

The Effects of Multimedia Annotations via PDA on EFL Learners' Vocabulary Learning

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Abstract: The purpose of the study is to investigate the effects of different combined annotations with first and second languages for verbal annotations and pictures and animation for visual annotations. It was administered on PDAs to further confirm whether the results are in agreement with those implemented on the desktop. According to the assigned annotation type, four classes of 121 senior high school freshmen in central Taiwan read 4 passages, each of which had 5 target English verbs, annotated in the following ways: L1 definition-plus-graphics, L1 definition-plus-animation, L2 definition-plus-graphics, and L2 definition-plus-animation. These participants took an immediate posttest after reading each and a delayed parallel posttest one month after the experiment. Two-way ANOVA analyses indicated no significant differences between the definition languages but significant differences between the visual aids, with animation more effective; besides, no interaction effects were observed. The findings of definition languages were in line with the previous studies', and this study offered evidence from younger adults and lower proficient English learners. The performance for animation over pictures supported the argument that dynamic animation is designed to illustrate concepts of changes and processes such as English verbs. Directions for future research and suggestions for language practitioners are also discussed.

Keywords: vocabulary learning, multimedia annotations, mobile-learning, PDA

Introduction

Successful vocabulary acquisition lays solid foundations for the mastery of a language. However, for most second language learners, it is hard to be equipped with a large vocabulary. To reduce stress from encounters of unknown words and to enhance vocabulary learning, glosses or annotations on a text are designed. This design increases exposure of the target words and calls learners' attention to them and the information provided by the design helps learners avoid incorrect guesses and inferences in given context (Nation, 2001:175). With the advent of technology, multimedia annotations, the digital genre of glosses, emerge and diversify gloss presentations, which improve learners' reading comprehension and promote their interest in vocabulary learning. Over the past decade, with mobile technologies applied to education, vocabulary learning has become more convenient. Beyond the constraints of time and space, mobile devices render language learning ubiquitous. Proposed systems via mobile devices can provide personalized and context-aware vocabulary, catering to the needs of language learners. Multimedia annotations via mobile devices are worthy of research due to hardware appropriateness, namely the capacity of mobile devices suitable for the installation of multimedia annotations and the screen of mobile devices suitable for the presentation of multimedia

annotations. As the popularity of mobile devices increases, their cost decreases. For future practical and efficient use, studies of multimedia annotations on mobile devices are urgent, but, however, now, still scant; thus, the purpose of this study, which has focus on language used for definition and on visual aids used for illustration.

The present study is guided by the following research questions: Do Chinese and English definitions have different effect on Taiwanese senior high school students learning English verbs? Do still images and dynamic animation have different effect on Taiwanese senior high school students learning English verbs? Is there an interaction effect between definition languages and visual aids on learning English verbs in the case of Taiwanese senior high school students?

1. Literature Review

1.1 Multimedia Annotations

Annotations, the design of textual enhancement, helped language learners better understand reading texts and acquire vocabulary (Hulstijn et al., 1996). As technology advances, multimedia annotations were soon incorporated into digitized materials, presented in diverse modes, verbal and non-verbal, including text, graphics, and videos or animations. This assists learners with reading comprehension and vocabulary acquisition (Chun & Plass, 1996). Proponents of multimedia-based vocabulary learning concentrate efforts on providing most helpful non-verbal aids. Their findings reveal that the effects of annotation are studied based upon a series of theorization of cognitive load from Paivio to Mayer and Mareno (Mayer, 2005).

Paivio's (1990) Dual-coding Theory concerns how information is processed. It states information processed in more than one channel, such as verbally and visually together, is more effective for learning than information processed singularly. The combination of textual and pictorial gloss has a larger positive effect on language learning, including word recognition, vocabulary retention, listening comprehension, reading comprehension, regardless of the text given in L1 (Chun and Plass, 1996; Kost, Foss & Lenzini, 1999; Yanguas, 2009;) or in L2 (Yoshii and Flaitz, 2002; Shahrokni, 2009; Yoshii, 2006).

