

Crossword Puzzles as a Learning Tool For Vocabulary Development

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Abstract

Introduction. Since vocabulary is a key basis on which reading achievement depends, various vocabulary acquisition techniques have become pivotal. Among the many teaching approaches, traditional or otherwise, the use of crossword puzzles seems to offer potential and a solution for the problem of learning vocabulary.

Method. This study was conducted to examine the effects of crossword puzzles on vocabulary acquisition of first-year students. Sixty-eight students enrolled in a fundamental English course participated in the study. The instruments were pre-and post-vocabulary tests and a questionnaire surveying the students' attitudes toward learning.

Results. The findings revealed that the students' overall post-test score was higher than their pre-test score at a significance level of .05. When classifying students into three groups based on their vocabulary proficiency, it was found that students in all groups could improve their vocabulary knowledge at a significance level of .05. The results from Repeated Measures Analysis of Variance test showed that significant differences existed in the scores of the three tests which students gained from the tests and the final exam. The results of the questionnaire also illustrated their very favorable attitudes toward learning vocabulary through crosswords as a whole.

Discussion and Conclusion. Crossword puzzles can help students improve vocabulary knowledge, meanwhile increase their learning motivation.

Keywords: vocabulary learning, teaching vocabulary, crossword puzzle, game

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El Uso de Crucigramas como Herramienta en el Desarrollo del Vocabulario

Resumen

Introducción. El vocabulario es la base fundamental sobre la que depende el nivel de lectura. Las distintas técnicas de adquisición de vocabulario se han convertido en cruciales. Entre los muchos enfoques de enseñanza, tradicionales o de otro modo, el uso de crucigramas parece ofrecer potencial y una solución para el problema de aprendizaje de vocabulario.

Método. Este estudio se realizó para examinar los efectos de crucigramas sobre la adquisición vocabulario de los estudiantes de primer año. Sesenta y ocho estudiantes inscritos en un curso de Inglés fundamental participaron en el estudio. Los instrumentos fueron pre-y post-pruebas de vocabulario y un cuestionario topografía actitudes de los estudiantes hacia el aprendizaje.

Resultados. Los resultados revelaron que la puntuación global post-test de los alumnos fue mayor que su puntuación pre-test a un nivel de significación de $p < .05$. Al clasificar a los estudiantes en tres grupos en función de su competencia en el vocabulario, se encontró que los estudiantes de todos los grupos podrían mejorar su conocimiento del vocabulario a un nivel de significación de $p < .05$. Los resultados de las medidas repetidas análisis de varianza mostraron que existían diferencias significativas en las puntuaciones de las tres pruebas que los estudiantes obtener de las pruebas y el examen final. Los resultados del cuestionario también ilustran sus actitudes muy favorables hacia el aprendizaje de vocabulario a través de crucigramas en su conjunto.

Discusión y Conclusiones. Los crucigramas pueden ayudar a los estudiantes a mejorar el conocimiento del vocabulario, por su parte increasase su motivación de aprendizaje.

Palabras clave: aprendizaje vocabulario, la enseñanza de vocabulario, crucigramas, juegos.

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Introduction

Living in a country where English is hardly spoken, if at all, a large number of Thai students find it difficult, impossible even, to effectively communicate in English. To form a meaningful and grammatically correct sentence, all the language components have to fall into place, the most prominent ones being grammar and vocabulary. Nation (1987) could not have stressed the importance of vocabulary more clearly when it said “Learners would need at least 95% coverage of the running words in the input in order to gain reasonable comprehension and to have reasonable success at guessing from context.” Mastering an adequate amount of vocabulary proves a daunting prospect for many Thai students. Their lack of sufficient working vocabulary militates against their chances of academic and communication successes. The problem tends to be compounded at college level where most textbooks, materials, written and oral reports and presentations are in English. A shaky foundation of English vocabulary will most certainly ensure their failure.

