

THE EFFECT OF CROSSWORD PUZZLE GAMES ON STUDENTS' VOCABULARY MASTERY: A QUASI-EXPERIMENTAL STUDY AT SMP NEGERI 3 BREBES

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Abstract

A strong command of vocabulary is essential for students to communicate and understand English effectively. Nevertheless, many learners in English as a Foreign Language (EFL) classrooms still encounter difficulties in expanding and retaining their vocabulary because learning activities often provide limited opportunities for meaningful practice. This research examined whether the use of crossword puzzle games could improve students' vocabulary mastery at SMP Negeri 3 Brebes. The study adopted a quantitative quasi-experimental design involving 64 eighth-grade students, consisting of 32 students in the experimental group and 32 students in the control group. Students' vocabulary achievement was measured through identical pre-test and post-test instruments. The collected data were processed using descriptive statistics, the Shapiro–Wilk normality test, Levene's homogeneity test, paired-samples *t*-test, and independent-samples *t*-test. Although vocabulary achievement increased in both groups, the experimental group obtained significantly better post-test results than the control group ($t(62) = 3.012, p = .004$). These results indicate that crossword puzzle games are an effective classroom strategy for strengthening vocabulary mastery by encouraging active learning, repeated word retrieval, and meaningful engagement with new vocabulary.

Keywords: crossword puzzle games; vocabulary mastery; EFL; game-based learning; quasi-experimental

1 INTRODUCTION

English has become an essential language for communication in today's global society. It is widely used in education, scientific research, business, technology, and cross-cultural interaction, making English proficiency increasingly valuable for learners worldwide. In countries where English is taught as a foreign language (EFL), students are expected not only to understand the language but also to use it effectively in both academic and everyday communication. Achieving this goal requires the development of several language components, among which vocabulary plays a particularly important role. Without sufficient vocabulary, learners often struggle to understand written texts, follow spoken conversations, express their ideas clearly, or produce meaningful written work.

Rather than simply learning the meanings of individual words, vocabulary mastery involves understanding how words function in authentic communication. Nation (2022) explains that vocabulary knowledge includes pronunciation, spelling, grammatical behavior, collocations, frequency of occurrence, and the ability to use words appropriately in different contexts. Similarly, Webb and Nation (2017) argue that vocabulary develops gradually through repeated encounters with words, meaningful exposure, and purposeful language use instead of rote memorization alone. This perspective is reinforced by Schmitt (2019), who emphasizes that vocabulary proficiency supports learners' achievement across listening, speaking, reading, and writing. Likewise, August et al. (2021) suggest that systematic vocabulary instruction contributes to students' broader academic language development. Collectively, these studies demonstrate that vocabulary serves as the foundation upon which successful English communication is built.

Although vocabulary is widely recognized as a fundamental component of language learning, many EFL students continue to encounter difficulties in developing adequate vocabulary knowledge. Learners frequently experience problems remembering unfamiliar words, retrieving appropriate vocabulary during communication, and using newly learned expressions accurately in different situations. One contributing factor is that vocabulary instruction often relies heavily on memorization and textbook exercises, providing relatively limited opportunities for students to engage with new words in meaningful contexts. Nation (2021) argues that vocabulary learning becomes more effective when learners repeatedly

interact with lexical items through purposeful activities. Expanding this idea, Nation (2024) emphasizes that meaningful classroom engagement enables learners to process vocabulary more deeply. Supporting these arguments, Webb, Uchiyara, and Yanagisawa (2023) report that repeated exposure substantially strengthens vocabulary acquisition, while Peters and Webb (2018) demonstrate that meaningful encounters with vocabulary contribute to long-term retention. These findings indicate that vocabulary instruction should move beyond memorization by encouraging students to actively use newly learned words throughout the learning process.

To address these challenges, many researchers have explored game-based learning as an instructional approach capable of increasing students' engagement while supporting vocabulary development. Educational games provide learners with opportunities to practice language in enjoyable, interactive, and meaningful learning environments. Recent studies have consistently reported positive outcomes associated with game-based vocabulary instruction. Jia et al. (2024) found that digital games enhanced both receptive and productive vocabulary knowledge. Yang et al. (2020) likewise reported improvements in vocabulary achievement together with reduced learning anxiety through competition-based educational games. Similar conclusions were presented by Lai and Chen (2025), Zhang et al. (2025), Zhang et al. (2023), Vnucko and Klimova (2023), and Zhang and Hasim (2023), who highlighted the contribution of game-based learning to vocabulary growth, learner engagement, and classroom participation. Nevertheless, most previous investigations have concentrated on digital learning environments, whereas classroom-based games that require little or no technological support have received considerably less attention.

