

MOBILE ENGLISH VOCABULARY LEARNING BASED ON CONCEPT-MAPPING STRATEGY

Pei-Lin Liu, National Chia-Yi University

Numerous researchers in education recognize that vocabulary is essential in foreign language learning. However, students often encounter vocabulary that is difficult to remember. Providing effective vocabulary learning strategies is therefore more valuable than teaching students a large amount of vocabulary. The purpose of this study was to encourage teachers to apply these strategies by using mobile phones and technology to facilitate vocabulary learning. Participants were divided into learner-constructed concept-mapping and text-only strategy groups. The concept-mapping group received the vocabulary instruction according to the concept maps constructed by the students themselves while the other group received the vocabulary in a random order. The research question was as follows: Does mobile English vocabulary learning based on concept-mapping strategy have a significant effect on EFL learners' vocabulary performance? For vocabulary learning acquisition and retention, the concept-mapping group performed significantly superior to the text-only group.

Language(s) Learned in this Study: English

Keywords: Concept Mapping, Computer-assisted Language Learning

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INTRODUCTION

Vocabulary knowledge is one of the most crucial elements in foreign language performance, particularly in academic settings (Chen & Chung, 2008; Huckin, Haynes, & Coady, 1993). Most language learners feel that learning vocabulary is not an easy task, and many of them have trouble memorizing large amounts of vocabulary or applying it appropriately (Oxford, 1990; Schmitt, 2010). Therefore, English as a Foreign Language (EFL) learners could use effective learning tools and memorizing strategies to facilitate their vocabulary learning.

Using mobile technology as learning tools has been proven effective for self-learning nearly anytime and anywhere; this is known as *ubiquitous learning* (Chinnery, 2006; Hwang & Chang, 2011; Hwang & Tsai, 2011; Hwang, Chu, Lin, & Tsai, 2011; Hwang, Shi, & Chu, 2011). Research has suggested that mobile phones are useful learning tools which can support language learning and teaching (Cavus & Ibrahim, 2009; Chinnery, 2006; Liu & Chen, 2014). In traditional language teaching, it is difficult for students to learn language anytime and anywhere. Mobile phones are optimal for students to learn language ubiquitously.

Learning strategies are steps taken by students to enhance their own learning. Appropriate language learning strategies result in improved proficiency and substantial motivation (Oxford, 1990). To transform pure data into useful knowledge systematically, concept mapping is an effective strategy for language learning (Brown, 2001). Novak (1972) developed a concept-mapping strategy to help learners organize their memorization by storing and retrieving information effectively. Concept-mapping strategies are crucial for enhancing recall because people seemingly organize words into groups unconsciously (Cohen,

1998; Schmitt & McCarthy, 1997). Concept mapping features a primary concept in the center of the map and involves using arrows to connect keywords, forming a graph (Oxford, 2013), thus supporting learners' organization of information through visual aids, such as by depictions of relationships among concepts or groups of words in a diagram. In information processing, concept mapping can stimulate learners' metacognitive awareness, which helps them to monitor their learning and retrieve knowledge (Chen & Chang, 1997; Li, 1998; Liu, 2010, 2011; Liu, Chen, & Chang, 2010; Novak & Musonda, 1991).

In addition to a purely verbal approach, combining concept mapping and ubiquitous technology provides a visual and innovative approach to learning. Numerous studies have examined the effects of using instant messaging (IM) in language education (Bowman, Levine, Waite, & Gendron, 2010; Cavus & Ibrahim, 2009; Collins, 2005; Sandberg, Maris, & de Geus, 2011), whereas other studies have investigated the effects of concept mapping in language learning (Hall, Dansereau, & Skaggs, 1992; Liu, 2014a, 2014b; Liu et al., 2010; Scevak, Moore, & Kirby, 1993). However, no research has examined the effects of incorporating concept mapping with IM as a learning strategy for EFL learners to memorize English vocabulary. This study focused on meaningful learning by associating IM with the concept-mapping strategy.

The primary goal of this study was to examine the effects of integrating concept mapping with IM on memory retention by using mobile phones for EFL college students. The main research question was as follows: Does mobile English vocabulary learning based on concept-mapping strategy have a significant effect on EFL learners' vocabulary performance? The hypothesis was that mobile English vocabulary learning based on concept-mapping strategy would have a significant and positive effect on students' vocabulary learning performance.