Educators and instructors have been experimenting with various vocabulary teaching methods with an eye to dealing with this problem, including activities conducive to reading and vocabulary acquisition (Min, 2008). Watson (2003) draws attention to words using the board, spelling and asking questions. Orawiwatnakul (2011) showed that the instruction of vocabulary acquisition techniques such as an analysis of word structures and context clues could greatly contribute to the success of vocabulary teaching. Tabtimsai (2003) recommended vocabulary exercises. Yeun (2009) found that students possess a better grasp of new vocabulary if they have been taught guessing meaning from context clues. Summat (2009) detected a boost in students’ confidence and vocabulary level after task-based activities. With varying degrees of success, these methods have proved efficacious in terms of students’ vocabulary acquisition.

In response to different styles of learning, the use of games in the classroom can be an effective tool, especially at the college level (David et al., 2009). However, games can be used as a supplement to traditional methods, not as a replacement (Moore & Dettlaff, 2005). There are many reasons why games should be applied in class. First of all, they can increase the amount of attention students give to the material, thus increasing retention (Klepper,

2003). Second, they can be used in all areas of study. Lastly, using games is a desirable learning method as they can make studying more enjoyable (Weisskirch, 2006).

Among many games, crossword puzzles seem to be more attractive than others. The crossword puzzle is a kind of word game. In order to finish a crossword puzzle, the player has to accurately fill in all the blank squares with letters that form words. The words are based on the clues provided, which can be complete sentences, phrases, or words. Since crossword puzzles are usually considered a game, something to be enjoyed rather than slogged through, they tend to be fun and learner-friendly (Childers, 1996). Apart from motivating student learning, these puzzles can help students to extend their vocabulary knowledge. Crosswords can be used to teach terminology, definitions, spelling, and pairing key concepts. Since students need to spell items correctly to complete the puzzle, they gain greater retention and memorization of vocabulary (Moore & Dettlaff, 2005). Usually, after students learn new words, they tend to forget as time passes. So, one way to help them retain new words is to expose them to those words repeatedly. Given the nature of crossword puzzles, students can practice more on new words they have just learned from the textbook. They can also use them to review for the exam.

The effectiveness of crossword puzzles has been proved in many studies. For example, Tabtimsai, (2003) employed crossword puzzles as “after reading” strategy to enhance students’ vocabulary growth. In another study, it was found that crossword puzzles could increase motivation and students’ interest in the topic (Franklin et al., 2003). Williams (2007) made use of his own crossword puzzles and those taken from other books as a revision technique for his students before examinations. Those students who took full advantage of the technique found their performance and their grades were gradually on the mend. Likewise, Weisskirch (2006) used crossword puzzles as a means of reviewing course material. Students did two crossword puzzles, one in class for one examination, the other outside class for another examination. They were well disposed towards the use of crossword puzzles. They indicated that learning became more interesting. Crossword puzzles yielded more advantages to students in terms of exam preparation when students worked together in class than when they worked separately. As well, students found it more pleasurable to work in groups and efficient as a tool for revision. Similarly, in a study conducted by Davis, Shepherd and Zwiefelhofer (2009), crossword puzzles were used for reviewing for exams. The researcher’s aim was to determine whether crossword puzzles as a revision tool would impact how well students performed in examinations by comparing two groups of students who studied in the

same class. According to Whisenand and Dunphy (2010), after information system (IS) technical terms had been taught to students through the use of crossword puzzles, the results showed crossword puzzles to be preferable and efficacious for vocabulary acquisition.

Objectives

For the undergraduate level at Bangkok University, nine faculties including Humanities, Business Administration, Accounting, Communication Arts, Fine and Applied Arts, Sciences, and Engineering, are required to take at least three fundamental English courses. Students in each class have different levels of language proficiency. During their first year at Bangkok University, the freshmen find themselves inadequate when they are assigned to read more in English. They are faced with the big problem of understanding English texts because of their lack of a working knowledge of vocabulary. A broader vocabulary knowledge base would vastly improve their academic performance. The key is to apply the best approach to broaden their vocabulary knowledge. The researcher believes that most students would find a traditional teaching technique of learning vocabulary lacking. A combination of game like crosswords might enable students to better acquire and retain words unknown to them. Therefore, this research was conducted to investigate the effects of crossword puzzle use on students' vocabulary knowledge, their retention in memorizing vocabulary as well as their attitude towards learning.