However, the cognitive load theory (Sweller, 1994) concerns the processing capacities when information is processed. It assumes that multimedia learning processes require cognitive resources but are executed under the constraints of limited working memory. Because a picture involves a higher cognitive load, pictorial annotations hindered the learning of young learners under the condition of text-plus-picture (Acha, 2009). The simultaneous provision of both written and pictorial annotations was not appropriate for learners with lower verbal and visual ability (Chen, Hsieh and Kinshuk, 2008). Vocabulary acquisition was worse for low-verbal and low-spatial ability students when they received visual annotations for vocabulary words (Plass, Chun, Mayer, and Leutner; 2003).

Based on Dual-coding Theory and the cognitive load theory, Mayer (2001) proposed his Generative Theory of Multimedia Learning. It assumes that learners have to actively involve themselves in the selection, organization and integration of the dual-channel information under the condition of limited capacity. The results of the studies are consistent with the theory (Plass, et. al., 2003; Akbulut 2007). It suggests that simultaneous presentation of verbal and visual annotation and elimination of extraneous media modes lead to better learning.

Animation or video, as well as pictures, is one of the suitable visual media especially to depict a series of changes or demonstrate a concept of process. However, annotations of dynamic animation have not yet reached a consensus of their competitiveness with still

pictures (Chun and Plass, 1996; Al-Seghayer, 2001; Akbulut, 2007). Considering these researchers includes in their studies diverse parts of speech, nouns, adjectives, verbs, etc., animation can't exert its distinctive effect to the full. So there is one issue that needs to attend to is whether or not dynamic graphics instead of static one are employed to annotate concepts of changes and processes.

1.2 Mobile-Assisted Vocabulary Learning

Mobile devices enable language learning to proceed in unprecedented ways. Whether cell phones, MP3/MP4 players, personal digital assistants (PDAs), smart-phones, or tablet PCs, mobile devices share such features as portability, immediacy, connectivity, and social-networking. These features have built language learning the threshold for mobile-learning (m-learning), ubiquitous-learning (u-learning), and seamless learning (Kululska-Hulme & Shield, 2008). Of all published studies on mobile-assisted language learning (MALL), mobile-assisted vocabulary learning received most attention. The reasons can be that compared with those in listening, reading, writing tasks, the contents of vocabulary learning are similar to those of short messaging service (SMS), which learners are able to finish reading in very few screens, and don't overload vocabulary learners in terms of temporal and environmental factors.

Studies on mobile-assisted vocabulary learning reveal mobile devices are endowed with strengths in facilitating vocabulary learning. First, mobile devices are a successful interest trigger, which arouses learners' greater interest in learning vocabulary, as in Thornton and Houser's project, *Vidioms* (2005), and in a series of personalized systems (Chen & Chung, 2008; Chen & Hsu, 2008; Chen & Li, 2010). Learners displayed positive attitudes towards mobile-assisted vocabulary learning (Lu, 2008; Kennedy & Levy, 2008). Many studies found that, compared with classroom instructions, paper-and-pencil learning, and personal computers with the access to the Internet, the effects of using mobile devices on vocabulary learning were significantly better, regardless of learners' age and proficiency (Thornton & Houser, 2005; Lu, 2008; Basoglu & Akdemir, 2010; Sandberg et al, 2011), except for a series of studies by Stockwell (2010). Second, mobile devices transcend the learning barriers to the classroom and further enable informal learning out of the classroom to complement formal learning in the classroom. Learners believed mobile devices are efficient because of their accessibility and portability (Basoglu & Akdemir, 2010). Repetitive delivery of SMSs caused the learning process to take place out of the classroom environment (Cavus & Ibrahim; 2009). Most agreed that the PDA enables them to perform English ubiquitous learning (Chen & Chung, 2008; Chen & Hsu, 2008; Chen & Li, 2010), reading or vocabulary learning. Besides, for school children mobile devices could promote seamless vocabulary learning after class hours (Wong & Looi, 2010) and formal school learning can be enhanced by learning in an informal context away from school (Sandberg et al, 2011); college students would also use networked computers in association with mobile devices to respond to their own requests for vocabulary learning (Song & Fox, 2008). Third, the mobile device works successfully as a platform. Researchers' self-developed systems range from vocabulary service systems (Thornton & Houser, 2005) to personalized systems (Chen & Hsu, 2008) to those equipped with context awareness features (Chen & Li, 2010) to game-incorporated MEL-application (Sandberg et al, 2011).