LITERATURE REVIEW

The most effective solution for overcoming EFL learners' difficulty in memorizing new vocabulary is to learn appropriate instruction, or *rich instruction* (Beck, McKeown, & Omanson, 1987; McWilliam, 1998). This involves paying elaborate attention to a word and extending the immediate demands of a particular context of occurrence (Nation, 2001). EFL learners should apply a mnemonic technique, such as the concept-mapping strategy, which facilitates linking a word with its meaning. In the following sections, the researcher first summarizes research on vocabulary learning and then presents the concept-mapping strategy applied in vocabulary instruction. The applications of IM in language learning are also addressed.

Vocabulary Learning

Past studies on reading considered vocabulary knowledge crucial for variation in the reading process, particularly because it affects high-level language processes such as grammatical processing and construction of schemata (August, Carlo, Dressler, & Snow, 2005), and also for overall academic success (Harris, Schumaker, & Deshler, 2011). Learners who experience slow vocabulary development may have higher risk for encountering difficulties in oral or text communication when compared with their peers. Studies have confirmed the high correlation between vocabulary knowledge and reading comprehension (Dalton & Grisham, 2011).

The multistore model by Atkinson and Shiffrin (1971) may explain the vocabulary information processing procedure. The researchers proposed that the human memory system could be divided into three components: sensory memory, working memory, and long-term memory. Information from the environment that people acquire through their senses enters the system through the sensory memory, which receives information from the environment and stores it fleetingly. The working memory is a mental processing unit in which information may be stored temporarily. The working memory is also a work space where a decision must be made either to discard information or to transfer it to permanent storage. The long-term memory is a unit in which information may be stored permanently and from which

it may be later retrieved. To assist learners in storing information in their long-term memory for vocabulary acquisition, the use of learning strategies is recommended.

In Taiwan, most students learn language primarily by reading and copying definitions. Some teachers use this strategy by listing vocabulary words and definitions on the board from the textbook glossary and then requiring students to copy them. Other teachers may require students to look up definitions in the dictionary. Yet many learners still have trouble memorizing the large amounts of vocabulary (Weng, 2010).

Teaching and Learning Vocabulary with Concept Maps

Concept mapping is a vocabulary learning strategy. The strategy involves arranging words into a picture with a core concept at the center or at the top and related words linked with the key concept by lines (Oxford, 2013). The visual display of a concept map emphasizes the connections between words (Baumann & Kame'enui, 2004).

Different theoretical frameworks have been used to explain how concept maps are linked to textual information in comprehension. Concept maps provide guidance in converting information into a structure. Another theoretical framework was described in Paivio's (1986) dual-coding model, which processes maps visually and processes texts verbally, thereby mobilizing all the available resources in working memory. Cognitive load theory refers to the total amount of mental effort being used in the working memory. According to the implication of cognitivism, concept maps can reduce cognitive load and promote direct attention on learning. All of these models share the principle of limited working memory resources. Concept maps mobilize increased resources in working memory, enabling learners to construct a mental model that supports learning processes (Amadiou & Salmerón, 2014).

Adopting concept mapping in vocabulary learning provides a framework for organizing conceptual information in the process of defining a word. A typical concept map or graphic organizer places the vocabulary word at the center and includes additional links or concepts connected to the central word. Before reading a text, it is advantageous to become acquainted with key vocabulary terms that will guide the reading and analysis of the text. The meta-analysis of Dexter and Hughes (2011) reviewed experimental and quasi-experimental studies of students with learning disabilities who learned using graphic organizers. The findings indicated that use of concept maps was associated with increases in vocabulary knowledge, comprehension, and inferential knowledge.

