STRATEGY : Jurnal Inovasi Strategi dan Model Pembelajaran
Vol. 6, No. 3, Mei-Juli 2026
e-ISSN : 2798-5466 | p-ISSN : 2798-5725
Online Journal System : https://jurnalp4i.com/index.php/strategi

THE EFFECT OF USING CROSSWORD PUZZLES ON INDONESIAN EFL COLLEGE STUDENTS' VOCABULARY MASTERY

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Diterima: *10/06/2026*; Direvisi: *23/06/2026*; Diterbitkan: *29/06/2026*

ABSTRAK

Penelitian ini mengkaji pengaruh penggunaan teka-teki silang terhadap penguasaan kosakata mahasiswa program Bahasa Inggris sebagai Bahasa Asing (EFL) di perguruan tinggi. Kosakata merupakan aspek penting dalam pembelajaran Bahasa Inggris karena membantu mahasiswa memahami dan mengekspresikan makna secara efektif. Banyak pelajar bahasa Inggris sebagai bahasa asing (EFL) yang masih kesulitan mengingat kosakata, mengeja kata dengan benar, dan menggunakannya secara tepat dalam konteks yang berbeda. Oleh karena itu, diperlukan kegiatan pembelajaran yang lebih menarik untuk mendukung pengembangan kosakata. Penelitian ini menggunakan desain pra-eksperimen (*pre-experimental design*) dengan rancangan *one-group pre-test–post-test* untuk mengetahui pengaruh penggunaan aktivitas *crossword puzzle* terhadap penguasaan kosakata mahasiswa. Penelitian melibatkan 27 mahasiswa semester IV Program Studi Tadris Bahasa Inggris yang dipilih dengan teknik *purposive sampling*.. Hasil penelitian menunjukkan bahwa nilai rata-rata kosakata meningkat dari 93,34 pada pra-tes menjadi 97,26 pada pasca-tes. Uji-t sampel berpasangan menunjukkan perbedaan yang signifikan antara skor pra-tes dan pasca-tes ($p < 0,001$), dengan ukuran efek yang besar (Cohen's $d = 0,91$). Temuan ini menunjukkan bahwa teka-teki silang efektif dalam meningkatkan penguasaan kosakata mahasiswa. Temuan ini menunjukkan bahwa teka-teki silang dapat mendorong partisipasi aktif, memberikan paparan berulang terhadap kosakata, dan menciptakan pengalaman belajar yang lebih bermakna. Oleh karena itu, teka-teki silang dapat dianggap sebagai strategi alternatif yang efektif dan menyenangkan untuk mengajarkan kosakata di kelas EFL.

Kata kunci: *Teka-Teki Silang, Penguasaan Kosakata, Pelajar EFL, Pembelajaran Berbasis Permainan, Pendidikan Bahasa Inggris.*

ABSTRACT

This study investigates the effect of using crossword puzzles on Indonesian EFL college students' vocabulary mastery. Vocabulary is an important aspect of learning English because it helps students understand and express meaning effectively. There's so many EFL learners are still struggle to remember vocabulary, spell words correctly, and use them appropriately in different contexts. For this reason, more engaging learning activities are needed to support vocabulary development. This study employed a pre-experimental design using a one-group pre-test and post-test approach to investigate the effect of crossword puzzle activities on students' vocabulary mastery. The study involved 27 fourth-semester students of the English Education (Tadris Bahasa Inggris) Study Program selected through purposive sampling. The

https://doi.org/10.51878/strategi.v6i3.12299

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Online Journal System : https://jurnalp4i.com/index.php/strategi

data were collected through vocabulary tests administered before and after the implementation of crossword puzzle activities. The results indicated an improvement in students' vocabulary mastery, with the mean score increasing from 93.34 in the pre-test to 97.26 in the post-test. A paired-samples t-test revealed a statistically significant difference between the pre-test and post-test scores ($p < 0.001$), with a large effect size (Cohen's $d = 0.91$). These findings suggest that crossword puzzles are effective in enhancing students' vocabulary mastery. These findings indicate that crossword puzzles can encourage active participation, provide repeated exposure to vocabulary, and create more meaningful learning experiences. Therefore, crossword puzzles may be considered an effective and enjoyable alternative strategy for teaching vocabulary in EFL classrooms.

