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The Use of ChatGPT-Based Interactive Exercises to Improve Students' Vocabulary Mastery

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ABSTRACT

This study investigates the use of ChatGPT-based interactive exercises to improve eighth-grade students' vocabulary mastery at SMP Astra Makmur Jaya. The research employed a quantitative, quasi-experimental design with an experimental and a control group. Students' vocabulary mastery was measured through pre-test and post-test scores, focusing on two aspects: meaning and use. The experimental group received six sessions of ChatGPT-based, collaborative, small-group interactive exercises, while the control group was instructed through traditional textbook-based methods. The results showed that ChatGPT-based interactive exercises significantly improved students' vocabulary mastery. The experimental group's post-test score improved to 82.32, while the control group's average score was 70.53. Further statistical analysis revealed that the t-counted value (3.92) was higher than the t-table value (2.008), indicating a significant difference between the two groups. These findings indicate that ChatGPT-based interactive exercises effectively improve students' vocabulary mastery by providing contextual practice, immediate feedback, and increased student engagement. Therefore, the findings indicate that ChatGPT can serve as an effective learning tool to improve students' vocabulary mastery.

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1. INTRODUCTION

Vocabulary plays a crucial role in language learning because it enables learners to understand and convey meaning across all communication skills [1]. Nation [2] states that vocabulary knowledge includes form, meaning, and use, which together support students' ability to comprehend and produce language effectively. Likewise, Webb [3] emphasizes that strong vocabulary mastery directly influences comprehension and fluency. For junior high school students, especially in eighth grade, adequate vocabulary is essential to participate successfully in listening, reading, writing, and speaking activities [4], [5], [6].

In Indonesia, the Merdeka Curriculum integrates vocabulary into meaningful, contextual tasks rather than treating it as a separate component. This curriculum encourages creativity, collaboration, and active learning to strengthen students' functional English skills [7]. However, despite this approach, many learners still struggle with vocabulary development. Alqahtani [8] notes that weak vocabulary mastery often leads to difficulties in pronunciation, spelling, and understanding word meanings. Similarly, Ilham [9], [10] reports that limited learning media and lecture-dominated methods negatively affect vocabulary retention. Most existing studies have explored vocabulary learning through conventional teaching approaches, and little attention has been given to AI-based interactive tools such as ChatGPT at the junior high school level [11], [12], [13]

These challenges are also observed at SMP Astra Makmur Jaya, where classroom observations and teacher interviews revealed that many eighth-grade students possess limited vocabulary knowledge and struggle to use words appropriately in communication. Similar findings have been reported in other Indonesian junior high school settings, where students struggle to apply vocabulary meaningfully in spoken and written communication despite years of English instruction [14]. This condition underscores the need for more engaging, interactive learning strategies that provide meaningful exposure to vocabulary.

Advancements in educational technology have encouraged teachers to adopt more interactive methods to improve vocabulary learning [15], [16]. One innovation that offers strong potential is the use of ChatGPT-based interactive exercises. ChatGPT provides contextual vocabulary practice, instant corrective feedback, and opportunities for active learning, making it suitable for students who need continuous support in understanding and using new words [17], [18]. Previous studies have also demonstrated ChatGPT's effectiveness in enhancing vocabulary mastery. Shahdid Siswanto [19] found that ChatGPT significantly supported EFL learners' vocabulary acquisition, while Aldowsari and Aljebreen [20] reported that real-time feedback from ChatGPT improved students' accuracy and engagement during vocabulary practice. The findings emphasize ChatGPT's potential to overcome vocabulary learning difficulties in junior high school settings.

However, research on the use of ChatGPT for vocabulary learning among junior high school students remains limited, particularly in Indonesia. Accordingly, this study aims to explore the effectiveness of ChatGPT-based interactive exercises in improving the vocabulary mastery of eighth-grade students at SMP Astra Makmur Jaya. The novelty of this research lies in applying AI-driven interactive exercises to improve vocabulary, meaning, and use within a junior high school context.

