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## **Lexical item learning via multimedia annotations**

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### **Abstract**

The ubiquitous computers with multimedia technology serve as an attractive learning tool because they are able to deliver integrated, different source media as well as access these media easily and instantaneously. Thus, to take advantage of these qualities to help language learners, multimedia annotations of lexical items, which present information of the items via printed text, audio mode, still pictures and animation, are utilized. This paper reports on the effects of integrating multimedia annotations in expository texts on the learning of lexical items by 109 Science students from Universiti Sains Malaysia. In this within-subjects design study, the participants read expository texts on the computer. These texts have lexical items that have been annotated. In each text, about half of all the annotations are in the multimedia mode, while the remaining ones are in the text-only mode; with learners having the liberty to access the annotations by clicking on the lexical items. Annotations in the multimedia mode consist of the pictorial form or, where applicable, animated form of the lexical item, the definition of the lexical item in printed text form, and the pronunciation of the lexical item in audio form. On the other hand, annotations in the text-only mode consist of the definition of the lexical item in printed text form, and the pronunciation of the lexical item in audio form. It was found that learners obtained a significantly higher gain score in vocabulary items that have been annotated in the multimedia mode compared to those annotated in the text-only mode.

**Keywords:** Multimedia annotations, lexical item learning, expository texts

## 1 Introduction

In recent years, the Malaysian government recognized the globalization trend as well as the need to develop its human capital to achieve developed nation status. It is generally accepted that Mathematics and Science are the basis for a nation's progress. A mastery of these subjects was therefore vital. Since the available resources of these subjects are mainly in English, a decision was hence made by the government to switch the medium of instruction of Mathematics and Science subjects in Malaysian schools from the national language, Malay, to English commencing 2003. The policy was implemented for those who entered Primary 1, Form 1 and Lower Six in that year. With this switch of the language of instruction for these subjects, the students' vocabulary knowledge in the target language while reading expository texts would thus be an important factor in determining their comprehension of the texts. This is because if they do not know the meaning of the content words in the texts, they may not be able to understand what they have read. As Eskey (1988:96) noted, "successful comprehension cannot be achieved without decoding". Furthermore, there is a direct association between knowledge of word meanings (i.e., vocabulary knowledge) and understanding what is to be learned (Misulis, 1999). Therefore, to assist students understand the content, they should be given help in making the vocabulary or words related to the content areas clear.

One way to help these students who face this problem of vocabulary knowledge deficiency while reading a passage is to provide them with access to the meanings, or brief definitions, of difficult words or phrases in the form of glosses, or annotations, in the reading passage (Davis, 1989; Hulstijn, Hollander, and Greidanus, 1996; Watanabe, 1997). As such, to take advantage of the ubiquitous computers with multimedia

capabilities, these annotations in the reading text can now take the form of text, pictures, sound and video (Chun and Plass, 1996; Plass, Chun, Mayer, and Leutner, 1998).

Moreover, such multimedia annotations can be designed in hypertext format so that they are “invisible and thus unobtrusive in the reading process” (Davis, 1989:42) until the user clicks on them to access the information that is pre-programmed within.

## 2 Review of related studies

The number of research on the effects of multimedia annotations on vocabulary acquisition or learning is large (e.g., Al-Seghayer, 2001; Chun and Plass, 1996; Lyman-Hager, Davis, Burnett and Chennault, 1993; Plass, Chun, Mayer and Leutner, 1998; Yeh and Wang, 2003; Yoshii, 2000; Yoshii, 2006; Yoshii and Flaitz, 2002).

Al-Seghayer (2001) carried out a study to examine the participants’ vocabulary acquisition through reading a narrative English text with word annotations in the form of printed text, graphics, video, and sound. Thirty ESL students read the text under three conditions: printed text definition alone, printed text definition coupled with still pictures, and printed text definition coupled with video clips. It was found that words that were dually coded, especially those with text and video annotations, were learned better than words with text definitions only.

The aspect of dual coding in vocabulary learning was also confirmed in Chun and Plass (1996). The participants were second-year students of German who used a multimedia application called *CyberBuch* that offers annotations in text, pictures, and video. The results showed that the rate of incidental learning of vocabulary was higher for visual annotations (i.e., words annotated with pictures and text, and also video and

text) compared to verbal annotations (i.e., words annotated with text alone). The researchers attributed this to the fact that learners were able to construct referential connections between two forms of mental representations – the verbal and the visual – thus, resulting them to learn or remember such words better.

Lyman-Hager, Davis, Burnett, and Chennault (1993) conducted a study to look into the effect of a multimedia program on vocabulary acquisition. Two conditions were used in this study: computerized text and conventional printed text. The computer group had access to multimedia annotations, while the traditional text group had access to printed text glosses identical to those available to the computer group. The subjects took a vocabulary test one week after reading the story. The results showed that subjects who worked with the multimedia program were able to retain vocabulary words better than those who worked on the non-computerized text.