Method

Participants and Design

This study employed the one group pre-test post-test design. The population was 2,800 students or 72 sections enrolled in EN 011 of 3 credits in the first semester of academic year 2012. As students were already assigned to their sections, the cluster sampling was employed to get two sections as a sample group for the experiment. It consisted of 37 students from School of Communication Arts and 31 students from School of Humanities. Two variables were involved here. The two dependent variables were the students' vocabulary capabilities which were measured by the pre-test, the post-test, the final exam and their attitude towards the learning which was evaluated by the questionnaire. The independent variable was learning vocabulary through crossword puzzles.

Instruments

Three instruments were used in this study. These were 1) the pre-test and the post-test, 2) crossword puzzle exercises, and 3) the questionnaire for gathering information about the students' attitudes towards learning vocabulary by crossword puzzles.

Vocabulary Tests

To study the students' vocabulary learning, the same test was used as a parallel test for pre-and post-testing. That is, the researcher shuffled the questions and multiple choices. The pre-test and post-test questions were comprised of 30 multiple-choice questions designed to assess the students' vocabulary proficiency, covering the content in the textbook *American English File (Student Book 3)* which was used for EN011.

Validity and Reliability of the English Vocabulary Tests

After the test was created, it was given to three experts at the Language Institute of Bangkok University to check and comment on the content. The experts were also asked to rate each item so as to see whether it was congruent with the objective. Then, the Item-Objective Congruence (IOC) Index was calculated by assigning scores to three kinds of answers: congruent = 1, questionable = 0, incongruent = -1. In this study, all items were rated higher than 0.5 of the IOC index, indicating that they were acceptably congruent with the objectives. Its content validity measured by the IOC Index was between 0.66-1.00. However, there were 3 items changed due to grammatical errors and miscommunication.

After that the test was piloted with 40 students enrolled in EN011 in the summer semester. The vocabulary scores received from the pilot were used to find difficulty and discrimination values. The reliability coefficient of the overall test calculated by Kuder-Richardson-20 formula (KR-20) was 0.87, which can be interpreted that the test had high reliability. This was done to see if the test items obtained the same binary (right/wrong) results over a population of testing subjects. According to the criteria, the test items of which difficulty indices range between 0.20 and 0.80, and the discrimination of indices which are equal to or higher than 0.20 were chosen for the main study. All 30 items in the test met the criteria and could be kept for the experiment.

Crossword Puzzle Exercises

Crossword puzzle sheets were prepared based on the vocabulary listed in Chapter 1-3 in the textbook *American English File (Student Book 3)*. Actually, there were 238 words students needed to learn for the whole course. However, the crossword puzzle exercises did not cover all the vocabulary on the list. One hundred words were selected due to their difficulty. Ten sheets of crosswords were created by the researcher and examined by other three instructors at the Language Institute for accuracy. The exercises comprised two formats. The first one provided students with the definitions of words. Learning the definition of a word can be an effective way to increase their vocabulary. Through a dictionary or other sources, students can become familiar with the many definitions of a word. As well, they can learn the instances in which the word can be used. The other one did not include the word definitions, but gave students sentences with missing words. Using the words in the proper context is an essential part of learning new words and an effective way to increase their vocabulary. The latter was more difficult since students were required to fill in the blank in order to get a correct sentence. After that they could complete the crosswords by using the words they filled in the sentences. Students, individually or in groups of as many as four, were allotted twenty minutes to complete this activity. Sometimes the activity was carried out like a competition where the winning team received a reward.

Questionnaire

The last instrument was an attitudinal questionnaire towards using the activity, investigating how the students felt about it. It consisted of ten items. The Likert five-rating scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree) was used for a post-study survey. The draft questionnaire items were checked for their content validity by three experts in English teaching field. The items with IOC index higher than 0.6 are acceptable. In order to test the proper reliability, the questionnaire was piloted with 40 undergraduate students who were not the target group and calculated by using Cronbach's Alpha. According to Cronbach and Shevelson (2004), coefficient ranges in value from 0 to 1. The higher the score, the more reliable the generated scale is. They have also indicated 0.7 to be an acceptable reliability coefficient. The coefficient value of the overall questionnaire was 0.98. After that, the questionnaire was distributed to them at the end of period in week 12. The data obtained from the opinion questionnaire were calculated by using mean and standard deviation and interpreted as levels to indicate how students in the study perceived learning vocabulary through crossword puzzles. A mean score of 1-1.50 indicates having an

attitude at a very negative level, 1.51-2.50 at a negative level, 2.51-3.50 at a moderate level, 3.51-4.50 at a positive level, and 4.51-5.00 at a very positive level.