Palmer, Boon, and Spencer (2014) compared a dictionary approach with a learner-constructed concept-mapping model in the learning of vocabulary words of four seventh-graders with mild disabilities. For the dictionary instruction approach, each student looked up a vocabulary word in the dictionary, and then wrote the word in a sentence on notebook paper. In the concept-mapping approach, the students completed a concept map that displays the definition of a word, and then wrote the word in a sentence. Results revealed significant improvements for all students in their vocabulary learning associated with the use of the concept-mapping model compared with the dictionary approach. Another study on using the learner-constructed concept-mapping strategy and its effects on vocabulary learning is the work of Jackson, Tripp, and Cox (2011). To support vocabulary development in science, they used interactive science word walls that resembled concept maps, strategically targeted academic vocabulary, and were student generated. The mapping strategy was useful to students not only in unifying related terms and concepts, but also in assisting them to visualize connections between vocabulary and their own interests and experiences (Shirzadeh, Soleimani, & Lotfi, 2014).

The expert-constructed concept map is used to train learners in comprehension of a text and to save instructors time in teaching (Liu, 2010). Margosein, Pascarella, and Pflaum (1982) randomly assigned junior high school students to two vocabulary instruction treatments. One involved using context-rich passages as sources for target word definitions, whereas the other involved applying concept-mapping treatment, which entailed learning new words by identifying the similarities and differences in related

words. The results indicated substantial effects favoring the concept-mapping strategy on general vocabulary knowledge. The findings suggest that focusing on the connections of a word with related, known words may be an effective instructional method for learning new vocabulary.

Concept maps facilitate logical thinking (Ritchhart, Turner, & Hadar, 2009). They serve as visual organizers to promote learning (Dunston, 1992) and are especially effective in teaching technical vocabulary (Readence, Bean, & Baldwin, 1989). In addition, concept mapping promotes other skills such as reflection, a self-regulatory process that is related to motivation, self-control, and self-efficacy. In other words, concept mapping increases learners' motivation in the classroom (Soleimani & Nabizadeh, 2012). The overall attitudes of learners toward concept mapping were positive. Additional research has revealed that concept mapping may be more useful when the organizers are constructed by the students rather than by the teacher (Moore & Readence, 1984; Phillips, Foote, & Harper, 2008).

IM as Support for Foreign Language Learning

IM technology enables the creation of a variety of content, ranging from text-only to multimedia content (including audio and visual content) that can be delivered electronically to mobile phones (Collins, 2005; Lu, 2008). The difference between IM and other delivery mechanisms on mobile devices is that users are engaged in quasi-synchronous communication (Verma, 2013). Mitchell, Heppel, and Kadirire (2002) indicated that the primary reason for the high sending rate of IM is low price (relatively inexpensive compared with voice communication) and asynchronous communication (when to read and reply to messages is at the user's discretion). Short message service (SMS) is the most rudimentary, allowing the transmission of simple text messages. Multimedia message service (MMS) allows the integration of visual, audio, and text. Consequently, numerous studies have used SMS and MMS with mobile phones to facilitate learning. Research has largely concentrated on English reading (e.g., Ng, 2012; Zhang, Shan, & Wang, 2012), understanding the context of an English sentence (e.g., Ng, 2012; Simon, Razak, & Lee, 2012), and English vocabulary learning (e.g., Cavus & Ibrahim, 2009; Chen & Chung, 2008; Lu, 2008; Sandberg et al., 2011). The results of these studies have indicated that using IM as a learning tool yields positive effects on learning, particularly for optimizing time spent learning English through reading. Therefore, IM is a useful tool in assisting students to recall English vocabulary.

Thornton and Houser (2005) used mobile phones to teach English at a Japanese university and compared the differences between web-based learning and SMS-based learning. Three times a day, students received short lessons through e-mails that divided large lessons into chunks which could be read easily on small screens. The lessons defined five words per week, recycled previous vocabulary, and involved using the words in various contexts including episodic stories. The results indicated that students who learned using SMS remembered more than twice the number of vocabulary words than students who learned through the web interface. The authors concluded that their lessons were effective because SMS is a push medium for promoting frequent rehearsal and spaced study that enhances the retention of recycled vocabulary (see Chinnery, 2006).

Lu (2008) examined the effectiveness of SMS vocabulary lessons of limited lexical information provided through the small screens of mobile phones. 30 Taiwanese high school students were randomly divided into two groups and given two sets of English words either on paper or through SMS messages over two weeks. The post-test results revealed that students recognized more vocabulary after reading the brief SMS lessons than they did after reading the more detailed printed material.