With all these advantages from previous studies, multimedia annotations for mobile-based vocabulary learning need studying. First and foremost the results of multimedia annotations on PC-based and web-based platforms need to be confirmed on mobile devices. This study asks two questions regarding the language of textual definitions and the visual aids for target words. Yoshii (2006) found no differences between learners' L1 (Japanese) and L2 (English)

for textual definitions on college students. This study tested on young adults, freshmen in a senior high school in central Taiwan. Whether or not the language issue remains insignificant among younger learners is key to acquisition and pedagogical practice. As for the types for visual aids, this study followed the instructional principle that dynamic animation be used for expressing concepts of changes and processes. Verbs were then the target words.

2. Methods

A total of 121 students participated in this study, who came from four freshman classes in a senior high school in central Taiwan. They were chosen because they just passed the joint high school entrance examination and entered the same high school according to their scores. This meant that they performed almost equally in academic achievement and were supposed to be equipped with 1,000 basic English words suggested by Taiwan's Ministry of Education. These participants were randomly assigned to one of the 4 annotation groups. These learners, equipped with 1000 basic English words, were regarded pre-intermediates in terms of English proficiency and had never done their vocabulary learning on PDAs.

Four stories were selected as reading materials in this study according to their length and readability, examined by the English teachers and two assistants. Five verbs as the target words in each story, totaling 20 target words, were annotated with four annotation types: L1(Chinese) definition plus pictures, L1 definition plus animation, L2 (English) definition plus pictures and L2 definition plus animation. As far as each target word is concerned, animation for annotation, whose clear illustration of the target verbs was evaluated by the English teachers and two assistants, was chosen from the on-line animation bank and one frame of the animation was taken as the picture annotation. The screenshots of the annotation presentation for one of the target words are as follows (Figure 1):



Figure 1: Chinese (left) and English (right) annotations of *plead*

The instruments in the study included a pretest and two posttests. The pretest was designed to assess the participants' prior knowledge of the target words, consisting of 20 target words and 10 distracters. The parallel posttests included the immediate posttest and delayed one. The former was administered on the PDA and was given to have an understanding of vocabulary learning after each story, containing three types of questions, five questions in each type, with a total of 15 questions in each story and 60 questions in the whole posttest. Participants were asked to answer a target word next to a given word definition in definition questions; to fill in each blank with a target word in sentence cloze questions; and, to match a target word with its definition given in matching questions (Figure 2). Chinese definitions were given to two Chinese groups, English ones to two English groups. The delayed posttest was parallel with the immediate but administered with paper and pen.