Students' Vocabulary Acquisition through Crosswords

Although there were many useful strategies and methods employed in previous research to develop students' vocabulary learning, this study was done with an aim to enhance students' vocabulary knowledge through the use of crosswords. Since using crossword puzzles alone might not be efficient enough to increase students' vocabulary knowledge, other strategies were employed to strengthen its process. That is, graphic organizer and word mapping were used before reading. For "during reading", students were to underline vocabulary they did not know and keep a vocabulary journal. Then doing crossword puzzles followed as the "after reading" stage.

Data Collection and Data analysis

This empirical study was carried out in two classes where the researcher was the teacher. At the beginning of the semester the students were allotted 30 minutes to do the 30-question vocabulary pre-test. The vocabulary was taken from their textbook *American English File* (Student Book 3). Each student's performance was recorded in terms of points. The pre-test score was used to divide the students into three groups, namely high-, intermediate-, and low-proficiency groups. The cut-point was determined by using Mean \pm 5 SD. The range of the "high" group was higher than 14.29 while the range of the "intermediate" group fell between 10.74-14.28. The range of the "low" group was lower than 10.73. Then for the next ten weeks they were taught new words through crossword puzzles. Detailed explanations were given and crossword puzzles were assigned and finished in class. In week 12, the students were given the post-test. The scores from both tests were compared using a paired samples t-test to learn whether and to what extent the crossword puzzle activity impacted on their vocabulary capabilities as well as to find out the significant differences. To examine whether the activity affected all three groups of proficiency, pre-and post-test scores were analyzed using paired samples t-tests. P values $<$.05 were considered statistically significant. After the students took the final exam, their vocabulary scores were compared with the pre-and post-tests using Repeated Measures ANOVA. Moreover, in an attempt to learn what the students

thought about this learning activity, they were asked to answer a questionnaire after the post-test. The scores were taken to analyze for means and standard deviations.

Results

The data obtained from the pre-test, post-test, final exam, and questionnaire were analyzed by Statistical Packages for the Social Sciences (SPSS). An analysis was done for mean, standard deviation, and paired samples t-test, and Repeated Measures ANOVA . The results were used to answer the research questions.

Research Question 1: Does the use of crossword puzzles enhance students' test scores? If so, to what extent?

In order to find out how much students significantly improved their vocabulary ability, the pre-test and post-test scores were compared using paired samples t-test. Table 1 shows that the mean score of the post-test was higher than that of the pre-test. As evidenced by the significant difference at the level of .05, it clearly illustrates that learning vocabulary through crossword puzzles proved rather effective.

Table 1. Means of the Pre-Test and Post-Test of the Students

	N	Min	Max	Mean	SD	t
Pretest	68	7	24	12.51	(3.54)	17.04*

* $p < .05$

Research Question 2: Will the three groups of students improve their test scores after the intervention?

Table 2 shows that the mean scores of the post-test in the low-, intermediate-, and high- proficiency groups were higher than those of the pre-test. In order to find out whether the students' proficiency increased significantly in each group, the pre-and post-test mean scores were compared by using paired-samples t-tests. As evidenced by the significant differences at the level of .05 for all three groups, it clearly illustrates that learning vocabulary through crossword puzzles helped students to obtain higher scores.

