

Effectiveness of Augmented Reality-Based learning in Enhancing Vocabulary at SMP IT AL-IHYA

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ABSTRACT

This study aims to examine the effectiveness of Augmented Reality (AR)-based learning media in enhancing English vocabulary mastery among eighth-grade students at SMP IT AL-IHYA. The research employed Classroom Action Research (CAR) following the Kurt Lewin model, conducted in two cycles. Data collection involved observations, interviews, pre-tests, post-tests, and documentation. The results showed a significant improvement in students' vocabulary mastery. The pre-cycle average score was 64.48 with only 24% of students reaching the minimum mastery level. After the implementation of AR-based learning in Cycle I, the average score increased to 70 with 40% of students achieving mastery. In Cycle II, the class average rose sharply to 87.4, with 100% of students achieving mastery. Observation of student activity also improved, from 52.38% in the pre-cycle to 85.7% in Cycle II. Based on the N-Gain Score of 0.645, the effectiveness of the intervention was categorized as moderate. These findings suggest that AR-based learning not only improves vocabulary mastery but also increases student engagement in the learning process.

Keyword: *Augmented Reality (AR); Vocabulary Enhancement; Secondary Education*

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INTRODUCTION

Mastery of vocabulary is the fundamental basis of English language proficiency, encompassing the four core skills of listening, speaking, reading, and writing. Nation (2022), emphasizes that vocabulary is a crucial element for understanding and effectively conveying messages. However, in Indonesia, English vocabulary mastery remains a significant challenge. The EF English Proficiency Index (2024), ranks Indonesia 79th out of 113 countries with a score of 505, which falls into the low proficiency category. This indicates that, on a national level, English proficiency-particularly in terms of vocabulary acquisition is far from optimal. Furthermore, a report by the Badan Standar Nasional Pendidikan (2022) reveals that Indonesian students, on average, only master around 1,000–1,500 words from the 3,000 basic vocabulary items recommended to reach an intermediate level.

This low level of English competence impacts the global competitiveness of the younger generation. One critical aspect that needs to be improved is vocabulary acquisition. Vu & Peters (2021) in Noori et al (2022), asserts that vocabulary plays a central role in communication; without sufficient vocabulary mastery, other language skills are difficult to develop. Similarly, Silverman et al (2019) points out that for beginner learners, especially at the elementary and secondary levels, the primary focus should be on building a strong vocabulary base as the foundation for developing other language skills. Therefore, enhancing vocabulary is a priority in English language teaching to support the achievement of broader language competencies.

Various teaching methods have been developed to improve English proficiency, particularly vocabulary acquisition. Effective methods are those that not only provide

repeated exposure to the language but also actively and contextually engage students. According to Schmitt (2000), student-centred approaches such as Communicative Language Teaching (CLT), Task-Based Language Teaching (TBLT), and the use of interactive learning media have proven effective in enhancing vocabulary mastery. Barcroft (2004) adds that multisensory learning that involves technology offers a more meaningful learning experience and helps students acquire new vocabulary more quickly.

One of the emerging innovations in learning media is Augmented Reality (AR). Azuma (1997), explain that AR combines the real world with interactive digital elements, allowing students to directly interact with virtual objects that enrich the learning experience. In the context of English language learning, AR can present vocabulary in a tangible way, enabling students not only to read or hear new words but also to see their representations in three dimensions. Azuma (1997) emphasizes that AR use in learning can boost students' motivation and retention due to its immersive and engaging nature.

In its implementation in Indonesia, the latest curriculum—known as the Merdeka Curriculum incorporates flexible, competency-based learning that encourages the integration of technology as an essential part of the teaching and learning process (Kemendikbudristek, 2020). This curriculum emphasizes differentiated learning tailored to students' needs and promotes exploratory and participatory activities. The government underscores that ideal learning should foster 21st-century skills, including critical thinking, creativity, collaboration, and digital literacy.

The government has high expectations for innovative teaching methods to enhance English language education quality (Ekayati & Arifin, 2020). According to the Directorate General of Primary and Secondary Education of the Kemendikbudristek (2020), technologies like AR are expected to accelerate the improvement of students' English skills by creating contextual and interactive learning environments. This aligns with Richards & Renandy (2008), who state that modern technology-supported learning provides greater opportunities for students to be exposed to the target language authentically and continuously.