Levy and Kennedy (2005) created a program for learning Italian through mobile SMS in an Australian university context. Vocabulary words and idioms, definitions, and example sentences were sent to the mobile phones of students between course lessons and tutorials. Feedback was requested in the form of quizzes and follow-up questions. The same authors reported similar findings on this topic in a later study (Kennedy & Levy, 2008) that entailed sending SMS messages at a substantially lower frequency and with higher-information content. Although they noted improved results, they found that each user had different

preferences related to the rate and information content of the messages.

A similar SMS-based program called a mobile learning tool, developed by Cavus and Ibrahim (2009), entails using wireless technologies in education, particularly for learning technical English vocabulary by using text messaging. Spaced repetitions of the same messages were sent on different days to test 45 Turkish undergraduate students. Outside the regular classroom environment, students completed daily activities and learned new technical words.

Chen, Hsieh, and Kinshuk (2008) used SMS and MMS messages for learning English vocabulary. Because of the limited screen size of mobile phones, they presented materials by using various learning-content representation types. The researchers experimented with four types of annotation: words only, words with written annotation, words with pictorial annotation, and words with both written and pictorial annotations. The findings showed that providing learning content with pictorial annotation in a mobile language learning environment helps learners with low verbal but high visual ability to learn content presented in a visual rather than a verbal form. Providing learning content with both written and pictorial annotation can also help learners with both high verbal and high visual abilities. Furthermore, the study demonstrated the validity of both dual coding and cognitive load theories (i.e., using more than one modality is more effective than using a single modality).

Cell phones provide an active environment of language learning for students to learn English independently. The aforementioned studies refer to authors who have conducted experimental studies related to IM for vocabulary learning. Although learners in each study had different preferences related to the rate and information content of instant messages (Kennedy & Levy, 2008; Levy & Kennedy, 2005), most of the findings showed positive effects. The findings described that IM is an effective application for expanding learners' vocabulary (Cavus & Ibrahim, 2009), facilitating users' vocabulary retention (Chinnery, 2006; Thornton & Houser, 2005), reducing students' learning difficulties (Chen et al., 2008), and enhancing learners' performance when compared with traditional teaching strategies (Lu, 2008). SMS served as a reminder to acquire new English vocabulary words.

METHODOLOGY

Experimental Design

The researcher used a quasi-experimental design in this study. Participants ($N = 100$) were randomly assigned to two groups, and both groups received vocabulary lessons via IM. The difference between the treatment groups was the IM learning strategies, which were the concept-mapping strategy ($n = 50$) and text-only strategy ($n = 50$). Because research has revealed that concept maps are more useful if the organizers are constructed by the learners rather than by the instructor (Moore & Readence, 1984; Phillips et al., 2008), the researcher used the learner-constructed concept map approach as the concept-mapping strategy.

1. Concept-mapping group: To learn the 32 target vocabulary words, students in the concept-mapping group were instructed with a concept-mapping strategy and asked to construct their own vocabulary maps that were to be used in conjunction with the MMS messages they received.
2. Text-only group: For the text-only group, the instructor used traditional instruction (e.g., vocabulary meaning explanation and sentence example) with the SMS messages that the students received to learn the 32 target vocabulary words.

Participants

Two classes of 100 freshmen consisting of 48 men and 52 women were invited to join the study. The mean age of participants was 19.37 years, ranging from 18 to 22 years. They had been learning English for six years on average. They studied in different fields such as architecture, management, and

engineering. Their English proficiency level was intermediate according to their scores on the General English Proficiency Test (GEPT). The GEPT was administered by the Language Training and Testing Center in Taiwan. This test corresponds to Taiwan's English education framework, and provides institutions and schools with a reference for evaluating the English proficiency levels of their job applicants, employees, or students. A participant with intermediate level based on the test is regarded as able to use basic English to communicate in daily life. The average English proficiency of each class was supposedly equal.

Reading Material

The researcher used nine papers in the high-intermediate level of a learning English magazine as the reading materials in the study. The magazine was used as the reading material because it was designed specifically to help learners improve their English conversation skills. It also prepared students for academic success in college life through practical and interesting content. Readings included textbook passages, essays, letters, and website articles. Vocabulary was presented before each reading and was used throughout the article. This magazine was the most popular English-teaching magazine in Taiwan.