Table 2. Mean Scores and Analysis of the Pre- and Post-Tests Shown in Three Groups

	Group	N	Min	Max	Mean	SD	t
Low Proficiency							
	Pre-test	23	7	10	8.91	(1.20)	11.18*
	Post-test	23	12	24	17.91	(4.58)	
	Difference				9.00		
Intermediate Proficiency							
	Pre-test	22	11	14	11.91	(.97)	17.76*
	Post-test	22	18	26	21.68	(2.49)	
	Difference				9.77		
High Proficiency							
	Pre-test	23	15	24	16.69	(1.92)	9.25*
	Post-test	23	18	26	21.30	(2.64)	
	Difference				4.61		

N = number of students taking the tests

* $p < .05$

Research Question 3: Are there any statistically significant differences in vocabulary scores of students in their three tests?

To see how much the use of crossword puzzles could help students' memorizing the vocabulary they learned and practiced in class, the scores students received in the vocabulary part of the final exam were compared with the pre- and post-tests scores using the Repeated Measures ANOVA.

Since determining the violation of sphericity is very important for the Repeated Measures ANOVA, data were reviewed using the Mauchly's Test, a formal way of testing the assumption of sphericity. This was done to check whether the variances of the differences were equal. The p value suggested that the variance was of compound symmetry ($\chi^2 = 80.77, p = .294$). Vocabulary scores gained from the three-time tests could be further compared using Multivariate Analysis of Variance. The multivariate test for differences of the three times generated Wilks' Lambda value of 0.181 ($F = 149.226, p < .001$), indicating that there was a statistically significant difference in students' vocabulary ability in at least one pair of tests.

In order to recheck the significant differences existing in the three times of vocabulary ability tests, the Test of Within-Subjects Effects was further conducted. As presented in Table 3, the result of Sphericity Assumed showed that at least a pair of tests was different at a significance level of .05 ($F = 278.676, p < .001$).

Table 3. Test of Within-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F
Finding Sphericity Assumed	2920.510	2	1460.255	278.676*
Greenhouse-Geisser	2920.510	1.172	2491.032	278.676*
Huynh-Feldt	2920.510	1.181	2473.502	278.676*
Lower-bound	2920.510	1.000	2920.510	278.676
Error Sphericity Assumed	702.157	134	5.240	
Greenhouse-Geisser	702.157	78.551	8.939	
Huynh-Feldt	702.157	79.108	8.876	
Lower-bound	702.157	67.000	10.480	

* $p < .001$

The findings in Table 4 showed that students' vocabulary scores increased after the pre-test and the post-test. Vocabulary score of the final exam was slightly increased from that of the post-test. This means that students still had good retention of vocabulary knowledge.

Table 4. Mean and Standard Deviation Error of Vocabulary Scores

Vocabulary Ability	Mean	Std. Error	95% Confidential Level	
			Lower Bound	Upper Bound
Pre-test	12.515	.430	11.657	13.372
Post-test	20.279	.455	19.372	21.187
Final Exam	20.779	.447	19.888	21.671

Research Question 4: What are students' attitudes towards learning vocabulary through crossword puzzles?

The results from data analysis revealed that the overall mean score of attitudes toward the use of crossword puzzles was at a positive level (Mean = 3.99, SD = .31). Among the 10 items, the highest mean score was of no. 3 "Crossword puzzles helped me memorize the vocabulary" (Mean = 4.25, SD = .56), followed by no. 2 "The format of the crossword puzzle sheet was clear and readily understandable" (Mean = 4.13, SD = .60), no. 5 "The crossword puzzle sheet enabled me to review the vocabulary (Mean = 4.09, SD = .57), and no.9 "Doing crossword puzzles helped rid me of anxiety when I learned new vocabulary" (Mean = 4.09, SD = .59). The lowest mean score was no. 1 "The vocabulary in the crossword puzzle sheet was sufficient to cover all the lessons" (Mean = 3.69). However, all of the items were at a positive level.