Previous research has examined the effectiveness of various English teaching methods. Kennedy et al (2023), found that using cooperative learning methods significantly improved students' vocabulary mastery. Another study by Kristiantari et al (2023) revealed that audio-visual media in English learning enhanced students' interest and accelerated the understanding of new vocabulary. These findings reinforce the argument that appropriate media and methods greatly influence English learning outcomes.

Research on the impact of Augmented Reality has also been conducted by several scholars. A study by Muangchan & Yanhua (2025) found that using AR in English vocabulary learning enhanced students' memory retention by up to 45% compared to conventional methods. Additionally, Statista (2023), reported that AR increased students' motivation due to its interactive and enjoyable nature. These findings demonstrate the significant potential of AR as an effective medium for English vocabulary learning.

Based on interviews with the English teacher of SMP IT Al-Ihya. It was found that students' vocabulary skills are still very limited, and they are not yet accustomed to listening activities. This is primarily because, at the elementary school level. They didn't learn English, that is mean it is first time students are learning English in junior high school. The school implements the Merdeka Curriculum and uses various learning media such as textbooks, PowerPoint presentations, and flashcards. However, teachers often face challenges in teaching pronunciation effectively to ensure students can pronounce vocabulary correctly. These conditions highlight the need for more interactive and innovative learning media to help students better understand and master English vocabulary.

Based on the above explanation, this study focuses on examining the effectiveness of using Augmented Reality as a learning medium to enhance English vocabulary mastery at SMP IT Al-Ihya. The objectives of this study are to determine the extent to which AR can support students' vocabulary acquisition and to identify the strengths and challenges of its implementation. It is hoped that this research will contribute to improving the quality of

English language education and serve as a reference for teachers in selecting suitable learning media that meet students' needs in the digital era.

METHOD

Research Setting

This study was conducted at SMP IT Al-Ihya Tanjung Gading, located in Sei Suka, Batubara, North Sumatra. The school was selected based on its compatibility with the research focus on vocabulary learning and the potential use of Augmented Reality (AR). The research was scheduled for 10 and 17 in July 2025, aligning with the academic calendar to ensure minimal disruption.

Research Schedule

The research schedule included several stages: initial observation in May, planning and media development in June, and data collection, implementation, and analysis in July. Activities were designed sequentially to ensure systematic execution and reflection at each phase.

Research Subjects

The population consisted of all eighth-grade students, totalling 80. The Al-Farabi class, comprising 25 students aged 13–14, was selected due to observed low motivation, limited vocabulary proficiency, and responsiveness to visual-interactive media.

Research Instruments

Instruments included interview sheets, observation sheets, test sheets (pre-test and post-test), questionnaires, and documentation. Interviews identified initial problems, while observations were used throughout the process to monitor activities. Pre- and post-tests measured vocabulary understanding, and questionnaires captured student perceptions. Documentation served as visual and written support data.

Research Procedures

This research employed Classroom Action Research (CAR) based on the Kurt Lewin model, comprising four steps: planning, acting, observing, and reflecting. During planning, problems were identified, lesson plans and AR media were prepared using SketchUp and 3D Warehouse. The acting stage involved implementing AR in the classroom. Observation recorded student-teacher interactions and classroom dynamics. Reflection assessed results and guided revisions for further cycles.

Data Analysis Techniques

Data were analysed using both quantitative and descriptive methods as follows:
N-Gain Score Technique

Used to compare pre-test and post-test results:

$$N - Gain = \frac{Posttest\ Score - Pretest\ Score}{Maximum\ Score - Pretests\ Score}$$

The interpretation of N-Gain values:

- $g > 0.7$ = High Gain
- $0.3 < g \leq 0.7$ = Medium Gain
- $g \leq 0.3$ = Low Gain

Mean Score Technique

Used to determine the class average in each cycle:

$$Mean = \frac{Total\ Score}{Number\ of\ students}$$

To calculate the percentage of students achieving mastery:

$$P = \frac{\sum \text{students who achieved mastery}}{\sum n \text{ total student}} \times 100\%$$

