieval rate for productive knowledge for both *still* and *animated* vocabulary was low. In both treatments, students were not exposed to the multidimensionality of all the new vocabulary. Teachers of English therefore need to be cognisant of the fact that presenting words either by *still* or *animation* does not guarantee that students would be able to use the words in different linguistic contexts, despite the protracted benefit to their receptive knowledge.

6. Conclusion

It can be concluded that there are still different conclusions reached regarding whether or not using *animation* is more useful than using *still* pictures, despite many of our positive thoughts about the use of technology in class. The overall effectiveness of multimedia instruction should, therefore,

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not overlook or despise other approaches of teaching new vocabulary. While the use of multimedia diversifies the approach on teaching vocabulary, no one approach could be comprehensive, sufficient and conclusive in teaching the same. A multidimensional approach, which unfortunately was not used in this study, could possibly yield much better results. Students need frequent exposure to new vocabulary words in many forms and contexts to maximise both their receptive and productive linguistic inventory.

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