Among the wide range of classroom activities available for vocabulary instruction, crossword puzzle games represent a practical and accessible alternative that can be implemented in various educational settings. Solving crossword puzzles encourages learners to retrieve previously learned vocabulary, identify correct spelling patterns, recognize semantic relationships among words, and apply lexical knowledge to complete meaningful tasks. Because students repeatedly interact with vocabulary while solving clues, the activity naturally promotes retrieval practice and deeper cognitive processing. Previous studies have reported encouraging results regarding the effectiveness of crossword puzzle games in improving vocabulary learning (Alda & Wati, 2021; Pratolo & Hafizhah, 2022; Anggraini et al., 2022; Nainggolan et al., 2023; Shohib, 2024; Yang, 2025; Nabila et al., 2026). However, empirical evidence from Indonesian junior high schools remains relatively limited, particularly studies employing quasi-experimental methods to evaluate the effectiveness of crossword puzzle games under authentic classroom conditions. Responding to this gap, the present study examines whether the implementation of crossword puzzle games can significantly improve the vocabulary mastery of eighth-grade students at SMP Negeri 3 Brebes. It is expected that the findings will enrich the existing literature while providing English teachers with practical evidence for integrating simple yet engaging classroom games into vocabulary instruction.

2 METHODOLOGY

2.1 Research Design

The present study investigated the effectiveness of crossword puzzle games in improving students' vocabulary mastery through a quantitative research approach. Since the research was carried out in an actual school setting where students had already been assigned to their respective classes, random assignment was not feasible. For this reason, a quasi-experimental design employing a Non-equivalent Control Group Design was selected. According to Creswell and Creswell (2018), this design is appropriate for educational research conducted in naturally existing classrooms because it allows researchers to examine the impact of instructional interventions without disrupting the regular organization of classes. Fraenkel et al. (2019) likewise note that quasi-experimental designs are widely used in school-based research when intact classes must be maintained throughout the study.

The study involved two different classes that received different instructional treatments. Students in the experimental class learned vocabulary through crossword puzzle games, whereas those in the control class received conventional vocabulary instruction. To evaluate the effectiveness of the treatment, both groups completed the same vocabulary assessment before the intervention and again after all instructional activities had been completed. Differences between the pre-test and post-test scores were subsequently analyzed to determine whether the treatment produced measurable improvements in vocabulary mastery.

Table 1. Non-equivalent Control Group Design

Group	Pre-test	Treatment	Post-test
Experimental	O ₁	Crossword Puzzle Games	O ₂

2.2 Research Participants

The participants were drawn from eighth-grade students enrolled at SMP Negeri 3 Brebes during the 2025/2026 academic year. A total of sixty-four students participated in the research. Rather than selecting students individually, purposive sampling was employed because the existing classroom arrangement could not be reorganized for research purposes. Two classes with comparable learning characteristics were therefore selected to represent the research sample. One class, consisting of thirty-two students, served as the experimental group, while another class with the same number of students functioned as the control group.

Before the treatment was implemented, all participants completed a vocabulary pre-test to identify their initial level of vocabulary knowledge. Following the pre-test, the experimental group participated in learning activities that incorporated crossword puzzle games, whereas the control group continued learning through conventional instructional practices. At the end of the intervention, both groups completed the same vocabulary test as a post-test to measure changes in vocabulary achievement.

2.3 Research Instrument

Vocabulary achievement was measured using a multiple-choice achievement test specifically prepared for this study. The final version of the instrument consisted of thirty questions representing the vocabulary items taught during the instructional sessions. The same instrument was administered as both the pre-test and the post-test, allowing students' vocabulary development to be evaluated consistently across the research period.