2. METHOD

This study employed a quantitative quasi-experimental approach using a pre-test and post-test control-group design (Creswell [21]). Two existing classes were selected through purposive sampling based on their relevance to the study. The experimental group received treatment using ChatGPT-based interactive exercises, while the control group was taught through conventional instruction. The independent variable of this study was the use of ChatGPT-based interactive exercises, and the dependent variable was students' vocabulary mastery.

Experimental Group : O_1 X O_2
Control Group : O_3 O_4

Where:
O_1 O_3 = Pre-test
X = Treatment (ChatGPT-Based Interactive Exercises)
O_2 O_4 = Post-test

The research population included all students enrolled in the eighth grade at SMP Astra Makmur Jaya in the 2025/2026 academic year. From this population, two classes were purposively selected, appropriate for a quasi-experimental design with experimental and control groups, as randomization was not used. Class VIII A, with a total of 28 students, was selected as the control group and taught by the English teacher using traditional instructional methods. In contrast, Class VIII B, with 29 students, was designated as the experimental group and received learning activities using ChatGPT-based interactive exercises. The study employed a test as the primary research instrument. As stated by Arikunto [22], a research instrument is a tool used to collect research data systematically. This study applied pre-test and post-test tests to examine vocabulary improvement before and after the treatment, with the following scoring system:

Table 1. Scoring System for the Test

No	Type of Items	Number of Items	Score per Items	Total of Score	Scoring Criteria
1	Multiple Choice	12	1	12	Correct = 1, Incorrect = 0
2	Matching	10	1	6	Correct = 1, Incorrect = 0
3	Fill in the Blank	10	1	6	Correct = 1, Incorrect = 0
Total Score				24	

In Table 1, it was found that pre- and post-tests comprising 24 items were administered to both the experimental and control groups, consisting of 12 multiple-choice questions, six matching items, and six fill-in-the-blank items. The test focused on vocabulary related to nouns, verbs, and adjectives and was developed based on the school's vocabulary indicators. Each item was scored using a dichotomous scoring system: correct answers received 1 point and incorrect answers received 0.

To ensure comparability between the groups, the post-test was developed using the same format and structural composition as the pre-test. The instrument underwent expert validation by two English lecturers and one English teacher to confirm its content validity. Moreover, the reliability evaluation demonstrated that the test items were consistent and appropriate for measuring students' vocabulary mastery.

The data were analyzed using quantitative statistical procedures. Descriptive statistics were used to obtain standardized results, including the means and standard deviations for both groups. An independent t-test was then used to compare the mean scores and determine whether there was a significant difference between the experimental and control groups. The analysis was carried out following appropriate statistical procedures proposed by Arikunto [22]. A significance level of $\alpha = 0.05$ was used to guide decision-making.

The decision-making procedure was determined by comparing the computed t-value with the corresponding critical value from the t-table. When the t-count exceeded the t-table value, the alternative hypothesis (H_a) was accepted, indicating a significant improvement in students' vocabulary mastery as a result of the treatment. Conversely, when the t-count was lower than the t-table value, the null hypothesis (H_0) was accepted, suggesting that the treatment did not have a significant effect on vocabulary mastery.

3. RESULTS AND DISCUSSION

The data for this study were collected through the administration of pre- and post-tests to measure students' vocabulary mastery. The test consisted of three item types—multiple-choice, matching, and fill-in-the-blank. Each correct response was awarded 1 point, resulting in a total score of 24 for the entire test. The pre-test and post-test employed the same scoring criteria to ensure valid measurement of students' improvement.

3.1. Results

3.1.1 Results of Pre-test and Post-test

The results of both the pre-test and post-test show a significant increase in students' vocabulary mastery.

