



THE EFFECTIVENESS OF CROSSWORD PUZZLES WITH VARIED CLUE TYPES ON VOCABULARY MASTERY AMONG SECONDARY SCHOOL STUDENTS IN JEMBER

by

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(Article History: Received:28-02-2026;Reviewed1:14-04-2026;Reviewed2:22-05-2026: Accepted:06-06-2026;Published:10-06-2026).

Abstract:

This study examines the effectiveness of crossword puzzles that integrate various type of clues in improving vocabulary mastery among secondary school students in an EFL learning environment. Vocabulary learning in the classroom can be challenging, as students have limited opportunities to interact with English. On the other hand, empirical research focusing on teaching strategies with structured instructional support is also limited. Therefore, this study aims to examine whether using of crossword puzzles that integrate varied clue types can support vocabulary learning. This study employed a pre-experimental one group pretest-posttest design, supported by qualitative data collected through questionnaires. Because the distribution of vocabulary test scores was not normal, non-parametric analysis was performed. Qualitative findings indicate that clues integrated into crossword puzzles support students, including definitions, synonyms, antonyms, fill-in-the-blanks, and pictures with letter clues in each grid, which help students recall the target vocabulary they have learned, in turn increase their confidence during the activity. The results of the study indicate that crossword puzzles with varied clue types improved students' vocabulary development and engagement in a rural EFL classroom. In practice, the findings suggest that teachers may adapt crossword puzzles with varied clue types as a low-cost accessible strategy to support vocabulary learning in contexts where exposure to English and instructional resources are limited.

Keywords: *crossword puzzle, English as a Foreign Language (EFL), varied clue types, vocabulary mastery*

Abstrak:

Penelitian ini mengkaji efektivitas teka-teki silang yang mengintegrasikan berbagai jenis petunjuk dalam meningkatkan penguasaan kosakata siswa sekolah menengah pada lingkungan pembelajaran bahasa Inggris sebagai bahasa asing (EFL). Pembelajaran kosakata di kelas dapat menjadi tantangan karena siswa memiliki kesempatan yang terbatas untuk berinteraksi dengan bahasa Inggris. Di sisi lain, penelitian empiris yang berfokus pada strategi pembelajaran dengan dukungan instruksi yang terstruktur masih relatif terbatas. Oleh karena itu, penelitian ini bertujuan untuk

How to cite this article:

Intama,A.,Nuraini,K., & Rasuki,M. (2026). The effectiveness of crossword puzzles with varied clues types on vocabulary mastery among secondary school students in **Jember**. *Premise: Journal of English Education and Applied Linguistics*, 15(2), 287-307. <https://doi.org/10.24127/pj.v15i1.15863>

Intama et al. (2026)

menguji apakah penggunaan teka-teki silang yang mengintegrasikan berbagai jenis petunjuk dapat lebih efektif dalam mendukung pembelajaran kosakata. Penelitian ini menggunakan desain pra-eksperimental one-group pretest-posttest yang didukung oleh data kualitatif yang dikumpulkan melalui kuesioner. Karena distribusi skor tes kosakata tidak menunjukkan distribusi normal, analisis non-parametrik digunakan. Temuan kualitatif menunjukkan bahwa petunjuk yang diintegrasikan dalam teka-teki silang, seperti definisi, sinonim, antonim, isian rumpang (fill-in-the-blank), gambar, serta bantuan petunjuk huruf pada setiap kotak, membantu siswa mengingat kembali kosakata target yang telah dipelajari sehingga meningkatkan kepercayaan diri mereka selama kegiatan berlangsung. Hasil penelitian menunjukkan bahwa teka-teki silang dengan berbagai jenis petunjuk berkaitan dengan peningkatan penguasaan kosakata siswa serta keterlibatan mereka dalam kegiatan pembelajaran pada konteks EFL di daerah pedesaan. Secara praktis, temuan ini menunjukkan bahwa guru dapat mengadaptasi teka-teki silang dengan berbagai jenis petunjuk sebagai strategi pembelajaran yang terjangkau, mudah diterapkan, dan dapat diakses untuk mendukung pembelajaran kosakata pada konteks yang memiliki keterbatasan paparan bahasa Inggris maupun sumber daya pembelajaran.