Keywords: *Crossword Puzzle, Vocabulary Mastery, EFL Learners, Game-Based Learning, English Education*

INTRODUCTION

Vocabulary is one of the important parts in learning English as a Foreign Language (EFL). It is needed because students use vocabulary to understand meaning and also to express their ideas, both in spoken and written form. If students do not have enough vocabulary, they usually find it difficult to follow lessons, understand texts, or express what they want to say. Therefore, vocabulary can be considered a fundamental element in learning English. Nation (2001) explains that vocabulary mastery is not limited to knowing the meanings of words but also includes knowledge of word forms, spelling, grammatical behavior, collocations, and appropriate use in different contexts. This multidimensional nature of vocabulary knowledge has also been emphasized in more recent studies (Ha, 2021; Tong et al., 2023).

In fact, many students in Indonesia still have problems with vocabulary. From what can be seen in the classroom, students often know only a limited number of words. This makes them confused when they read English texts or listen to explanations. Sometimes they learn new vocabulary, but after some time they forget it. In addition, when they try to use new words, they are often unsure whether they are using them correctly, which reduces their confidence. Spelling also remains a common challenge. According to Zhu and Wang (2022), successful vocabulary learning depends not only on memorization but also on learners' ability to regulate their own learning process. Likewise, Ueno and Takeuchi (2022) found that self-regulated vocabulary learning strategies contribute significantly to vocabulary development. These findings are further supported by Hayatbakhsh et al. (2024), who argued that effective vocabulary acquisition requires learners to develop both the breadth and depth of vocabulary knowledge through appropriate learning strategies.

Because of this situation, teaching vocabulary only by asking students to memorize words may not be effective enough. In some classes, teaching still depends mainly on teacher explanations, while students spend most of their time listening passively. According to Aswad et al. (2022), technology-supported vocabulary instruction can create a more interactive learning environment that encourages students to participate actively in classroom activities. When students are not actively involved, they tend to pay less attention and have fewer opportunities to practice new vocabulary. Katemba et al. (2022) also found that game-based activities, such as Kahoot!, significantly increase students' motivation and engagement during vocabulary learning. Therefore, teachers need to adopt more interactive instructional approaches that encourage active participation, such as game-based learning activities. These approaches also provide repeated exposure to target words, which supports vocabulary acquisition and long-term retention (Lee, 2022).

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One activity that can be used is crossword puzzle. It is actually a simple word game, where students need to fill in words based on some clues, either across or down. Even though it looks simple, this activity can help students practice vocabulary. They need to think about the meaning, remember the words, and also make sure the spelling fits. In this case, students are not only memorizing, but also trying to connect the words with the clues. This process is related to task-induced involvement because students need to search for words, evaluate clues, and connect word forms with meanings (Hulstijn & Laufer, 2001; Orawiwatnakul, 2017).

There are some advantages of using crossword puzzle in learning vocabulary. For example, students can remember words better because they repeat and think about the vocabulary while doing the puzzle. It also helps them to be more careful with spelling. Besides that, the activity feels more relaxed, because it is like a game. So, students usually enjoy it more and become more active in the class. Game-based and gamified learning activities have also been reported to increase students' engagement, motivation, and attention in language learning when they are designed appropriately (Hung et al., 2018; Zhang & Hasim, 2023; Zou et al., 2021).

Some previous studies also found that using crossword puzzle can help improve students' vocabulary. Students who used this activity often showed better results compared to those who learned in a usual way. They were also more active and looked more interested during the lesson. In general, using games in learning can make students feel more comfortable and help them remember vocabulary better. Orawiwatnakul (2017), for example, found that crossword puzzles had a positive effect on students' vocabulary development, while studies on digital and game-based vocabulary learning also indicate that games can support vocabulary learning and retention (Chen et al., 2021; Lin & Lin, 2019; Mahdi, 2018; Zou et al., 2021).

However, not all studies focus on the same context. Many of them were conducted in junior high school, and not many at the university level. Some studies also used different methods or combined crossword puzzle with other techniques. Therefore, there is still a research gap regarding the effectiveness of crossword puzzles as a standalone vocabulary learning strategy for university-level EFL learners, particularly in Indonesian Islamic higher education contexts. In addition, previous studies have predominantly focused on younger learners, making empirical evidence on vocabulary development among English Education students at the tertiary level relatively limited.