Table 2. Total of Pre-test and Post-test Scores

Groups	N	Total Score of Pre-test		Total Score of Post-test	
		Pre-test	Mean	Post-test	Mean
Experimental	29	1995.87	68.82	2387.55	82.32
Control	28	1941.66	69.34	1975.02	70.53

The pre-test results show that the experimental group achieved a total score of 1995.87 with an average of 68.82, while the control group obtained a total score of 1941.66 and a mean of 69.34, indicating that both groups had similar initial vocabulary mastery.

After the intervention, the post-test data indicated a noticeable disparity between the two groups. The experimental group's total score increased to 2387.55 with an average score of 82.32, while the control group reached 1975.02 with a mean of 70.53. These results demonstrate that the experimental group achieved greater improvement in vocabulary mastery than the control group.

3.1.2 Results of Score Deviation

The score deviation was computed to determine the extent of change in students' pre-test and post-test performance between the experimental and control groups.

Table 3. Total Deviation, Mean Deviation, Squared Deviation, Sum of Squared Deviation

Groups	N	Total Score of Deviation			
		D	Mean	d2	Sum d2
Experimental	29	390.68	13.47	12973.97	7710.84
Control	28	33.26	1.18	16707.24	16.66

In the experimental group, a total deviation of 390.68 was observed, along with a mean deviation of 13.47 and a total squared deviation of 12,973.97. In comparison, the control group showed a total deviation of 33.26, a mean deviation of 1.18, and a total squared deviation of 16,707.24.

The sum of squared deviation was 7,710.84 for the experimental group and only 16.66 for the control group. These findings indicate that the increase in students' scores was substantially higher in the experimental group than in the control group.

After calculating the sum of squared deviations for both groups, the researcher examined whether the difference between the two groups was statistically significant. The calculation was conducted using the procedure outlined by Arikunto [22] as follows:

$$t = \frac{M\,x - \mathrm{M}\,y}{\sqrt{\left(\frac{\sum x^2 + \sum y^2}{Nx + Ny - 2}\right)\left(\frac{1}{Nx} + \frac{1}{Ny}\right)}} \quad (1)$$

$$t = \frac{13.47 - 1.18}{\sqrt{\left(\frac{7710.84 + 16.66}{29 + 28 - 2}\right)\left(\frac{1}{29} + \frac{1}{28}\right)}} \quad (2)$$

$$t = \frac{12.29}{\sqrt{\left(\frac{7727.5}{55}\right)\left(\frac{57}{812}\right)}} \quad (3)$$

$$t = \frac{12.29}{\sqrt{(140.5)\,(0.07)}} \quad (4)$$

$$t = \frac{12.29}{\sqrt{(9.835)}} \quad (5)$$

$$t = \frac{12.29}{3.13} \quad (6)$$

$$t = 3.92 \quad (7)$$

Based on the calculations, the obtained t-value was 3.92, which exceeded the t-table value at the 0.05 significance level.

3.1.3 Testing Hypothesis

To determine the t-table value used in this study, the researcher first calculated the degrees of freedom (df), calculated using the formula df = Nx + Ny – 2. With 29 students in the experimental group and 28 students in the control group, the degrees of freedom were determined as follows:

$$df = 29 + 28 - 2 = 55 \quad (8)$$

Using a significance level of 0.05, the t-table value for df = 55 was obtained directly from Agus Setiawati [23], which states that the critical value at this level is 2.008.

The results of hypothesis testing showed that the obtained t-value (3.92) surpassed the t-table value (2.008), and thus the alternative hypothesis was accepted. Since the t-count exceeded the critical value, the alternative hypothesis was accepted. This indicates that ChatGPT-based interactive exercises had a significant impact on vocabulary mastery among eighth-grade students at SMP Astra Makmur Jaya.

3.2. Discussion

The findings of this study indicate that ChatGPT-based interactive exercises led to a significant improvement in students' vocabulary mastery. Students in the experimental group obtained higher post-test scores than those in the control group, who were taught through conventional methods. The improvement occurred because ChatGPT provided students with interactive practice and immediate feedback during the learning process. At the initial stage of treatment, many students experienced difficulty understanding word meanings and using vocabulary appropriately in context, as they tended to memorize words without applying them correctly in sentences.