Kata kunci: teka-teki silang, variasi petunjuk, pembelajaran kosakata, EFL

INTRODUCTION

In many secondary school EFL classrooms, students encounter English structures that differ from their first language. Because of this, vocabulary learning does not rely only on repeated exposure to English input. Students also need opportunities to recognize new words, understand their meanings, and recall them through meaningful use in learning activities (Rasuki & Ahmad, 2023). Rural students may struggle with this process due to limited exposure to English outside school. Although the school is not geographically isolated, English is rarely used in students' daily environments, making classroom activities the primary source of English input. In these circumstances, vocabulary knowledge provides the essential foundation that shapes how well students comprehend reading materials and participate in classroom activities. Over time, this builds language proficiency development and can build their reading, speaking, listening, and writing skills (Al Qunayeer, 2021; Ashar et al., 2025).

Previous studies have reported that students in rural areas often fall behind their urban peers in English vocabulary development. Research indicates gaps between rural and urban learning contexts. According to Restinawati et al. (2024), urban students in Buton, Indonesia, tended to score higher than their rural counterparts, particularly in pronunciation, grammar, and comprehension of English term. In rural settings, these gaps can create extra challenges for vocabulary learning. Lack of instructional resources, insufficient exposure to English, and teacher shortages are among the factors contributing to students' performance (Astriyani et

al., 2025; Fadilah et al., 2023). However, vocabulary problems cannot be entirely explained by the exposure problem. Vocabulary learning is also influenced by students' effort and their active engagement in using English (Dörnyei & Ryan, 2015; Laufer & Hulstijn, 2001). In a rural context where exposure is limited, this cognitive effort becomes even more demanding, especially for beginner and low-proficiency EFL learners who often engage in cognitive translation from their first language (L1) into English, the target language (L2). According to cognitive load theory, learners may experience unsatisfactory learning outcomes when tasks are too difficult or poorly structured, as this can overload their working memory (Sweller et al., 2019). Therefore, there is an increasing need for structured instructional tasks that can support vocabulary learning while maintaining manageable cognitive demands, particularly in rural EFL contexts where independent exposure is limited (Eskandari et al., 2024; Rejeki & Wahyuni, 2025).

One instructional approach that offers structured yet engaging learning experiences is game-based learning. In recent years, studies have shown that game-based learning effective in foreign language learning settings because it boosts student motivation, engagement, and language retention (Luo, 2023; Roseni & Muho, 2024). This game-based strategy has also been found to support vocabulary learning (Panjaitan & Amaniarsih, 2021). In rural contexts, activities that incorporate game elements can foster a learning environment where students feel more engaged and supported. Research in a rural school in Thailand found that students who use gamified learning performed better than those in conventional classrooms (Panyajamorn et al., 2022). However, these studies generally emphasize the effectiveness of game-based activities at a broad level, without examining how specific instructional elements within the activity are designed, implemented, and function to support vocabulary learning.

Among various game-based approaches, puzzle-based learning, particularly crossword puzzles, has been shown to support vocabulary learning. Previous studies have explored the use of puzzles as tools for vocabulary learning and have shown a positive outcome. For example, Hafizhah and Pratolo (2022) examined puzzle-based activities in junior high school students using a classroom-based intervention design and reported improved vocabulary outcomes. However, the study focused on general puzzle engagement without specifying the types of clues used. Similarly, Sari et al. (2023) applied Scrabble and crossword puzzles in a rural learning environment using collaborative learning activities. While the finding indicated

improved vocabulary acquisition, the study did not examine how different forms of clues functioned as instructional support. While, Alda and Wati (2021) examined pronunciation during crossword activities, focusing on oral production rather than structured cognitive support through clue design. In another study, Ramadhani and Shofiyuddin (2025) developed crossword puzzles with clue cards as instructional media to enhance vocabulary mastery. Although the results showed vocabulary improvement, the clues functioned mainly as direct prompts rather than varied scaffolding mechanisms.

Nevertheless, these studies differ from the present study in several aspects, including research focus, instructional design, and methodological approach. Most prior studies focus on the use of puzzles as general learning tools, often employing single-type clues or template formats, without systematically examining how different types of clues function as instructional variables. In addition, previous research tends to emphasize outcomes rather than analysing the role of clue variation in supporting vocabulary processing, and many studies do not explicitly address how task design interacts with cognitive processes in rural EFL contexts.