The level of achievement was evaluated based on the following criteria:

Table 1. Categories of Student Learning Achievement Levels

No	Achievement Level (%)	Category
1	85-100	Very Good
2	75-84	Good
3	65-74	Fair

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4	55-64	Poor
5	0-54	Very Poor

Observation Data Analysis

Observation results were calculated using:

$$P = \frac{\text{Score Obtained}}{\text{Maximum Possible Score}} \times 100\%$$

The level of achievement was evaluated based on the following criteria:

Table 2. Observation Result Categories

No	Achievement Level (%)	Category
1	85-100	Very Good
2	75-84	Good
3	65-74	Fair
4	55-64	Poor
5	0-54	Very Poor

Action Plan Development

If the results of Cycle I did not meet the predetermined success indicators, a second cycle would be conducted with necessary adjustments. The process continued until the AR media effectively enhanced students' English vocabulary achievement.

FINDINGS AND DISCUSSION

Initial observations revealed that the English vocabulary mastery of students at SMP IT AL-IHYA was still relatively low. Many students experienced difficulties in recognizing and understanding the meanings of basic English words and were not yet able to use them correctly in sentence contexts. Out of 25 observed students, only 6 showed good vocabulary comprehension, while the majority were categorized as lacking.

This condition was caused by the lack of engaging and interactive learning media. The dominant conventional teaching methods, which relied heavily on lectures and memorization, tended to demotivate students in learning vocabulary. This lack of interest affected their low engagement in English learning activities, particularly in the vocabulary aspect.

Therefore, a more innovative and contextual learning approach is needed to help students understand vocabulary in a more enjoyable and meaningful way. This study aims to improve students' vocabulary mastery through the implementation of Augmented Reality (AR)-based media in the learning process.

The use of AR media is expected to capture students' attention, help them understand the meaning and usage of words visually, and increase their engagement in the English learning process. AR is considered effective because it can display 3D objects and animations related to the vocabulary being taught, allowing students to experience a more interactive, concrete, and engaging learning process.

Pre-Cycle

This study was conducted on eighth-grade students of SMP IT AL-IHYA, with a total of 25 participants. Before the AR-based learning intervention was applied, the researcher conducted an initial observation in May 2025, aimed at identifying student activity in conventional English vocabulary learning. This observation served as an important reference for understanding the students' initial vocabulary comprehension and usage abilities, as well as assessing the level of participation and engagement before the application of AR media.

The Augmented Reality (AR) learning media was designed to enhance students' vocabulary mastery through engaging interactive visualizations and to support active involvement in the learning process. This pre-cycle observation included several student activity indicators such as enthusiasm, interaction with teachers and peers, group cooperation, and the ability to summarize learned vocabulary. The results of student activity observations during the pre-cycle stage are presented in table form and used as a basis for comparison with the post-intervention results of the AR-based learning process:

Table 3. Student Learning Activity Percentage in the Pre-Cycle Stage of Augmented Reality-Based Vocabulary Learning at SMP IT AL-IHYA

No	Student Activity Indicators	Maximum Score	Score Obtained
1	Enthusiasm in AR-based vocabulary learning	3	1
2	Interaction with the teacher	3	1
3	Interaction with fellow students	3	2
4	Teamwork in group activities	3	2
5	Engagement in group discussions	3	2
6	Involvement in the learning process	3	2
7	Participation in concluding the learning session	3	1
Total Score		21	11
Percentage		52.38%	

Based on the observations conducted during the pre-cycle stage at SMP IT AL-IHYA, student learning activity in vocabulary learning using Augmented Reality (AR) showed an achievement of 52.38%, which falls into the "Very Poor" category based on the learning activity criteria.