During the implementation, students worked collaboratively in small groups and used ChatGPT to complete vocabulary exercises prepared by the teacher. Through these activities, students actively discussed their answers, identified errors, and revised their responses based on ChatGPT's feedback. This process encouraged active participation and increased students' engagement in learning, while the teacher served as a facilitator. Over several sessions, students showed clear improvement in vocabulary comprehension and contextual usage, accompanied by higher motivation during classroom activities.

These findings are consistent with previous studies. Shahdid Siswanto [19] reported that ChatGPT effectively improves vocabulary mastery by providing interactive learning experiences and real-time corrective feedback. Similarly, Aldowsari and Aljebreen [20] found that AI-assisted instruction enhanced students' engagement and accuracy in vocabulary learning.

In contrast, the control group showed only a slight improvement. Conventional, teacher-centered instruction limited students' opportunities to practice vocabulary and receive immediate feedback actively. As a result, students in the control group tended to learn vocabulary superficially and struggled to apply it in context. This difference highlights the effectiveness of ChatGPT-based interactive exercises in creating a more interactive, student-centered learning environment.

The effectiveness of ChatGPT-based interactive exercises can also be explained theoretically. According to Swain's Output Hypothesis [24], language learning is strengthened when learners are encouraged to produce language and reflect on their mistakes actively. In this study, ChatGPT required students to produce language through exercises and provided feedback that supported self-correction. In addition, the Input Enhancement Hypothesis, as proposed by Smith [25], explains how ChatGPT helps learners notice vocabulary forms and meanings through contextualized input.

Despite its effectiveness, several challenges were identified. Using ChatGPT required careful time management, and limited device availability forced students to share devices in groups. However, these challenges were managed through clear instructions and teacher guidance.

This study has limitations, as it involved only two classes and focused on vocabulary meaning and use. Therefore, the findings cannot be generalized to other contexts or vocabulary aspects. Nevertheless, the results indicate that ChatGPT-based interactive exercises are an effective and innovative learning medium for improving vocabulary mastery among junior high school students.

4. CONCLUSION

The findings of this study indicate that ChatGPT-based interactive exercises significantly enhanced vocabulary mastery among eighth-grade students at SMP Astra Makmur Jaya, particularly in understanding word meanings and applying vocabulary appropriately in context. Students who learned through ChatGPT-based interactive exercises achieved higher scores than those taught using conventional instructional methods. Moreover, the use of ChatGPT fostered a more interactive and learner-centred classroom atmosphere, where students actively participated in completing tasks, discussing their responses, and revising their answers based on instant feedback. This indicates that ChatGPT-Based Interactive Exercises contribute not only to vocabulary development but also to meaningful language use in junior high school learning.

The findings also provide several practical implications for teaching, curriculum, and assessment. For teachers, ChatGPT-Based Interactive Exercises encourage active learning by providing immediate feedback and fostering collaborative student activities. This approach helps students become more involved and reflective in their vocabulary learning. For curriculum designers, incorporating AI-assisted interactive media into English instruction can increase student engagement and support the development of functional language skills. In terms of assessment, greater attention should be given to students' ability to understand and apply vocabulary appropriately in context, rather than solely to memorization.

Nevertheless, this study has certain limitations. The research was limited to one school and involved a relatively small sample, with a primary focus on vocabulary mastery, particularly word meaning and use. Additionally, the study examined vocabulary improvement only within a short period and did not assess long-term retention. Therefore, future research is suggested to involve larger samples, multiple schools, and different educational levels. Further studies may also explore the effectiveness of ChatGPT-Based Interactive Exercises in enhancing other language skills, such as reading and writing, and investigate long-term learning outcomes to strengthen the evidence of AI-based learning effectiveness.

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