Based on these limitations, a clear research gap emerges regarding the role of varied clue types within crossword puzzles as structured instructional support for vocabulary learning. Therefore, this study aims to investigate (1) the effectiveness of crossword puzzles incorporating varied clue types in improving students' vocabulary mastery and (2) students' perceptions of the use of such activities in a rural EFL classroom.

Practically, it provides a low-cost, accessible, and adaptable instructional strategy for teachers working in resource limited rural classrooms, where exposure to English is minimal and instructional support is often constrained. This study empirically contributes to the literature by shifting the focus from the general effectiveness of game-based learning to the analysis of instructional design within the activity, particularly how varied clue types function as task-embedded scaffolding. This novelty lies in examining not only whether crossword puzzles show improvement, but also how their structure through different types of clues, can facilitate vocabulary processing. Additionally, this study highlights how a commonly used instructional tool can be optimized through the structured variation of clues. It makes the study particularly relevant in contexts where teachers need practical, adaptable, and resource-efficient strategies to support vocabulary learning.

Based on the theoretical framework and previous studies discussed above, this study assumes that crossword puzzle activities with varied clue types may support vocabulary learning by providing structured instruction and encouraging active engagement throughout the learning process. In addition, students are expected to demonstrate positive attitudes toward the activity, particularly in vocabulary understanding, participation, and collaborative learning.

This study draws on scaffolding theory and cognitive load theory. Scaffolding theory suggests that learners can perform beyond their independent ability when supported appropriately (Wood et al., 1976), while cognitive load theory emphasizes the importance of managing cognitive demands during learning (Sweller et al., 2019). In this study, scaffolding is embedded in the task design, with each crossword item providing a fixed type of support (e.g., definition, synonym, antonym, image, fill-in-the-blank, or letter cue rather than allowing learners to follow different pathways of vocabulary processing. This structured variation allows learners to engage with vocabulary through multiple forms of processing without overwhelming working memory. Therefore, this study addresses the following research questions:

- 1) Is there any significant improvement in students' vocabulary mastery after using crossword puzzles with varied clue types?
- 2) How do students perceive the use of crossword puzzles with varied clue types in vocabulary learning?

METHOD

Design

This study employed a pre-experimental one-group pretest-posttest design supported by qualitative descriptive data. Quantitative data were collected through pretest and posttest scores to examine students' vocabulary achievement after the treatment. In contrast, qualitative supporting data from questionnaires and open-ended responses were used to provide additional insights into students' perceptions of the learning activity. In a chart, the one group pretest-posttest design (Ary et al., 2014) was described in Figure 1.

Figure 1. *One group pretest-post-test design*

Pretest	Independent	Posttest
Y_1	X	Y_2

Notes:

Y_1 = Students' vocabulary mastery before treatment

X = Crossword puzzle activities with varied clue types

Y_2 = Students' vocabulary mastery after treatment

The independent variable (X) in this study was the use of crossword puzzles incorporating varied clue types (definitions, synonyms, antonyms, fill-in-the-blank, images, and letter cues. In contrast, while the dependent variable (Y) was students' vocabulary mastery. Vocabulary mastery was operationally defined as students' ability to correctly select and use target words in context, as measured through fill-in-the-blank test items.

In addition to the vocabulary test scores, questionnaire data and open-ended responses were collected to support the interpretation of students' perceptions, engagement, and learning experiences during the implementation of crossword puzzle activities. This design enabled the study to examine not only students' vocabulary improvement after the treatment, but also their responses toward the learning process.

Participant

The participants consisted of 20 eleventh-grade students (9 females and 11 males) from Class XI IPS 1 at SMA BIMA Ambulu during the 2024/2025 academic year. The school is located in Jember, East Java, Indonesia, and represents a rural EFL context in which students have limited exposure to English outside the classroom. The participants were selected through convenience sampling due to accessibility considerations. Given that the current study employed a pre-experimental design, it was conducted with only one class accessible for research purposes. Ethical considerations were addressed by obtaining permission from the school and ensuring that students participated voluntarily. Students' identities were kept confidential and the data were used solely for research purposes.

Instrument

The instruments used in this study consisted of a vocabulary test and a perception questionnaire. The vocabulary test was administered as both a pretest and a posttest to

measure students' vocabulary achievement. The test result was a numerical score ranging from 0 to 100. The test consisted of eight fill-in-the-blank items, and each correct answer was scored 12.5 points, resulting in a maximum score of 100. The test was conducted during regular English class sessions in the students' classroom environment.