In an investigation that explored the effectiveness of multimedia annotations on vocabulary learning (Plass, Chun, Mayer and Leutner, 1998), 103 college students were asked to read a short story in German via a computer program. This story in the computer program was the same one used in Chun and Plass (1996). The subjects were able to select the type of annotation (verbal annotation, visual annotation, or both) to look up for some vocabulary words while reading the text. Immediately after reading the text, the subjects answered a vocabulary test. The results revealed that students' vocabulary learning was facilitated when they chose to look up both verbal and visual annotations.

In a similar study, Yoshii (2000) and Yoshii and Flaitz (2002), looked at the effect of annotation type (text-only, picture-only, and a combination of the two) on L2 incidental vocabulary retention in a multimedia reading setting. The subjects were 151 adult ESL

learners who read an annotated story for the purpose of comprehension using the Internet. Vocabulary retention test results showed that annotations with text and picture were most effective in helping the learners retain the vocabulary.

A study by Yeh and Wang (2003) on the effectiveness of three types of vocabulary annotations (text only, text and picture, and text, picture and sound) on vocabulary learning showed that the text and picture was the most effective type. This study involved 82 EFL college students in Taiwan reading a text in English with vocabulary annotations in L1 (Chinese translation) and L2 (English explanation).

In another study on the effectiveness of L1 (Japanese) and L2 (English) annotations as well as annotation types (text-plus-picture and text-only) on incidental vocabulary learning by university students in Japan, Yoshii (2006) found that text-plus-picture annotations were significantly more effective than text-only ones regardless of the language of the annotations. However, this was only applicable to the definition-supply vocabulary test and not the recognition test.

From the existing literature on multimedia annotations that has been reviewed in this section, it can be seen that such annotations resulted in positive effects on vocabulary acquisition or learning. The efficacy of multimedia annotations has been ascribed to the accessibility of information in different modes that made possible the building of referential connections between two different forms of mental representations and the construction of a mental image.

This paper reports on the outcome of a study that was conducted to investigate the effects of integrating multimedia annotations in expository texts on lexical item learning.

### **3 Purpose of study**

The problem addressed in this study was concerned with increasing and improving the learners' vocabulary knowledge through the use of multimedia annotations in a reading passage presented through the medium of a computer. With their vocabulary knowledge thus enhanced, it is believed that they would then very likely be able to understand class discussions and course texts in the target language (Donley and Reppen, 2001).

The main objective of this study was to investigate the effect of two presentation modes of annotations of lexical items in expository texts on the learners' vocabulary learning gain scores. The two presentation modes in this study were multimedia and text-only. The multimedia mode of the annotations consists of graphical representations, namely, pictures, or where applicable, pictures with animation, and text definition. The text-only mode, on the other hand, gives only the text definition.

The research question put forward in this study was: Did the learners' lexical item learning gain scores differ significantly between the multimedia and text-only presentation modes of lexical item annotations in expository texts?

### **4 Research Design**

This study was a quasi-experimental, within-subjects, pretest-posttest design. A within-subjects design is when all the subjects used the same version of a courseware (Chun and Plass, 1996). For the purpose of this study, a single courseware was developed in which the different presentation modes of lexical item annotations, which were the treatment conditions, have been integrated.

The lexical item learning gain scores of the subjects were calculated from their vocabulary pretest and posttest scores. These gain scores were assumed to denote the subjects' lexical item learning. Hence, the gain scores served as the dependent variable. The independent variable, on the other hand, was the presentation mode of lexical item annotations in the expository texts. This variable has two levels – multimedia and text-only.

## **5 Participants**

A total of 120 students in the science and technology field were selected using the random sampling method as participants in this study. They were undergraduates from the schools of Biology, Chemistry, Industrial Technology, Mathematics and Physics in the main campus of Universiti Sains Malaysia, Penang. Although 120 students took part in this study, 11 of them did not complete it. Therefore, only the results of the 109 participants who completed the study were considered in the data analysis.

## **6 Procedure**

This study was conducted entirely in a computer laboratory with one participant to one personal computer. A maximum of 20 participants could be accommodated in the computer laboratory in any one session. They were asked to proceed through the courseware on their own. An interactive guide at the beginning of the courseware showed them how to access the annotations in the reading passages.



The participants were required to attend two sessions in the computer laboratory, with an interval of seven to 10 days between the sessions. The participants, depending on their learning pace, took between 30 to 50 minutes to complete each session.

In the first session, a multiple-choice vocabulary pretest was administered, via the computer, to the participants. Upon completing the pretest, they proceeded to the main component of the courseware, which was the treatment, whereby they read an expository text with annotations. After reading that passage, they were required to complete a multiple-choice vocabulary exercise which was based on the passage, also via the computer. During this vocabulary exercise, immediate feedback was given for the answers they selected.