Table 5. Mean, Standard Deviation, and Level of Attitudes of the Students

	Statements	Mean	SD	Level
1.	The vocabulary in the crossword puzzle sheet was sufficient to cover all the lessons.	3.69	.58	positive
2.	The format of the crossword puzzle sheet was clear and readily understandable	4.13	.60	positive
3.	Crossword puzzles helped me memorize the vocabulary.	4.25	.56	positive
4.	Crossword puzzles made learning vocabulary more interesting.	3.82	.65	positive
5.	The crossword puzzle sheet enabled me to review the vocabulary.	4.09	.57	positive
6.	Doing crossword puzzles constantly increased my vocabulary.	3.99	.63	positive
7.	Crossword puzzles made me want to learn more vocabulary.	3.82	.77	positive
8.	Doing crossword puzzles helped solve the problem of being unable to complete the exercises in class.	3.94	.71	positive
9.	Doing crossword puzzles helped rid me of anxiety when I learned new vocabulary.	4.09	.59	positive
10.	Doing crossword puzzles increased my exam scores.	4.06	.79	positive
	total	3.99	.31	positive

Discussion

This study was carried out to determine whether the use of crossword puzzles was a useful tool for enhancing students' vocabulary. The findings are discussed in relation to the research objectives as follows:

First, the research finding supported the hypothesis that learning vocabulary through crossword puzzles contributed to the students' improvement of vocabulary. This is probably because students had a good chance to review vocabulary from the textbook they had learned with crossword puzzle sheets. Since the number of key terms students practiced through this activity was large, they tended to gain more knowledge of vocabulary. They had greatly benefited from the activity provided as shown in the progress they made in terms of the pretest, posttest, and final exam scores. So, it can be concluded that the vocabulary scores have been positively impacted by the use of this learning tool. So, this finding was similar to other research work such as Tabtimsai, (2003) and Williams (2007) indicating that the use of crosswords can help improve students' learning outcome.

Second, the data obtained from the subjects provided sufficient reply for the research question two that the use of crossword puzzles was most likely to enhance the students' vocabulary learning in the three proficient groups due to higher mean scores from the pre-and post-tests (high = 16.69: 21.30, intermediate = 11.91: 21.68, low = 8.91 : 17.91). So, it may be concluded that the tool in this study was suitable to all students. No matter what level of vocabulary proficiency students had before the intervention, they could improve their vocabulary knowledge as well. This was probably because of the nature of crossword puzzles which is usually perceived as a game. Doing a crossword puzzle is more or less like playing a game, where enjoyment and fun figure. Students could gain more vocabulary knowledge through an enjoyable tool like puzzles (Weisskirch, 2006). The tool's effectiveness can be explained by what Moore and Dettlaff, (2005) stated, that crosswords can be used to teach terminology, definitions, spelling, and pairing key concepts.

Third, the findings assured students' retention in memorizing vocabulary they gained from the activity provided. The results reveal that in the scores of the three vocabulary tests, there were significant differences at the 0.05 level. That is, the scores from the first vocabulary test were different from those of the second time and the third time. Especially, a statistically significant difference between the second time and the third time demonstrated that students had better vocabulary retention after learning with this tool. It might be because the students studied vocabulary in enjoyable learning environments. In this fun and recreation, they gained knowledge at the same time. Since students need to spell items correctly to complete the puzzle, they gain greater retention and memorization of vocabulary (Moore & Dettlaff, 2005). In addition, the vocabulary improvement was probably due to the fact that playing games can increase the amount of attention students give to the material, thus increasing retention (Klepper, 2003). Therefore, it strongly stresses that learning vocabulary through a game like crossword puzzles is crucial for all students.

Lastly, positive attitudes toward learning vocabulary through crossword puzzles were expressed by the subjects. Having positive attitudes indicated that students liked learning with fun. The finding could be supported by Franklin et al. (2003) stating that these puzzles can increase students' motivation and interest in the topic. When they liked the activity, they tended to be more active in learning. This active performance resulted in higher learning achievement. This finding was also consistent with the findings reported by Weisskirch, (2006), who found that students rated the crossword puzzle exercise favorably. In addition, it is inte-

resting to see that the item “Crossword puzzles helped me memorize the vocabulary” received the highest mean score. This finding helps to support the effectiveness of crossword puzzles and they should be implemented in teaching and learning vocabulary.

Conclusion

There is no absolute answer when it comes to the issue of the best teaching techniques of English. Some techniques may suit some students at certain levels. The same technique which works well with some students may not be successful with others. As suggested by this research study, learning vocabulary through crosswords is one of the best ways to improve students' vocabulary. Student motivation to learn English can be increased if the teacher provides them with enjoyable learning environments.

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