The researcher developed the test items based on the Indonesian senior high school English syllabus for Grade XI Semester 2 (Curriculum 2013 revised edition), with a particular focus on cause-and-effect texts. The vocabulary items were aligned with the instructional materials taught during the intervention and with vocabulary previously introduced in class. The items were reviewed by a university lecturer to ensure their clarity, relevance, and alignment with the learning objectives. Each item had a predetermined correct answer, and scoring was based on an affixed answer key to ensure consistency in scoring.

The perceptions questionnaire consisted of nine closed-ended items measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), as well as open-ended questions to capture students' qualitative responses. The closed-ended items produced ordinal data, while the open-ended questions generated qualitative responses regarding students' learning experiences. The questionnaire items were designed based on the objectives of the study and focused on three aspects: (1) students' perceived understanding of vocabulary through the clues provided, (2) students' enjoyment of the crossword puzzle activity, and (3) students' willingness to participate in similar activities in future learning. The questionnaire was administered immediately after the intervention during classroom instruction to capture students' perceptions of the learning experience.

Data collection technique

The study was conducted in three meetings. The first meeting served as the pretest session. Throughout this session, students independently completed eight item fill-in-the-blank assessment items. Students were expected to decide the correct target word to finish each sentence. The assessment was designed to measure students' base vocabulary knowledge related to the cause-and-effect topics.

In the second meeting, the treatment was implemented through a crossword puzzle activity designed to build vocabulary using varied types of clues. The treatment was conducted in a single session because the study aimed to investigate the immediate effects of

the crossword puzzle activity on students' vocabulary learning. Rather than investigating long-term vocabulary retention, the study focused on the short-term instructional effects of the activity following a single exposure. This approach enabled the researcher to assess students' immediate gains in vocabulary and perceptions following the intervention. During the treatment, students worked in pairs to solve crossword puzzles containing six types of clues: definitions, synonyms, antonyms, fill-in-the-blank, images, and letter cues. These hints were categorized as textual, contextual, and visual.

Textual hints cover definitions, synonyms, antonyms, and letter cues, such as a definition explaining a word meaning (e.g., to stay away from something bad or harmful) or a synonym and antonym prompt made students to think of words that semantically connected (e.g., hand in as a synonym of submit, or the opposite of fail) or letter cues (e.g., "V" in the second row) which integrated into the crossword grid to help students verify spelling and narrow possible answers. Then, contextual hints were provided through fill-in-the-blank sentences intended to be completed with the target vocabulary within cause–effect structures (e.g., she worked very hard to win the race, and her ____ paid off), allowing students to infer meaning from context. Images were used as visual hints to support vocabulary recognition. Each crossword item was designed with a predetermined type of clue, meaning that students did not choose the type of hint, but instead engaged with systematically varied clue types across items. This design ensured consistent exposure to different forms of cognitive support. These clues encouraged students to infer meaning, recall vocabulary, and verify answers independently rather than receiving direct answers.

During the treatment phase, a supplementary puzzle-based activity related to cause-and-effect relationships was briefly introduced as part of regular classroom practice. This activity aimed to help students recognize cause-and-effect structures in sentences. This activity did not use structured clues for the target vocabulary, so it was not included in the main intervention. As a result, it was excluded from the data analysis, and the study focused only on crossword puzzles that included various types of clues to support vocabulary learning.

The study employed a pretest-posttest procedure aligned with the research hypotheses, allowing the researcher to examine whether a statistically significant difference existed before and after the treatment. In the final meeting, students are supposed to complete a posttest using the same format as the pretest, to measure vocabulary achievement after treatment

followed by a questionnaire. The posttest measured students' vocabulary achievement right after implementing the crossword puzzle activities.

Data analysis technique

The quantitative vocabulary test data were analysed using descriptive and inferential statistics. Students' vocabulary scores from the pretest and posttest were calculated as means and standard deviations to identify the overall score distribution and improvement after the treatment. Since the pretest scores did not meet the assumption of normality, a Shapiro–Wilk test was conducted to assess the normality of the data distribution. A non-parametric Wilcoxon Signed-Rank Test was used to analyse the difference between the pretest and posttest scores. This test was selected because it is appropriate for paired data and does not require normal distribution in small samples. To examine whether the treatment produced a significant difference in vocabulary achievement, the following hypotheses were tested:

H₀: There is no significant difference in students' vocabulary mastery before and after the implementation of crossword puzzles with varied clue types.