In the second session, the participants were required to read another expository text with annotations. A vocabulary posttest was then administered to them after they have finished reading that text. The test items in the vocabulary pretest and posttest were the same except for the order of the items.

At the end of each session in the computer laboratory, the researcher collected the log file data of each participant for data analysis. These log files were generated by the courseware whilst the participants were using it. Among the data recorded in each log file were the answers the user selected in the vocabulary exercise, vocabulary pretest and posttest, as well as his scores for each one. A complete record of their actions, i.e., the annotations they accessed while reading the passages were also captured in the log file.

## 7 Courseware

In the courseware, the text of each reading passage was displayed over a few screen pages, with each page occupying the left half of the screen only. The navigation buttons were located at the bottom of the screen while the right half of the screen was reserved for the display of the lexical item annotations.

There were two types of lexical item annotations in the reading passages – multimedia and text-only. In both the reading passages, there were about equal number of lexical items annotated in each type. For lexical items with annotations in the text-only mode, a text definition in English was displayed when the learner clicked on that item in the reading passage. On the other hand, for lexical items with annotations in the multimedia mode, the learner was first presented with a choice of looking up either the picture or the text definition when he clicked on that item in the reading passage. Nevertheless, this choice was not restricted. He could look up both the picture and text definition if he chose to, but these were displayed consecutively, not simultaneously. In addition, the learner could access the annotations as often as he liked and in any order.

## 8 Results and Discussion

The test items in the vocabulary pretest and posttest could be divided into the multimedia mode and the text-only mode. This was because the test items were the annotated lexical items taken from the reading passages. Therefore, to obtain a learner's lexical item learning gain score for a particular presentation mode of annotation, for example the multimedia mode, the score in his vocabulary pretest for items in the multimedia mode (in the reading passage) was deducted from the score in his vocabulary posttest for items

in that mode. Table 1 shows the means and standard deviations of the participants' lexical item learning gain scores for the two presentations modes of annotations available.

Table 1. Means and standard deviations of vocabulary test gain scores for different presentation modes of annotations

	n	Presentation Mode of Annotation			
		Multimedia		Text-only	
		Mean	SD	Mean	SD
Total Sample	109	4.82	2.45	3.48	2.64

From Table 1 it is clear that the learners obtained a higher gain score when lexical items were annotated in the multimedia mode ( $M = 4.82$ ,  $SD = 2.45$ ) compared to those in the text-only mode ( $M = 3.48$ ,  $SD = 2.64$ ). Although it could be argued that since the learners had complete freedom to access either the picture or text definition for lexical items annotated in the multimedia mode, they might not have clicked on the picture; thus invalidating the label of multimedia as the presentation mode for these annotations. Nonetheless, an analysis of the learners' log file data revealed that the pictures in the multimedia mode of annotations were accessed nearly 68%. Hence, it can be inferred that the label of multimedia mode was valid.

The gain scores of the two presentation modes of lexical item annotations were analyzed using a repeated-measures ANOVA, with the (two-level) presentation modes as the within-subject factor. The results are shown in Table 2.

Table 2. Summary table of repeated-measures ANOVA on gain scores by presentation mode of annotations

Tests of Within-Subjects Contrasts							
Measure: MEASURE_1							
Source	MODE	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
MODE	Linear	97.780	1	97.780	23.198	.000	.177
Error(MODE	Linear	455.220	108	4.215			

Note. MODE = Presentation mode of annotations

The results above shows that there was a significant difference in the learners' lexical item learning gain scores between the two presentation modes of annotations,  $F(1, 108) = 23.20, p < 0.001$ . This difference was characterized by the learners performing significantly better in the vocabulary test for lexical items annotated in the multimedia mode compared to the text-only mode in the reading passage.

Results gathered from this study suggest that annotations in the multimedia mode were better retained in memory than those in the text-only mode. These findings were congruent with those of Chun and Plass (1996), Yoshii (2000), and Yoshii and Flaitz (2002). A possible explanation to the present findings was that of dual coding effect (from Paivio's (1979, 1986) dual coding theory), that is, lexical items that have been annotated or coded in two modes – text and picture in the case of the present study – were learned or retained in memory better compared to those annotated in a single mode (i.e., text-only). This outcome was also consistent with what Mayer (2001:78) refers to as multimedia effect whereby “presenting an explanation with words and pictures results in better learning than does presenting words alone.”

## 9 Conclusion

As a conclusion, since the findings of this study clearly showed that lexical item learning was more effective for those coded in the multimedia mode compared to those coded in the text-only mode, it is recommended that expository text instructional materials feature multimedia annotations as a supplementary tool in order to increase and improve learners' lexical item knowledge. With an enhanced repertoire of lexical item knowledge, it is believed that learners' reading comprehension, of expository texts in particular, in the English language will invariably improve.

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