This low percentage indicates that student engagement in the learning process was still very minimal. This was evident from the lack of enthusiasm in using AR media, low levels of interaction both with the teacher and peers, and limited active participation in learning activities. In addition, students had not yet demonstrated sufficient initiative in applying or practicing the vocabulary learned through AR media. This can be further seen in the table of student vocabulary score distribution below:

Table 4. Vocabulary Score Distribution of SMP IT AL-IHYA Students in Pre-Cycle

No	Score Range	Frequency	Percentage
1	85-100	0	-
2	75-84	6	24%
3	65-74	11	44%
4	55-64	6	24%
5	0-54	2	8%
Total		25	100%

Based on the score distribution in the table above, it can be concluded that the majority of students at SMP IT AL-IHYA still have a low level of English vocabulary mastery. Out of a total of 25 students, 17 students or 76% scored below 75, with 44% of students in the 65–74 range, 24% in the 55–64 range, and 8% in the 0–54 range. Meanwhile, only 6 students or 24% scored above 75. This condition indicates that most students have not yet met the minimum mastery criteria (KKM), highlighting the need for more interactive and contextual learning strategies, such as the use of Augmented Reality (AR) media, to help improve their understanding and mastery of English vocabulary more effectively. For a clearer overview of student learning activity levels in vocabulary learning using Augmented Reality, please refer to the following chart:

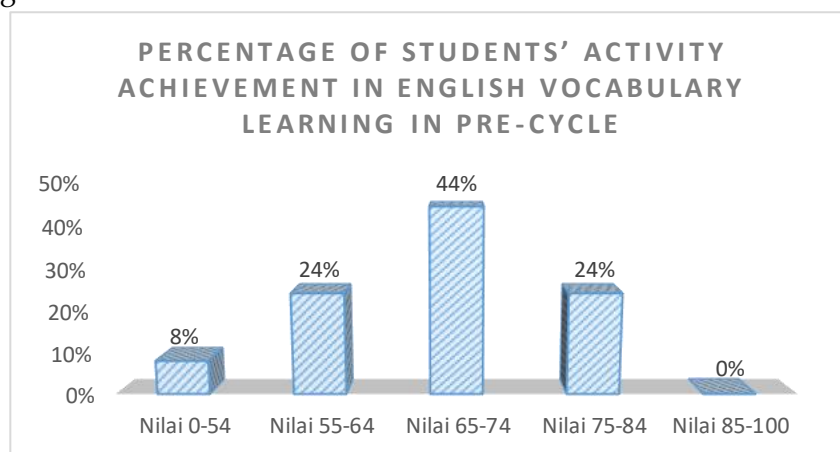


Figure 1. Graph of Student Activity Achievement Percentage at SMP IT Al-Ihya in Vocabulary Learning During the Pre-Cycle Stage

The following are the results of student mastery scores based on the initial test (pretest) regarding vocabulary acquisition before the implementation of Augmented Reality-based learning. The classical percentage of students achieving mastery in vocabulary acquisition is shown as follows:

$$P = \frac{\sum \text{students who achieved mastery}}{\sum n \text{ total student}}$$

$$P = \frac{6}{25} \times 100\%$$

$$P = 24\%$$

The average score obtained by students in the pre-cycle stage is calculated using the following formula:

$$\text{Mean} = \frac{\text{Total Score}}{\text{Number of students}}$$

$$\text{Mean} = \frac{1612}{25}$$

$$\text{Mean} = 64.48$$

Based on the initial test (pretest) results, the level of student mastery in vocabulary acquisition before the implementation of Augmented Reality-based learning was relatively low. Only 24% of students achieved the minimum mastery score, with a class average of 64.48. This indicates that most students had not yet mastered vocabulary optimally prior to the application of Augmented Reality-based learning. This condition highlights the need for improvement in instructional strategies through the use of Augmented Reality media, enabling teachers to create a more engaging and interactive learning environment. With the implementation of this media, it is expected that students' vocabulary mastery will gradually improve in the following stages of learning..