H_a: There is a significant difference in students' vocabulary mastery before and after the implementation of crossword puzzles with varied clue types.

The closed-ended questionnaire data, which used a five-point Likert scale, were analysed descriptively using frequencies, percentages, and mean scores to identify students' perceptions toward the crossword puzzle activity. Responses to the open-ended questionnaire items were analysed using Content Category Analysis (CCA). Similar responses were coded and grouped into recurring categories related to crossword puzzle experience and vocabulary learning, and the data were then analysed to describe the distribution of students' responses. The qualitative findings were used to support and enrich the interpretation of the quantitative results.

RESULT AND DISCUSSION

Result of Vocabulary improvement after the treatment

To address the first research question, students took a pretest and a posttest to examine their vocabulary achievement. Descriptive statistics showed an increase in vocabulary scores following the intervention. The mean pretest score was 34.37 (SD = 27.76), while the mean posttest score was increased to 50.00 (SD = 26.28), as indicated in Table 1.

Table 1. Descriptive statistics of vocabulary scores

<i>Variable</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>
<i>Pretest</i>	20	34.37	27.76
<i>Posttest</i>	20	50.00	26.28

Before conducting inferential analysis, a Shapiro-Wilk test was used to examine the normality of the data distribution. The results showed that the pretest scores were not normally distributed ($p = 0.012$), whereas the posttest scores were normally distributed ($p = 0.799$), as shown in Table 2.

Table 2. Normality test results

<i>Variables</i>	<i>N</i>	<i>S-W</i>	<i>P-value</i>	<i>Interpretation</i>
<i>Pretest</i>	20	0.871	0.012	<i>Not normally distributed</i>
<i>Posttest</i>	20	0.972	0.799	<i>Normally distributed</i>

Since the assumption of normality was not fully met, a non-parametric Wilcoxon Signed-Rank Test was used to compare pretest and posttest scores. The rank analysis showed that 15 students obtained higher posttest scores than pretest scores, 4 students obtained lower posttest scores, and 1 student showed no change, as shown in Table 3.

Table 3. Wilcoxon Signed Ranks Test - Ranks

		<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>
<i>Posttest-</i>	<i>Negative Ranks</i>	4	6.38	25.50
<i>Pretest</i>	<i>Positive Ranks</i>	15	10.97	164.50
	<i>Ties</i>	1	-	-
	<i>Total</i>	20		

The Wilcoxon Signed-Rank Test revealed a statistically significant difference between the pretest and posttest scores ($Z = -2.839$, $p = 0.005$), as shown in Table 4.

Table 4. Wilcoxon Signed-Rank Test – statistics test

<i>Variable</i>	<i>N</i>	<i>Z</i>	<i>Sig. (2-tailed)</i>
<i>Pretest-posttest</i>	20	-2.839	0.005

The findings indicate that students achieved significantly higher vocabulary scores after the implementation of the crossword puzzle activity with varied clue types.

Students' perceptions of crossword puzzle activities based on closed-ended responses

To address the second research question, students' perceptions of the crossword puzzle activity were collected through a closed-ended questionnaire. The questionnaire focused on three aspects: vocabulary understanding and retention, perceived difficulty, and enjoyment of the activity.

Table 5. Students' perception of the effectiveness of crossword puzzles in supporting vocabulary understanding and retention

<i>Agreement Level</i>	<i>Frequency (N = 20)</i>	<i>Percentage</i>
<i>Strongly Disagree</i>	0	0%
<i>Disagree</i>	1	5%
<i>Neutral</i>	3	15%
<i>Agree</i>	12	60%
<i>Strongly Agree</i>	4	20%

Table 5 presents students' responses to the statement, "Crossword puzzles help me in understanding and remembering new vocabulary." The majority of respondents 60% agreed, and 20% strongly agreed that the crossword puzzle helped them understand and remember new vocabulary. Meanwhile, 15% of students chose the neutral option, and a mere 5% students disagreed.