In this research, the focus is on students of Tadris Bahasa Inggris, using a pre-experimental design with one-group pre-test and post-test. This is important because even at the university level, students still face difficulties in vocabulary, especially when they need to use it in academic contexts. Harselina et al. (2024) reported that university students still experience considerable difficulties in vocabulary mastery, particularly in understanding and using different word classes appropriately. Likewise, research on Indonesian EFL university students has shown that lexical diversity and academic vocabulary use remain major challenges in academic writing, indicating the need for systematic vocabulary instruction (Raufi et al., 2024). Therefore, vocabulary-learning interventions that provide structured practice are still necessary to strengthen students' lexical knowledge and academic language use (Zakian et al., 2022).

The novelty of this study lies in its examination of crossword puzzles as a focused vocabulary-learning intervention among Indonesian EFL students enrolled in a Tadris Bahasa Inggris program at an Islamic university. Unlike previous studies that mainly involved school students or integrated crossword puzzles with other instructional approaches, this study specifically investigates the effect of crossword puzzle activities through a pre-experimental

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one-group pre-test and post-test design in a higher education setting. Based on the explanation above, this study tries to find out whether the use of crossword puzzles gives a significant effect on students' vocabulary mastery. The focus is on Indonesian EFL students of Tadris Bahasa Inggris by comparing their scores before and after the treatment using a one-group pre-test and post-test design.

RESEARCH METHOD

This study employed a pre-experimental design using a one-group pre-test and post-test approach to investigate the effect of crossword puzzle activities on students' vocabulary mastery. The design was selected because it enables researchers to examine changes in participants' achievement before and after an instructional intervention using the same group (Creswell & Creswell, 2018). The study was conducted in the English Education (Tadris Bahasa Inggris) Program at an Islamic higher education institution in Indonesia. The participants were 27 fourth-semester students selected through purposive sampling because they had completed basic English courses and were considered suitable for the objectives of the study.

The research instrument was a vocabulary test administered as both the pre-test and the post-test. The test consisted of 20 items, including multiple-choice, fill-in-the-blank, and crossword-based questions designed to assess students' vocabulary mastery in terms of word meaning, spelling, and contextual use. To ensure content validity, the instrument was evaluated by two lecturers in English language education who examined the relevance, clarity, and appropriateness of each item based on the learning objectives. Revisions were made according to their suggestions before the instrument was administered. Subsequently, a pilot test was conducted with students who had characteristics similar to those of the research participants. The reliability of the instrument was calculated using Cronbach's alpha, with a coefficient of 0.70 or above considered acceptable for educational research.

Data collection was carried out in three stages. The first stage involved administering the pre-test to determine students' initial vocabulary mastery. The second stage consisted of three instructional meetings using crossword puzzle activities as the primary learning strategy. During the treatment, students solved vocabulary puzzles individually and in small groups by interpreting clues, recalling appropriate vocabulary items, and completing crossword grids related to the instructional materials. These activities were intended to provide repeated opportunities for vocabulary practice in an engaging learning environment. After the completion of the treatment, the post-test was administered using an equivalent test to measure students' vocabulary mastery after the intervention.

The collected data were analyzed quantitatively using IBM SPSS Statistics. Descriptive statistics were calculated to summarize the students' pre-test and post-test scores, including the mean, standard deviation, minimum score, and maximum score. Before conducting hypothesis testing, the normality of the data was examined using the Shapiro–Wilk test. Since the same participants completed both tests, a paired-samples *t*-test was employed to determine whether the difference between the pre-test and post-test scores was statistically significant. The level of significance was set at 0.05. The null hypothesis (H_0) stated that crossword puzzle activities did not significantly improve students' vocabulary mastery, whereas the alternative hypothesis (H_1) stated that they significantly improved students' vocabulary mastery. The decision to accept or reject the hypothesis was based on the significance value obtained from the paired-samples *t*-test.

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RESULT AND DISCUSSION

The effectiveness of crossword puzzles in improving vocabulary mastery may also be related to the cognitive engagement created during the learning process. Students were required to analyze clues, recall vocabulary items from memory, and connect word meanings with spelling patterns simultaneously. This process encourages deeper mental processing compared to traditional memorization activities. According to the Involvement Load Hypothesis proposed by (Hulstijn & Laufer, 2001), learners tend to retain vocabulary better when they actively process lexical items through meaningful tasks.

Another important finding is the reduction of score variability after the treatment, as indicated by the lower standard deviation in the post-test scores. This suggests that crossword puzzle activities not only improved high-achieving students' performance but also helped lower-achieving students participate more effectively in vocabulary learning. Collaborative discussions during puzzle-solving activities may have supported weaker students in understanding unfamiliar words and correcting spelling mistakes.