Cycle 1

In Cycle I of this classroom action research (CAR) regarding the implementation of Augmented Reality-based learning to improve vocabulary mastery at SMP IT AL-IHYA, improvement steps were taken based on the pre-cycle results, which showed that students' vocabulary mastery was still relatively low. The classical mastery percentage in the pre-action stage reached only 24%, with an average score of 64.48. Therefore, in this cycle, Augmented Reality media was integrated into the learning process as a visual and interactive innovation to help students better understand vocabulary meanings and increase their engagement during learning activities. The data obtained from the observation of student activity during Cycle I is presented in the table below:

Table 5. Student Learning Activity Percentage in the Cycle I Stage of Augmented Reality-Based Vocabulary Learning at SMP IT AL-IHYA

No	Student Activity Indicators	Maximum Score	Score Obtained
1	Enthusiasm in AR-based vocabulary learning	3	2
2	Interaction with the teacher	3	3
3	Interaction with fellow students	3	2
4	Teamwork in group activities	3	3
5	Engagement in group discussions	3	2
6	Involvement in the learning process	3	2
7	Participation in concluding the learning session	3	2
Total Score		21	16
Percentage		76.19%	

Based on the observation results in Cycle I at SMP IT AL-IHYA, student learning activity in vocabulary learning using Augmented Reality (AR) reached 76.19%, which falls into the "Fair" category. This increase indicates that student engagement has started to improve compared to the pre-cycle stage, which only reached 52.38%. Several indicators, such as interaction with the teacher and group collaboration, have been optimal; however, students'

enthusiasm, peer interaction, and participation in group discussions still need improvement. This can be seen in the distribution table of students' vocabulary scores below:

Table 6. Vocabulary Score Distribution of SMP IT AL-IHYA Students in Cycle I

No	Score Range	Frequency	Percentage
1	85-100	0	-
2	75-84	10	40%
3	65-74	15	60%
4	55-64	0	-
5	0-54	0	-
Total		25	100%

Based on the distribution of scores in Cycle I, it was found that most students experienced improvement in their English vocabulary mastery, although they were still within the moderate category. Out of a total of 25 students, 15 students (60%) scored within the range of 65–74, and 10 students (40%) fell within the range of 75–84. No students scored below 65 or above 84. This indicates that the learning process in Cycle I has begun to show a positive impact, particularly through the implementation of digital learning strategies such as Augmented Reality (AR) media.

However, these results also show that no students have yet reached the excellent category (85–100), and further efforts are needed to achieve maximum mastery. Therefore, in Cycle II, improvements will be made by adjusting the learning approach to be more intensive, interactive, and focused, in order to help students, achieve optimal scores and enhance their motivation and interest in learning English vocabulary. For a clearer overview of student learning activity levels in vocabulary learning using Augmented Reality, please refer to the following chart:

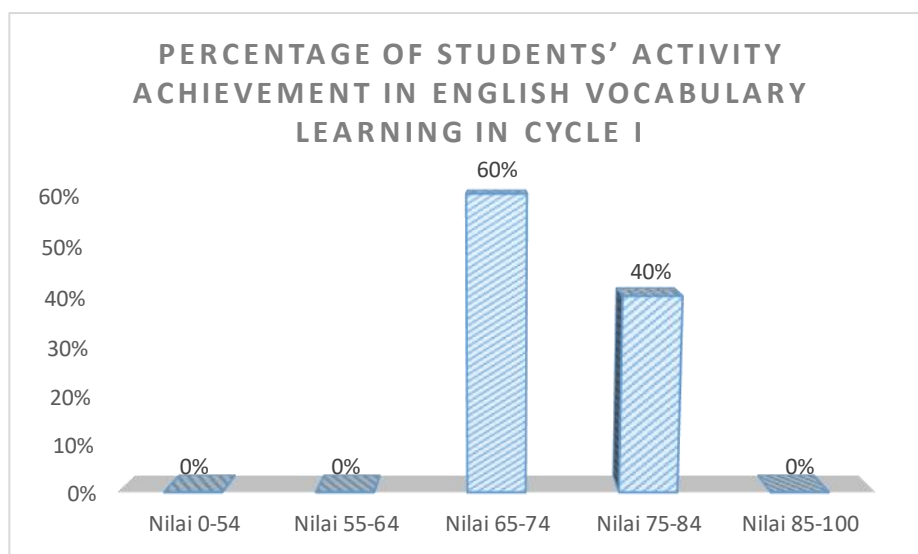


Figure 2. Student Activity Achievement Percentage in Vocabulary Learning Using Augmented Reality in Cycle I