Table 6. Students perceived level of difficulty in completing the crossword puzzle activity

<i>Agreement Level</i>	<i>Frequency (N = 20)</i>	<i>Percentage</i>
<i>Strongly Disagree</i>	3	15%
<i>Disagree</i>	7	35%
<i>Neutral</i>	7	35%
<i>Agree</i>	2	10%
<i>Strongly Agree</i>	1	5%

Table 6 shows students' responses to the statement, "I have difficulty understanding or completing crossword puzzles." The results show that 35% of students disagreed and 15% strongly disagreed with the statement that they experienced difficulty in completing the

crossword puzzle activity. In the hand, 15% of students agreed or strongly agreed that they experienced some difficulty, whereas 35% chose the neutral response.

**Table 7. Students' perceptions of the attractiveness of crossword puzzles
for vocabulary learning**

<i>Agreement Level</i>	<i>Frequency (N = 20)</i>	<i>Percentage</i>
<i>Strongly Disagree</i>	0	0%
<i>Disagree</i>	1	5%
<i>Neutral</i>	2	10%
<i>Agree</i>	12	60%
<i>Strongly Agree</i>	5	25%

Table 7 presents students' responses to the statement, "Crossword puzzles are fun to use in vocabulary learning." A total of 60% of students and 25% strongly agreed that crossword puzzles were interesting for learning vocabulary. Only 10% of students responded neutrally, while a small percentage expressed disagreement.

Students' perceptions based on open-ended responses

To complement the closed-ended questionnaire results, students were asked to provide written comments regarding their experiences during learning activities. The responses were grouped into three categories: vocabulary learning benefits, enjoyment and interest, and learning with peers.

Table 8. Content categories from students' open-ended responses

<i>Category</i>	<i>Frequency</i>	<i>Percentage</i>
<i>Enjoyment of Learning Activities</i>	7	50.0%
<i>Vocabulary Learning Benefits</i>	3	21.4%
<i>Peer Collaboration</i>	4	28.6%
<i>Total</i>	14	100%

As shown in Table 8, students commonly described the activities as enjoyable and engaging, while others reported learning new vocabulary and understanding word meanings. Some students also reported difficulties related to understanding English vocabulary and completing some of the puzzle tasks.

Table 9. Representative responses from students’ open-ended responses

Category	Example Responses
Crossword Puzzles	“I enjoyed the guessing activity because it was very fun”
Enjoyment	“I liked the crossword because it was easy and I enjoyed it” “The guessing activity made the learning process enjoyable”
Advantages of Learning Vocabulary	“I learned and translated eight vocabulary items” “I gained new vocabulary” “I learned how to find out the meanings of vocabulary”
Peer Collaboration	“I arranged the puzzle together with my friends” “We worked together to complete the task”

Discussion

Vocabulary achievement after the crossword puzzle treatment

The findings of this study revealed a statistically significant improvement in students’ vocabulary mastery following the implementation of a crossword puzzle activity featuring varied clue types. This finding directly addresses the first research question, the increase in posttest scores indicates that the instructional treatment contributed to measurable vocabulary development in a rural EFL classroom. This interpretation is supported by the increase in posttest scores and students’ improved performance as reflected in the descriptive and inferential statistical results.

This finding aligns with previous studies that identify the role vocabulary knowledge plays in language skills development (Al Qunayeer, 2021; Ashar et al., 2025). Those suggesting that the observed improvement reflects not only increased word recognition but also enhanced ability to use vocabulary within meaningful contexts. Similarly, Panyajamorn et al. (2022) demonstrated that gamified learning environments improve vocabulary retention. However, unlike these studies, which were conducted in more resource-supported or technology-enhanced contexts, the present study demonstrates that vocabulary gains can also be achieved through low-resource, paper-based crossword activities in rural classrooms.

Previous studies have reported that puzzle-based learning activities contributed positively to vocabulary learning, particularly in supporting students’ vocabulary mastery and classroom engagement (Alda & Wati, 2021; Hafizhah & Pratolo, 2022; Ramadhani &

Shofiuddin, 2025; Sari et al., 2023). However, these studies did not explicitly examine how internal task features, such as clue variation, contribute to learning processes, which this study addresses. Nevertheless, previous studies primarily treated puzzles as general learning media, whereas the present study specifically highlights the role of varied clue types as structured instructional support, representing a key distinction. Unlike previous studies that focused mainly on the effectiveness of puzzles in general, this study suggests how varied clue types may function as structured instructional scaffolding, thereby addressing the gap identified in the introduction.