Prior to its use in the main study, the instrument underwent validity and reliability testing. Forty multiple-choice questions were initially developed and administered during the pilot study. Item validity was examined using the Pearson Product-Moment correlation. The analysis indicated that thirty-three items satisfied the required validity criteria, whereas seven items (Items 14, 15, 23, 30, 34, 38, and 40) were excluded because they did not meet the established standard. Although thirty-three items were statistically acceptable, only thirty were retained to ensure balanced representation of the instructional content while maintaining an appropriate testing duration.

The reliability of the instrument was assessed using Cronbach's Alpha. The resulting coefficient of 0.913 indicated excellent internal consistency, confirming that the instrument was sufficiently reliable for measuring students' vocabulary achievement throughout the study.

Table 2. Summary of Research Instrument

Measurement Aspect	Result
Test Format	Multiple-choice
Initial Items	40
Valid Items	33
Invalid Items	7
Final Items	30
Validity Test	Pearson Product Moment
Reliability Test	Cronbach's Alpha
Reliability Coefficient	0.913
Interpretation	Excellent

2.4 Research Procedure

The research was conducted through three consecutive phases, namely preparation, implementation, and evaluation.

During the preparation phase, the researcher designed the research instrument, prepared the crossword puzzle learning materials, and coordinated the research schedule with the participating school.

The implementation phase began with the administration of the vocabulary pre-test to both classes. After the initial assessment, students in the experimental group participated in vocabulary learning activities using crossword puzzle games. The activities required students to solve crossword puzzles individually and collaboratively while applying the vocabulary introduced during each lesson. In contrast, the control group learned the same instructional content through conventional teaching practices consisting of teacher explanations, textbook exercises, and vocabulary memorization.

The final phase focused on evaluating students' learning outcomes. Both groups completed the post-

test after all instructional sessions had been completed. The scores obtained from the pre-test and post-test were then compiled for statistical analysis to determine the effectiveness of the instructional treatment.

2.5 Data Analysis

All quantitative analyses were conducted using IBM SPSS Statistics. Descriptive statistics were first calculated to summarize students' vocabulary performance before and after the intervention. The mean and standard deviation were used to describe the overall achievement of both research groups.

Before hypothesis testing, the suitability of the data for parametric analysis was examined. The distribution of the data was evaluated using the Shapiro–Wilk normality test, whereas Levene's test was employed to determine the homogeneity of variance between groups. After these assumptions had been satisfied, paired-samples *t*-tests were carried out to examine vocabulary improvement within each group. Finally, an independent-samples *t*-test was performed to compare the post-test performance of the experimental and control groups. Statistical significance was established at the 0.05 level.

3 RESULTS

3.1 Descriptive Statistics

The students' vocabulary performance before and after the instructional intervention is summarized in Table 3. The descriptive statistics provide an overview of the achievement of both research groups and illustrate the changes that occurred during the study.

Table 3. Descriptive Statistic

Group	N	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Mean Gain
Experimental	32	55.91 $\pm$ 7.11	77.41 $\pm$ 5.92	21.50
Control	32	51.91 $\pm$ 6.40	73.19 $\pm$ 5.27	21.28

As presented in Table 3, students from both groups obtained higher scores on the post-test than on the pre-test, indicating that vocabulary learning occurred throughout the instructional period. The experimental group recorded a mean score of 55.91 (SD = 7.11) before the treatment, which increased to 77.41 (SD = 5.92) after learning through crossword puzzle games. Meanwhile, the control group improved from a pre-test mean of 51.91 (SD = 6.40) to a post-test mean of 73.19 (SD = 5.27) following conventional instruction.

Although improvement was observed in both classes, the increase achieved by the experimental group was slightly greater than that of the control group. This pattern suggests that incorporating crossword puzzle games into classroom instruction may have provided additional support for students in developing their vocabulary knowledge. However, descriptive statistics alone cannot determine whether the observed difference is statistically meaningful. Therefore, further analyses were conducted using inferential statistics.

3.1.1 Assumption Tests

Before comparing the performance of the two groups, the dataset was examined to ensure that it satisfied the assumptions required for parametric statistical analysis. Two preliminary analyses were carried out, namely the Shapiro–Wilk normality test and Levene's homogeneity test.

Table 4. Shapiro-Wilk Test

Variable	Group	p-value	Interpretation
Pre-test	Experimental	1.000	Normal
Pre-test	Control	.202	Normal
Post-test	Experimental	1.000	Normal
Post-test	Control	.111	Normal

The results of the Shapiro–Wilk test revealed that every significance value exceeded the criterion of **0.05**, indicating that the vocabulary scores in both groups followed a normal distribution. Consequently, the normality assumption required for parametric testing was fulfilled.