Test

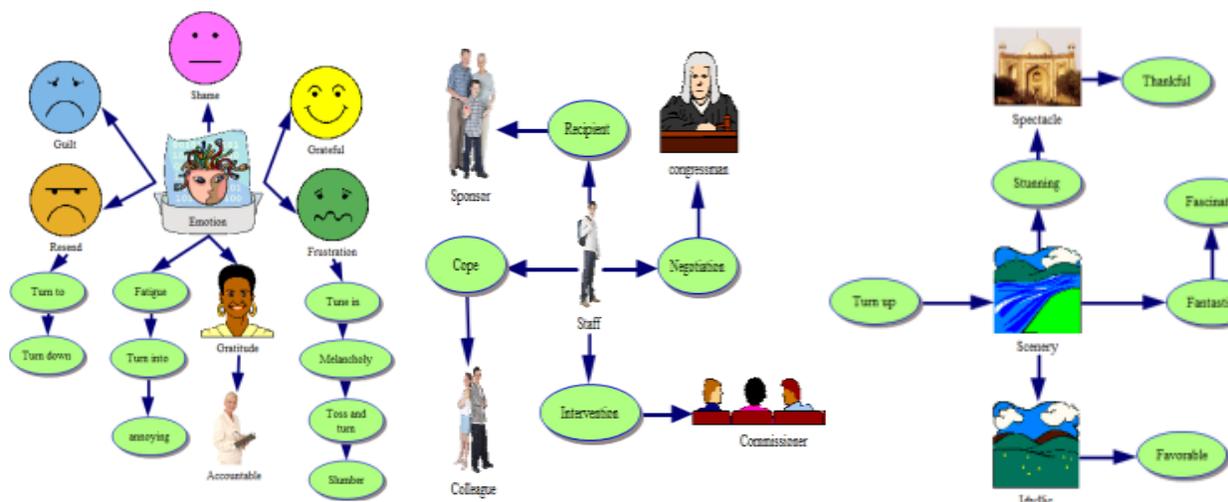
The preliminary test was used to collect information on participants' vocabulary proficiency in the English reading material. It adopted 100 vocabulary words of the nine articles in the form of a word-definition fill-in format. For each tested word, participants were required to write down their first language (Chinese) translations. After conducting the preliminary test, 32 target vocabulary items were retained, whereas 68 were filtered out. The results of the paired *t*-test confirmed no significant difference in the preliminary test of the two groups.

One week after receiving IM vocabulary lessons, a post-test was administered, followed by a delayed post-test after another week. The purpose of the post-test was to determine the learners' vocabulary acquisition, and the delayed post-test was conducted to evaluate vocabulary retention. The test content consisted the same 32 translation items for the post-test and delayed post-test. The total score of each test was 32 points.

Concept Mapping

A concept map is a diagram showing the relationships among groups of words, and concept maps were used in this study to support learners' organization of information through visual aids. The learners were taught how to draw a concept map by themselves by using the Inspiration software, and constructed their maps by using computers. After completing the maps, the students submitted their maps, the explanations of the maps, and the sending schedules to the instructor online (for sample maps and a sending schedule, see [Figure 1](#)). Having learners construct concept maps allowed them to show their teachers how they linked vocabulary together, a learning strategy not possible when learners have to simply memorize facts in a linear method. There are several methods to constructing concept maps. Most include the following steps:

1. Identify the major concepts regarding a selection of vocabulary words.
2. Organize the ideas into categories. Remind students that the organization may change as they continue to read and add information.
3. Use lines or arrows on the map to represent how vocabulary words are connected to one another, a particular category, or the main concept.
4. After students have finished the map, encourage them to explain their decisions of where they placed each word and the relationship between words.
5. Encourage students to use the concept map to memorize the vocabulary.