From a theoretical perspective, this improvement can be explained through meaningful context exposure and cognitive processing. According to Nation (2001), vocabulary is more effectively acquired when presented in meaningful contexts rather than through isolated memorization. In this study, vocabulary items embedded in cause-and-effect contexts allowed students to connect meaning and usage. Additionally, Laufer and Hulstijn (2001) argue that deeper cognitive involvement enhances retention, which aligns with the problem-solving nature of crossword tasks. This finding supports the initial assumption that rural EFL learners require structured instructional support due to limited exposure to English.

Therefore, the findings suggest that the observed improvement may be associated with the interaction between contextual learning, cognitive engagement, and guided task design. This result suggested the argument proposed in the introduction that structured tasks help manage cognitive load in low-exposure contexts. However, this finding should be interpreted cautiously. The small sample size, limited number of test items, and short intervention period may restrict the generalizability of the results.

The function of varied clues as scaffolding

The second essential finding shows that varied clue types functioned as structured instructional scaffolding that supported vocabulary learning processes. Unlike traditional crossword puzzles that typically rely on a single type of clue (e.g., definitions), this study incorporated multiple types of hints (definitions, synonyms, antonyms, fill-in-the-blanks, images and letter cues).

Previous studies have reported positive outcomes from game-based and puzzle-based learning activities. Luo (2023) emphasized the effectiveness of gamified learning tools in

increasing students' engagement, motivation, and participation in language learning. Similarly, Panjaitan and Amaniarsih (2021) focused on improving students' vocabulary mastery through puzzle games. At the same time, Roseni and Muho (2024) highlighted the positive impact of gamification on students' engagement and language proficiency outcomes rather than instructional structure. However, these studies primarily discussed the overall effectiveness of game-based learning without examining how variation in clues supports students' cognitive processing, such as inferring meaning, recalling vocabulary, and verifying answers. In contrast, the present study suggests that varied clue types may have served as structured instructional scaffolding, guiding students along different pathways for vocabulary retrieval and meaning construction.

This result is grounded in scaffolding theory (Wood et al., 1976), where scaffolding provides temporary support that enables learners to accomplish tasks beyond their independent ability. In this study, each type of clue served as a different form of support, guiding students toward meaning without directly providing answers. At the same time, this finding can be interpreted in light of cognitive load theory. According to Sweller et al. (2019), learning is more effective when cognitive load is managed appropriately. Although multiple clue types could potentially increase task complexity, the structured distribution of clues across items may have helped regulate cognitive demand rather than overload it. This aligns with Mayer and Fiorella (2022), who argue that well-designed instructional support enhances cognitive processing.

Although students did not choose the type of clues, the variation across items ensured that learners were exposed to multiple forms of support, allowing them to engage with vocabulary through different cognitive pathways. Thus, the varied clues may be interpreted as systematically embedded scaffolding that provided different forms of support during vocabulary learning.

Students' perceptions of the crossword puzzle activity

The findings related to research question 2 indicate that students generally perceived the crossword puzzle activity as engaging, helpful, and supportive for vocabulary learning. Questionnaire results and qualitative responses consistently showed positive attitudes toward the activity. These perceptions are supported by the questionnaire results, which showed high

levels of agreement regarding engagement, enjoyment, and perceived usefulness of the activity.

Previous studies reported that game-based learning enhances motivation and engagement (Luo, 2023; Panjaitan & Amaniarsih, 2021). The present findings indicate that students' positive perceptions may also be influenced by the structured support embedded within the task, suggesting that engagement is closely linked to perceived cognitive accessibility rather than enjoyment alone. This interpretation is supported by engagement theory and active learning perspectives. According to Dörnyei and Ryan (2023), active involvement enhances language learning outcomes. In this study, students actively interpreted clues, discussed answers, and negotiated meaning, which contributed to both engagement and understanding.

Importantly, variation in student responses, including reports of difficulty may reflect differences in prior knowledge and learning experience rather than failure of the instructional design. Instead, the presence of multiple types of clues allowed students to approach tasks using different strategies. Therefore, it can be inferred that students' positive perceptions were influenced not only by enjoyment, but by the perceived usefulness and accessibility of the learning support provided.