Furthermore, the enjoyable nature of crossword puzzles appeared to reduce students' anxiety during vocabulary learning. Many EFL learners often feel pressured when learning new vocabulary through conventional methods such as memorization and translation exercises. By integrating game-based learning activities, students became more relaxed and willing to participate actively in classroom interaction. This supports previous findings by (Zou et al., 2021) and (Hung et al., 2018), who reported that gamified learning environments can increase learner motivation and engagement in language classrooms.

Result

Descriptive Statistics

Table 1 presents the descriptive statistics of the pre-test and post-test scores obtained from 27 participants. The findings indicate that students' learning outcomes improved after the implementation of the treatment. The mean score increased from 93.34 in the pre-test to 97.26 in the post-test, while the median score also increased from 96.67 to 99.00. In addition, the standard deviation decreased from 8.106 in the pre-test to 6.714 in the post-test, indicating that students' scores became more homogeneous after the treatment was applied. The Shapiro-Wilk test results showed significance values below 0.001 for both pre-test and post-test scores, suggesting that the data were not normally distributed. Nevertheless, the descriptive findings still demonstrated a positive tendency toward improved student achievement after the treatment.

Table 1. Descriptive Statistics of Pre-Test and Post-Test Scores

Statistics	Pre-Test	Post-Test
Valid	27	27
Missing	0	0
Median	96.67	99.00
Mean (Arithmetic)	93.34	97.26
Standard Deviation	8.106	6.714
Shapiro–Wilk	0.768	0.412
Shapiro–Wilk *p*-value	< .001	< .001
Minimum	63.33	65.33
Maximum	100.00	100.00

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Table 1 presents the descriptive statistics of students' pre-test and post-test scores. The results show that the mean score increased from 93.34 in the pre-test to 97.26 in the post-test, indicating an improvement in students' vocabulary mastery after the implementation of the crossword puzzle activities. In addition, the standard deviation decreased from 8.106 to 6.714, suggesting that students' scores became more consistent following the treatment. Although the descriptive statistics provide an overview of students' performance, they do not fully illustrate the distribution of the scores. Therefore, boxplot visualizations were used to complement the statistical findings by displaying the median, interquartile range, overall spread, and potential outliers. These graphical representations allow a clearer comparison of students' performance before and after the treatment. The distribution of students' pre-test scores is presented in Figure 1.

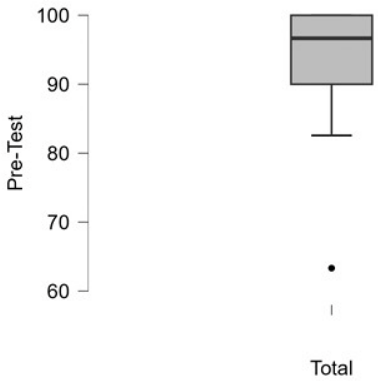

Figure 1. Boxplots of Pre-Test

Figure 1 shows that the pre-test scores were relatively dispersed, as indicated by the wider interquartile range and the longer lower whisker. In addition, one low outlier can be observed at approximately 63.33, suggesting that at least one participant performed considerably below the majority of the students before the treatment. Although several students achieved high scores, the variation in performance was still relatively large during the pre-test. After the crossword puzzle intervention, the distribution became more concentrated at higher score levels, as illustrated in Figure 2.

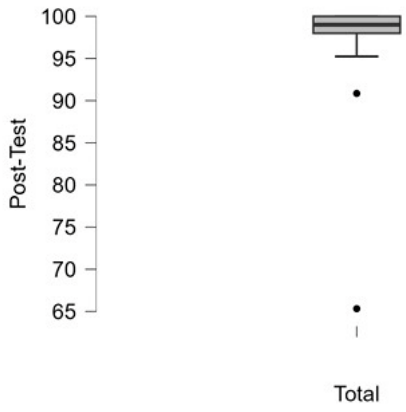

Figure 2. Boxplots of Post-Test

https://doi.org/10.51878/strategi.v6i3.12299

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Figure 2 demonstrates that the post-test scores were more concentrated near the maximum score, with a smaller interquartile range than that of the pre-test, indicating greater consistency in students' performance after the treatment. Although two lower outliers remained, most participants achieved scores between approximately 98 and 100. This upward shift in score distribution is consistent with the increase in the mean score reported in the descriptive statistics, suggesting that students' vocabulary mastery improved following the crossword puzzle intervention.