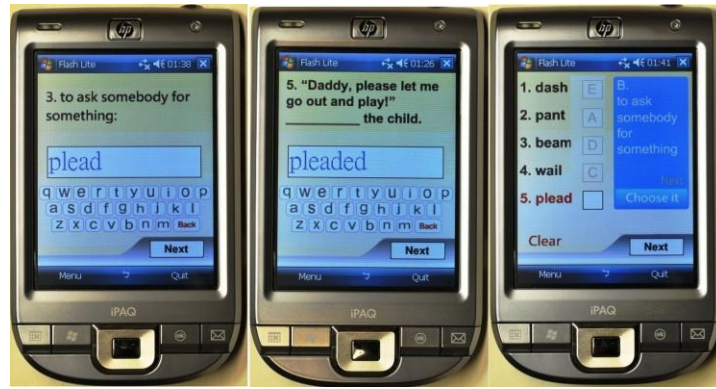


Figure 2: The snapshots of three types of tests

The treatment was done in the following procedure. Prior to the treatment, the participants were asked to take the pen-and-paper pretest and were given instructions on the operation of PDA. During the treatment week, the participants were required to finish 15 questions after reading each story on PDAs. One month later, all participants were asked to take the pen-and-paper delayed posttest without prior announcement. Each correct answer was counted one point. The highest point of the pretest is 30 and that of the posttest is 60. One-way ANOVA was applied to the pretest and two-way ANOVA was applied to analyze the results of the posttests.

3. Results and Discussions

The results of the pretest scores analyzed by one-way ANOVA showed that there were no significant differences among the four groups ($F(3,117)=1.517$, $p=.214$) and that our participants hardly knew the 20 target words ($M=.99$, $S.D.=1.814$). The descriptive statistics of the two posttests are shown below (Table 1).

Table 1. Descriptive statistics of the posttests

Groups	N	Immediate Posttest		Delayed Posttest	
		M	S.D.	M	S.D.
Chinese Pictures	30	33.77	13.174	18.37	10.775
Chinese Animation	30	45.63	11.291	21.50	9.350
English Pictures	30	33.97	15.655	19.83	13.228
English Animation	31	38.87	13.358	15.55	8.687

The two-way ANOVA was used to analyze the scores of the immediate posttest with languages and visual aids as two independent variables. The results revealed no significant differences between the two definition languages ($F(1,117)=1.798$, $p>.05$), suggesting Chinese definitions and English definitions did not differ in their effectiveness for helping our participants learn the English verbs. The analyses, however, manifested significant differences between the two visual aids ($F(1,117)=11.742$, $p<.05$), in which the animation groups ($M=42.252$, $S.D.=1.723$) outscored the pictures groups ($M=33.867$, $S.D.=1.737$). These indicated that animation annotations were significantly more effective than pictures annotations for learning the target English verbs. There were no significant interaction effects between the two independent variables ($F(1,117)=2.024$, $p>.05$). The two-way ANOVA of the delayed posttest failed to show significant differences between the two definition languages ($F(1,117)=1.344$, $p>.05$) and between the two visual aids ($F(1,117)=.089$, $p>.05$). These indicate that Chinese definitions and English definitions did not differ, neither did pictures and animation, in their effectiveness for retrieving the

meanings of English verbs learned among our participants. Their interaction effects were not significant ($F(1,117)=3.677, p>.05$).

In line with Yoshii's findings (2006), the results of this study revealed no significant differences between Chinese and English used in the definitions of multimedia annotations. In Yoshii's study, English learners' mother tongue (Japanese) and the target language (English) were compared and Japanese college learners of English found both Japanese and English definitions helpful to their learning and acquiring the target words with or without pictures. However, in this study, English learners' mother tongue (Chinese) and the target language (English) were compared and Taiwanese senior high school students found there were no significant differences in the effect of Chinese definitions and English definitions while they learned the English verbs. The present study further confirmed that Taiwanese senior high school students, younger adults and less proficient English learners, could maintain their learning of English verbs with either Chinese or English definitions together with some visual aid. Pedagogically, the concern of avoiding using English to explain or define English words derives from a worry about learners' proficiency levels. However, drawn from Yoshii's study and the present study, it is highly recommended that teachers employ the target language to explain vocabulary together with some kind of visual aids to facilitate vocabulary learning. For one thing, language learners benefit from learning vocabulary meanings from L2 definitions as well as from L1 definitions. For another, compared with learners given L1 definitions, those given L2 definitions need to mentally exercise more to make the connection between the L2 definitions and the visual aids available (Yoshii, 2006). This deep processing of target words in L2 gives the learning in L1 no advantages. What's more, the provision of the target language exposes learners to the target language longer, increasing learners' learning opportunities