Peer collaboration

Another important finding is the role of peer collaboration in facilitating vocabulary learning during the activity. Students worked in pairs, allowing them to exchange ideas, verify answers, and solve problems collaboratively. This collaborative interaction supported vocabulary development by enabling students to check their understanding and refine their responses through shared reasoning. This finding extends previous research on collaborative learning by Malik et al. (2024) and Sari et al. (2023), showing that peer interaction not only increases engagement but also serves as an additional layer of scaffolding, enabling students to negotiate meaning and verify vocabulary through shared reasoning. In this study, collaboration enabled students to clarify misunderstandings and confirm vocabulary choices, particularly when encountering unfamiliar words.

From a theoretical perspective, this interaction reflects contingent scaffolding. That support can emerge dynamically through peer interaction (Pol et al., 2010). In this study,

scaffolding was not only embedded in the task design with such clues, but also emerged from social peer discussion. Thus, vocabulary learning in this study was supported by structured instructional scaffolding and peer collaboration.

CONCLUSION AND IMPLICATION

Conclusion

This study concludes that using crossword puzzles with varied purposeful clues may support vocabulary development among secondary school EFL learners in rural settings with limited exposure to English. The findings indicate that the observed improvement was not merely the result of puzzle engagement, but may also have been influenced by structured task design in which contextual, textual, and visual clues served as cognitive scaffolding to support recall, verification, and vocabulary use. By specifically examining differentiated clue types such as definitions, synonyms, antonyms, fill-in-the-blank prompts, images, and letter cues, this study contributes a more focused understanding of how structured clue design may facilitate vocabulary mastery in resource constrained classrooms. The results suggest that low-cost instructional strategies can promote cognitive engagement and collaborative participation in vocabulary learning.

For pedagogical practice, English teachers in rural secondary schools may consider integrating crossword puzzles with varied hints as an alternative strategy to enhance vocabulary learning. Rather than using puzzles solely as supplementary games, teachers are encouraged to design differentiated clues that serve as scaffolding. Future studies may extend this investigation by implementing longer treatment periods, involving larger samples, or examining long-term vocabulary retention to validate the sustainability of this instructional approach further.

Limitation

This study has several limitations that should be acknowledged. First, the final analysis involved only 20 students from a single rural classroom due to incomplete pretest and posttest data. As a result, the findings should be interpreted with caution and may not generalize to vocabulary learning outcomes in broader EFL contexts. Second, the non-normal distribution of pretest scores reflects heterogeneous baseline ability, which may influence the magnitude of improvement. Third, the instrument consisted of only eight items, limiting

measurement depth. Future studies may incorporate additional validation procedures to strengthen instrument quality. Fourth, the instructional treatment was conducted in a single session, limiting conclusions regarding long-term vocabulary retention. As a result, the posttest scores reflect short-term learning outcomes, and variations in classroom conditions during testing may have affected students' focus and time management. This limitation suggests that the findings should be interpreted as preliminary evidence rather than definitive conclusions.

The findings indicate that vocabulary improvement was not solely the result of engaging activities, but rather the interaction between structured scaffolding, cognitive processing, and collaborative learning. The varied clue types served as systematically embedded support guiding learners along different pathways of lexical retrieval while maintaining a manageable cognitive load. Therefore, this study extends previous research by demonstrating that the effectiveness of game-based learning lies not only in engagement but also in how learning tasks are structured to support cognitive processes.

Implication

This study offers several pedagogical implications for English language teaching in rural contexts. Crossword puzzles with varied clue types may serve as an alternative instructional strategy for vocabulary development, particularly in rural classrooms with limited instructional resources. The use of textual, contextual, and visual clues in design may help accommodate learners with diverse proficiency levels thereby reducing difficulty when encountering unfamiliar vocabulary. Rather than using puzzles solely as supplementary activities, teachers may consider designing clues to provide structured support throughout the learning process. Given the minimal resources required, this approach may be practical and adaptable for vocabulary instruction in under-resourced EFL classrooms.

ACKNOWLEDGEMENT

The author would like to sincerely thank the school principal and the English teacher at SMA BIMA Ambulu for granting permission to conduct this research. Special appreciation is extended to the students for their active participation and cooperation throughout the study. The author is also deeply grateful to her supervisor for the valuable guidance, constructive feedback and support throughout the completion of this study.

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