Sending Day	Main categories	Subcategory	Related vocabulary
Week 1	Mon.	Emotion	(1) fatigue (2) turn into (3) annoying
	Tues.		(4) resend (5) turn to (6) turn down
	Wed.		(7) frustration (8) turn in (9) melancholy
Week 2	Thur.	Emotion	(10) toss and turn (11) slumber
	Fri.		(12) guilt (13) shame (14) grateful
	Sat.		(15) gratitude (16) accountable
Week 2	Mon.	Staff	(17) intervention (18) commissioner
	Tues.		(19) negotiation (20) congressman
	Wed.		(21) recipient (22) sponsor (23) cope (24) colleague
Week 2	Thur.	Scenery	(25) stunning (26) spectacle (27) thankful
	Fri.		(28) fantastic (29) fascinate
	Sat.		(30) idyllic (31) favorable (32) turn up

Note. Each student may have different concept maps and sending schedule.

Figure 1. Concept maps developed by one of the students and the MMS sending schedule.

Instant Messages

The concept-mapping group and text-only group received the same 32 target vocabulary items sent by IM once per day during the two-week experiment. For the concept-mapping group, the vocabulary items were sent according to participants' sending schedule. Students received two or three vocabulary items per day on average. Students created their own concept maps and explanations in the concept-mapping group during Weeks 2 and 3, and they were instructed to refer to concept maps in conjunction with the MMS messages they received regarding the target vocabulary.

The vocabulary delivered by SMS to the text-only group was composed of English vocabulary by their syntactic categories, Chinese translations, and example sentences. The new vocabulary was also provided

at the onset to the text-only group to ensure that they had the same amount of time for preparation and review as the concept-mapping group had.

Procedure

A preliminary test was administered in the first week, and the results confirmed that there was no significant difference in vocabulary comprehension between the two groups. In the following two weeks, participants in the experimental group received MMS messages regarding the 32 English words in the students' concept map categories, at the rate of two to three words per day. The participants were able to see the overall structure of the concept map in each MMS by clicking on a "View" button. Participants in the text-only group received SMS messages regarding the same 32 English words without concept maps, at a similar rate as the experimental group. The messages were sent every day by using WhatsApp Messenger over a six-day period (from Monday to Saturday). All of the participants received the English vocabulary lessons once per day.

In Week 4, after the final messages of English words were delivered, the post-test was administered to both groups. During the fifth week, the delayed post-test was administered to the participants. During the same week, group interviews were conducted. Each group consisted of five participants and they were interviewed for approximately 15 min about their feelings and opinions regarding the experiment.

RESULTS

To examine the effects of using the mobile-assisted concept-mapping vocabulary learning strategy on vocabulary performance of EFL learners, two independent-sample *t*-tests were conducted to compare memory for vocabulary in text-only and concept-mapping conditions (see Table 1). There was a significant difference in the post-test scores for text-only ($M = 25.95$, $SD = 12.36$) and concept-mapping ($M = 31.69$, $SD = 10.76$) treatments ($t = -2.02$, $p = .04$). For the delayed post-test, the differences in the learning strategies between the two groups were also significant ($t = -3.32$, $p = .00$). The concept-mapping group significantly outperformed the text-only group on both post-tests. These results suggest that the concept-mapping MMS learning strategy had a positive effect on memory for vocabulary.

Table 1. Results of Independent *t*-tests of Two Groups on the Post- and Delayed Post-tests

	Text-only group			Concept-mapping group			<i>MD</i>	<i>t</i>	<i>p</i>
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>			
Post-test	50	25.95	12.36	50	31.69	10.76	-5.74	-2.02	.04*
Delayed Post-test	50	20.68	13.28	50	29.90	13.06	-9.22	-3.32	.00*

Note. * indicates $p < .05$

To determine whether there was any statistically significant difference between students' success rate on vocabulary retention in the post-test and delayed post-test, a paired-samples *t*-test was performed and the results are shown in Table 2. Results clearly indicate that using the concept-mapping MMS learning strategy, students had lower decrease rates ($MD = -1.79$) than did students using the text-only SMS learning strategy ($MD = -5.27$). A paired-samples *t*-test based on post-test and delayed post-test results indicated a significant difference between the two tests ($t = 2.05$, $p = .04$) for the text-only group; however, no significant difference was found between the two tests ($t = .96$, $p = .34$) for the concept-mapping group. Through the MMS concept-mapping learning process, learners were able to more easily recall vocabulary over a longer period of time.