Paired Sample t-Test Analysis

To determine whether the improvement between pre-test and post-test scores was statistically significant, a paired-samples *t*-test was conducted. As shown in **Table 2**, the analysis revealed a significant difference between the pre-test and post-test scores, $t(26) = -4.727$, $p < .001$. These results indicate that the treatment significantly improved students' academic performance. Furthermore, the Cohen's *d* value of −0.910 indicates a large effect size, suggesting that the treatment had a substantial practical impact on students' learning achievement. Therefore, the findings suggest that the implementation of the learning strategy used in this study was effective in enhancing students' vocabulary mastery. The detailed statistical results of the paired-samples *t*-test are presented in Table 2.

Table 2. Paired Sample t-Test Results

Measure 1		Measure 2	t	df	p	Cohen's d	SE Cohen's d
Pre-Test	-	Post-Test	−4.727	26	< .001	−0.910	0.127

Note. Student's t-test.

Table 2 presents the results of the paired-samples *t*-test used to examine the difference between students' pre-test and post-test scores. The statistical analysis revealed a significant difference between the two sets of scores, $t(26) = -4.727$, $p < .001$. In addition, the effect size was large, as indicated by Cohen's $d = -0.910$, suggesting that the treatment produced a substantial improvement in students' vocabulary performance. Therefore, the findings indicate that the crossword puzzle activities were associated with an increase in students' vocabulary mastery.

Relationship Between Pre-Test and Post-Test Scores

Figure 3 presents the scatter plot illustrating the relationship between pre-test and post-test scores. The upward regression line indicates a positive relationship between both variables, meaning that students with relatively high pre-test scores also tended to achieve high post-test scores. Moreover, the clustering of points near the upper score range in the post-test suggests that most students experienced improvement after the treatment. The scatter plot also confirms the consistency of score improvement across participants, supporting the statistical findings obtained from the paired sample t-test analysis.

https://doi.org/10.51878/strategi.v6i3.12299

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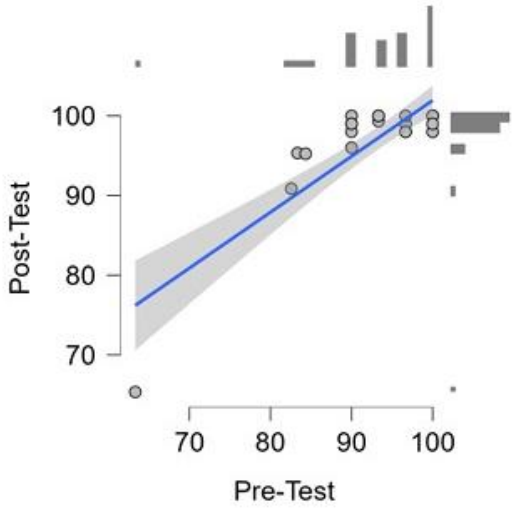

Figure 3. Scatter Plot of Pre-Test and Post-Test Scores

Discussion

The findings of this study indicate that the use of crossword puzzles had a positive and significant effect on students' vocabulary mastery. This can be seen from the improvement in students' post-test scores compared to their pre-test scores. The statistical analysis also showed a significant result ($p < .001$), indicating that the treatment successfully improved students' vocabulary achievement. These findings are consistent with the study conducted by Mansur et al. (2023), which reported that crossword puzzle activities effectively improved EFL students' vocabulary mastery by increasing their engagement with target words. Similarly, Ramadhani and Shofiyuddin (2024) found that crossword puzzle-based learning media enhanced students' vocabulary acquisition and learning motivation. The present findings also support the results reported by Wefi et al. (2023), who concluded that crossword puzzles significantly contributed to learners' vocabulary development in EFL classrooms.

The improvement of students' scores may occur because crossword puzzle activities encourage students to actively engage with vocabulary items during the learning process. Students were not only asked to memorize words, but also to identify meanings, recall vocabulary from memory, connect clues with word forms, and pay attention to spelling accuracy. This finding supports Nation (2001), who states that vocabulary mastery involves several aspects such as meaning, spelling, form, and use. This conceptualization has recently been reinforced by Stewart et al. (2024), who demonstrated that vocabulary knowledge comprises multiple interrelated dimensions that contribute to learners' language proficiency. Through crossword puzzle activities, students practiced those aspects simultaneously.