As had been expected, in this study, with English verbs as the target words, two groups with access to dynamic animation significantly outperformed the other two with access to still pictures in the immediate posttest. However, they didn't sustain their retention of the target words in the delayed posttest. From the comparative studies on dynamic films/animation and still images/pictures (Akbulut, 2007; Al-Seghayer, 2001; Chun & Plass, 1996), the findings are not yet conclusive; however, the premise of using video, films, or animation was not observed used to test verbs in the past studies. In the pioneer study of multimedia annotations, Chun and Plass (1996) used different nouns, verbs, and adjectives, 4 in a syntactic category and 12 in total, for each type of annotations, including text, text and pictures, and text and animation (p. 198). So did Al-Seghayer (2001) and Akbulut (2007), where Al-Seghayer included equal amount of nouns (7), verbs (2), and adjectives (1) for each type of annotations (p. 213) and Akbulut simply annotated target words without informing readers of their syntactic categories (p. 505). Chun and Plass' American college learners of German found texts and pictures more effective than texts and video, but Al-Seghayer's international learners of English found the otherwise. As for Akbulut's Turkish college learners of English, the two annotations did not differ. Three reasons for explaining the dynamic favoritism given by Al-Seghayer (pp. 224-225) are that compared with pictures, films are easier to remember, films are easier for users to concentrate, and films have more redundant information. Likewise, designed to illustrate concepts of changes and processes as in English verbs in the present study (Mayer, 2005), animation offers our participants sufficient information to create mental images of the target English verbs. This goal of illustrating verbs was attained.

4. Conclusions

This study administered on PDAs examined the effectiveness of different combination glosses on EFL learners' vocabulary learning with particular focus on comparison between different language types and between different visual aids. It tried to confirm the effect of using the target language for definitions and that of using dynamic images for illustrations. Unlike previous studies, this study concerned the use of English to explain verbs to young adults at a senior high school in Taiwan; it also focused its efforts on annotating English verbs by using animation. The findings that our young learners of English found no differences in learning the target words from Chinese and English definitions are in agreement with Yoshii's (2006). The findings that our senior high students performed better when given animations than pictures on learning English verbs add a piece of evidence supporting the premise of using dynamic images for concepts of changes and processes. The suggestions for language practitioners, therefore, are as follows. Images, in general, help EFL learners retrieve word meanings; and, classroom teachers should take advantage of them, both dynamic and static. Links to dynamic images from free online sources are highly recommended for explaining lexical concepts of changes and processes. With the assistance of images, language teachers should encourage students to learn unknown words defined in the target language, found in monolingual dictionaries. To avoid incorrect guessing and improper inferences, classroom teachers can have a check of meanings after presentations of target words.

The following are some suggestions for future research. There were two limitations to this study: the media and the tests. Films should also be used as one of the annotation types. However, they were not used because of the capacity limitations of the PDA. Films may involve features different from those of animations and of pictures. If films are included as one of the visual aids, how they affect vocabulary learning may be demonstrated. Besides, all tests designed for the study should have been administered on PDA so that three-way ANOVA could be conducted, time of measurement being the within-subject factor. In this way, it can be observed whether there is difference in the effect of different language types and of different visual aids on retention of vocabulary. Thus, the immediate needs for future study are to include films for multimedia annotations and time for data analysis. Other than the media and the test issues, the directions for future study should also incorporate features of mobile devices in mobile-assisted vocabulary lessons, for example, context awareness as demonstrated in Chen and Li (2010). Language learners should find it facilitative when learning vocabulary with the assistance of multimedia annotations and mobile technologies. Rich contextual and instant information not only enhance vocabulary learning but also ensure vocabulary retention. Last, all the findings on annotations may be experimented on the e-book so that language learners and readers may profit more with the popularity of the e-book.

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