Table 5. Homogeneity Test

Variable	Levene Statistic	p-value	Interpretation
Pre-test	0.259	.613	Homogeneous
Post-test	0.849	.360	Homogeneous

The equality of variance was then examined using Levene's test. Similar to the normality results, the significance values obtained for both the pre-test and the post-test were greater than **0.05**. These findings demonstrate that the variability of scores between the experimental and control groups was sufficiently similar, confirming that the assumption of homogeneity had also been satisfied. Since both assumptions were met, parametric statistical procedures could be applied to test the research hypotheses.

Paired-Samples *t*-Test

To determine whether students' vocabulary mastery changed after the instructional treatment, paired-samples *t*-tests were performed separately for the experimental and control groups.

Table 6. Paired Sample *t*-test

Group	Mean Difference	df	p-value
Experimental	-21.500	31	<.001
Control	-21.281	31	<.001

The analysis demonstrated statistically significant differences between the pre-test and post-test scores in both groups, with probability values below **0.001**. These findings indicate that students experienced measurable vocabulary improvement following the instructional activities regardless of the teaching method employed.

Although the paired-samples analysis confirmed learning progress within each class, it did not indicate whether one instructional strategy produced better outcomes than the other. Consequently, a comparison between the two groups was conducted using an independent-samples *t*-test.

Independent-Samples *t*-Test

The primary objective of the study was to examine whether vocabulary instruction supported by crossword puzzle games resulted in better learning outcomes than conventional classroom instruction. To answer this question, an independent-samples *t*-test was carried out using the post-test scores of both groups.

Table 7. Independent Sample *t*-test

Variable	t	df	p-value	Mean Difference
Experimental	3.012	62	0.004	4.219

The statistical analysis produced a *t* value of 3.012 with 62 degrees of freedom and a significance level of 0.004. Since the obtained probability value was lower than the predetermined significance level of 0.05, the null hypothesis was rejected.

This result indicates that the vocabulary achievement of students who learned through crossword puzzle games differed significantly from that of students who received conventional instruction. More specifically, the experimental group obtained higher post-test scores, suggesting that crossword puzzle games contributed more effectively to vocabulary learning within the context of this research.

4 CONCLUSIONS

This study examined the effectiveness of crossword puzzle games as a classroom strategy for improving the vocabulary mastery of eighth-grade students at SMP Negeri 3 Brebes. Based on the statistical analyses, students who learned through crossword puzzle activities demonstrated better vocabulary achievement than those who received conventional instruction. Although both groups showed progress

after the learning period, the higher post-test performance of the experimental group indicates that the use of crossword puzzle games provided additional support for vocabulary learning.

The findings suggest that the effectiveness of crossword puzzle games is closely related to the learning experiences they provide. Throughout the activities, students repeatedly recalled vocabulary, matched words with contextual clues, and identified appropriate spelling patterns while solving the puzzles. These processes encouraged learners to interact with vocabulary in a more meaningful way than simply memorizing word lists. As a result, students had more opportunities to strengthen their vocabulary knowledge through active participation and repeated retrieval.

This study also contributes to the growing body of research on game-based learning in EFL classrooms. While many previous studies have focused on technology-based games, the present findings demonstrate that a simple classroom activity requiring minimal resources can also support vocabulary development effectively. Therefore, crossword puzzle games may be considered a practical instructional alternative for teachers who wish to create more engaging vocabulary lessons without relying on digital technology.

Despite these encouraging findings, several limitations should be acknowledged. The research involved participants from only one junior high school and was conducted over a relatively short instructional period. Consequently, the findings should be interpreted within the context of the present study. Future research is encouraged to involve a wider range of participants, extend the duration of the intervention, and compare crossword puzzle games with other vocabulary learning strategies to provide broader evidence regarding their effectiveness.

Overall, the study provides empirical evidence that crossword puzzle games can make vocabulary learning more interactive, meaningful, and engaging. When implemented systematically, this instructional strategy has the potential to support vocabulary development while creating a classroom environment that encourages students to participate actively in the learning process.

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