In addition, crossword puzzles can create a more interactive and enjoyable classroom atmosphere. During the treatment sessions, students became more active and motivated because the activity was presented in the form of a game. This condition helped students pay more attention to the lesson and reduced boredom during vocabulary learning. This finding is in line with (Hung et al., 2018) and (Zou et al., 2021), who explain that game-based learning activities can improve students' engagement and motivation in language learning.

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Another possible reason for the improvement is the role of repetition and active recall in crossword puzzle activities. While solving the puzzles, students repeatedly read, remembered, and used vocabulary items. According to Webb (2007), repeated exposure to vocabulary helps learners retain words more effectively in long-term memory. This argument is further supported by Shin and Kim (2023), who found that higher exposure frequency and repeated vocabulary activities significantly enhanced vocabulary learning outcomes compared with limited exposure. In this study, students continuously interacted with the same vocabulary items during the treatment, which may explain why their vocabulary scores improved after the intervention.

The findings of this research also support the Involvement Load Hypothesis proposed by Hulstijn and Laufer (2001). The theory explains that vocabulary learning becomes more effective when learners are cognitively involved in processing words. Recent evidence from Liu and Reynolds (2022) further confirms that vocabulary tasks requiring greater cognitive involvement consistently produce better vocabulary learning outcomes across a wide range of EFL contexts. In crossword puzzle activities, students needed to think carefully about clues, evaluate possible answers, and connect meanings with spelling and word forms. Therefore, students were not passive learners but actively processed vocabulary throughout the learning activities.

Furthermore, this study is consistent with previous studies that found positive effects of crossword puzzles on vocabulary learning. (Orawiwatnakul, 2017), for example, reported that crossword puzzles improved students' vocabulary development because learners became more engaged and interested during classroom activities. Similarly, (Mahdi, 2018) and (Lin & Lin, 2019) explained that interactive and game-based vocabulary learning activities can support vocabulary retention and improve learning outcomes. The decrease in standard deviation from the pre-test to the post-test also indicates that students' scores became more homogeneous after the treatment. This means that crossword puzzle activities did not only benefit high-achieving students, but also helped lower-performing students improve their vocabulary mastery. The treatment may have provided equal learning opportunities because students could learn collaboratively, discuss clues with peers, and receive immediate feedback during classroom activities.

Although the findings showed positive results, this study still has some limitations. First, the research used only one group without a control group, so external factors could not be fully controlled. Second, the number of participants was relatively small and limited to one class of fourth-semester students. Therefore, the findings may not fully represent all EFL learners in different educational contexts. Despite those limitations, the results still suggest that crossword puzzles can be used as an alternative teaching strategy in vocabulary learning, especially for EFL students. Teachers may apply crossword puzzle activities to create a more enjoyable classroom atmosphere and help students improve vocabulary mastery through active learning and repeated practice.

CONCLUSION

Based on the findings of this study, it can be concluded that crossword puzzles are an effective instructional strategy for improving vocabulary mastery among Indonesian EFL students. Beyond the statistical improvement observed between the pre-test and post-test scores, the findings suggest that vocabulary learning becomes more meaningful when students are actively engaged in discovering, recalling, and applying lexical items in a contextualized and interactive manner. This indicates that crossword puzzles support not only vocabulary retention

https://doi.org/10.51878/strategi.v6i3.12299

but also deeper cognitive processing of word meanings, forms, and usage, which are essential components of vocabulary mastery in EFL learning.

The results also highlight the importance of incorporating game-based learning activities into vocabulary instruction at the tertiary level. Crossword puzzles provide opportunities for students to interact with vocabulary in an enjoyable and low-anxiety learning environment, thereby increasing engagement and participation. In this regard, the study supports the view that effective vocabulary instruction should move beyond rote memorization and encourage learners to actively construct vocabulary knowledge through meaningful learning experiences. Thus, the use of crossword puzzles can serve as a practical pedagogical alternative for English language instructors, particularly in higher education EFL contexts.

This study achieved its objective of examining the effect of crossword puzzles on students' vocabulary mastery by demonstrating their positive contribution to vocabulary development among Tadris Bahasa Inggris students. Nevertheless, the findings should be interpreted within the limitations of the study, including the use of a single-group design and a relatively small sample size. Future research is recommended to employ more rigorous experimental designs involving control groups, larger participant populations, and different educational contexts. Further studies may also investigate the long-term effects of crossword puzzles on vocabulary retention and explore their potential contribution to the development of other language skills, such as reading comprehension, writing, speaking, and language fluency.

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