Table 2. Results of Paired *t*-test of Two Tests on the Text-only Group and Concept-mapping Group

Tests	Post-test			Delayed post-test			<i>MD</i>	<i>t</i>	<i>p</i>
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>			
Text-only group	50	25.95	12.36	50	20.68	13.28	-5.27	-2.05	.04*
Concept-mapping group	50	31.69	10.76	50	29.90	13.06	-1.79	-0.96	.34

Note. * indicates $p < .05$

DISCUSSION

Although several previous studies have reported the effectiveness of the concept-mapping approach, the effects of using mobile technologies with concept-mapping activities on students' learning performance still required investigation. The experimental results show that the students who learned using both the MMS and the learner-constructed concept-mapping strategy revealed significantly superior performance in terms of their vocabulary acquisition and retention. These findings are consistent with those of Liu et al. (2010) and Liu (2011, 2014a, 2014b), in that applying the concept-mapping strategy had a direct influence on learners' English learning ability.

To investigate the factors affecting the performance of the students in the experimental group, an in-depth group interview was arranged. The interview results showed that most of the students in the mapping group thought that learning English words with the assistance of concept maps and the word association information enhanced their memorization. One participant mentioned, "I think that the words I learned are organized in a semantically related way and it really helps me. It is because I can know the relationships among the groups of words and then I can easily associate the words that have similar meanings. By learning new words through this way, the association helps me with comprehension." Understanding how the words group together is useful for making the learning material easier to remember (Cohen, 1998; Schmitt & McCarthy, 1997).

The interview responses showed that the concept-mapping approach attracted the attention of students with map diagrams. One comment was "I like to memorize words by the maps because the pictures enhance my memorization of words. When I forget the words that I read several days ago, I can refresh my memory by thinking of the words in the pictures." Such findings are consistent with those reported by Paivio (1986) that both visual and verbal codes can be used when recalling information. The approach of concept mapping that presents words in two different forms (text and picture) increases the chance of remembering vocabulary compared with the approach that only presents words in one form.

Compared with the text-only SMS strategy, the concept mapping with MMS strategy in this study was more learner-oriented. Students in the experimental group spent time drawing map diagrams to represent what they had learned in class. However, in the text-only approach, students were less involved because they received the word lessons from the teacher. Therefore, less time involved in organizing word knowledge could be a major reason why their learning achievement was less favorable than that of the students who learned with their own map. The result was consistent with those of Moore and Readence (1984) and Phillips et al. (2008), that the maps were more useful when learners were involved in productive mapping activities rather than in just receiving teachers' mapping guidance. For example, one of the students stated, "Through the map-building process, I review the words many times for thinking the associations among those words. The process helps me familiarize with the new English words."

CONCLUSION

This experimental study provided another intriguing result, indicating that the group of concept-mapping students retained what they learned for longer periods compared to the group of text-only students.

Students who learned using the traditional instruction with the SMS text-only approach showed a significant decrease in the scores on their delayed post-test compared to those who learned through the MMS concept-mapping approach. Although students might be interested in using mobile devices to learn, mobile learning performance is not effective in the long term without effective strategies to assist student learning.

Compared with the learning approach for the control group, the concept-mapping approach provided a more efficient memorization tool for the students to organize and represent vocabulary knowledge. Such findings correspond with those by Hwang, Kuo, Chen, & Ho (2014), who indicated that the computerized concept-map approach assists students in improving their learning achievements and promoting their learning interest.

Providing example sentences for new vocabulary is a common method used by EFL instructors in teaching vocabulary. In this study, instead of using particular learning formula and schedule designed by instructors, different students had different approaches in clustering vocabulary and had their own mobile learning schedule for personalized learning. The overall goal of this study was to add value to the anytime and anyplace flexibility of mobile learning. One of the contributions of this study is elucidating the importance of providing concept maps and supplementary materials by IM for vocabulary memory retention. Another contribution is to demonstrate how the approach can be used in a specific learning activity to inspire others to attempt a similar approach for improving student learning achievements.

ABOUT THE AUTHOR

Dr. Pei-Lin Liu is an Associate Professor of the Department of Foreign Languages at National Chia-Yi University in Taiwan. Her research interests include computer-assisted language learning, concept mapping, and eye-tracking.

E-mail: peilin@mail.ncyu.edu.tw

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