The following are the results of student mastery scores based on the test in Cycle I regarding vocabulary acquisition after the implementation of Augmented Reality-based learning. The percentage of students who achieved mastery in vocabulary acquisition, measured classically, is shown as follows:

$$P = \frac{\sum \text{students who achieved mastery}}{\sum n \text{ total student}}$$

$$P = \frac{10}{25} \times 100\%$$

$$P = 40\%$$

The average score obtained by students in the cycle I stage is calculated using the following formula:

$$\text{Mean} = \frac{\text{Total Score}}{\text{Number of students}}$$

$$\text{Mean} = \frac{1740}{25}$$

$$\text{Mean} = 69.6 \text{ rounded to } 70.$$

Based on the test results in Cycle I, the level of student mastery in vocabulary acquisition began to show improvement compared to the pre-cycle stage. A total of 40% of students achieved mastery, with the class average increasing to 70. Although this result has not yet met the minimum classical mastery criteria (75%), the improvement indicates that Augmented Reality-based learning has begun to have a positive impact. Therefore, it is necessary to proceed to the next cycle to optimize students' learning outcomes.

Cycle 2

In Cycle II of this classroom action research (CAR) on the implementation of Augmented Reality (AR)-based learning to improve vocabulary mastery at SMP IT AL-IHYA, improvement efforts focused on enhancing students' interaction quality with AR media and reinforcing reflective strategies related to vocabulary materials. This was done in response to the findings from Cycle I, which indicated that although progress had been made, some students still faced difficulties in applying vocabulary within sentence contexts. To address this, the teacher added vocabulary usage exercises in sentence construction, paired learning for independent AR exploration, and group discussions to deepen word comprehension. The integration of AR media in this cycle aimed not only to present information visually but also to encourage students to actively build understanding through immersive learning experiences. The data obtained from the observation of student learning activities at the final stage, namely Cycle II, is presented in the table below:

Table 7. Student Learning Activity Percentage in the Cycle II Stage of Augmented Reality-Based Vocabulary Learning at SMP IT AL-IHYA

No	Student Activity Indicators	Maximum Score	Score Obtained
1	Enthusiasm in AR-based vocabulary learning	3	3
2	Interaction with the teacher	3	2
3	Interaction with fellow students	3	2
4	Teamwork in group activities	3	2
5	Engagement in group discussions	3	3
6	Involvement in the learning process	3	3
7	Participation in concluding the learning session	3	3
Total Score		21	18
Percentage		85.7%	

Based on reflection and evaluation from Cycle I, it was found that although vocabulary mastery had improved, certain aspects of student activity, especially interaction and active participation – still needed enhancement. Therefore, in Cycle II, improvements were made by optimizing the use of AR-based media in vocabulary learning. The teacher further strengthened their role as a facilitator by creating a more collaborative and enjoyable learning environment and providing clearer instructions during group activities.

The observation results from Cycle II showed a significant improvement in student learning activities. The percentage of student learning engagement reached 85.7%, classified as "Very Good." Almost all indicators of student activity showed improvement, including enthusiasm, involvement in discussions, and participation in drawing conclusions. This indicates that the integration of AR-based learning has become increasingly effective in improving student engagement and understanding of vocabulary. This can be further observed in the vocabulary distribution table below:

Table 8. Vocabulary Score Distribution of SMP IT AL-IHYA Students in Cycle II

No	Score Range	Frequency	Percentage
1	85-100	19	76%
2	75-84	6	24%
3	65-74	0	-
4	55-64	0	-
5	0-54	0	-
Total		25	100%

Based on the score distribution in Cycle II, there was a significant improvement in English vocabulary mastery among SMP IT AL-IHYA students. Out of 25 students, 19 students (76%) scored within the 85–100 range (Very Good category), and 6 students (24%) scored between 75–84 (Good category). No students scored below 75, indicating that all students had surpassed the minimum mastery threshold. This reflects the effectiveness of the instructional improvements made in Cycle II, particularly through the increasingly engaging AR-based learning approach that facilitated active student involvement.

The improvement in learning outcomes aligns with the observed increase in student learning activity, which showed high enthusiasm, active participation in group discussions, and improved involvement in summarizing learning results. Thus, AR-based vocabulary learning not only impacted students' cognitive outcomes but also positively influenced their behaviour and participation in class. This is further illustrated in the graph below:

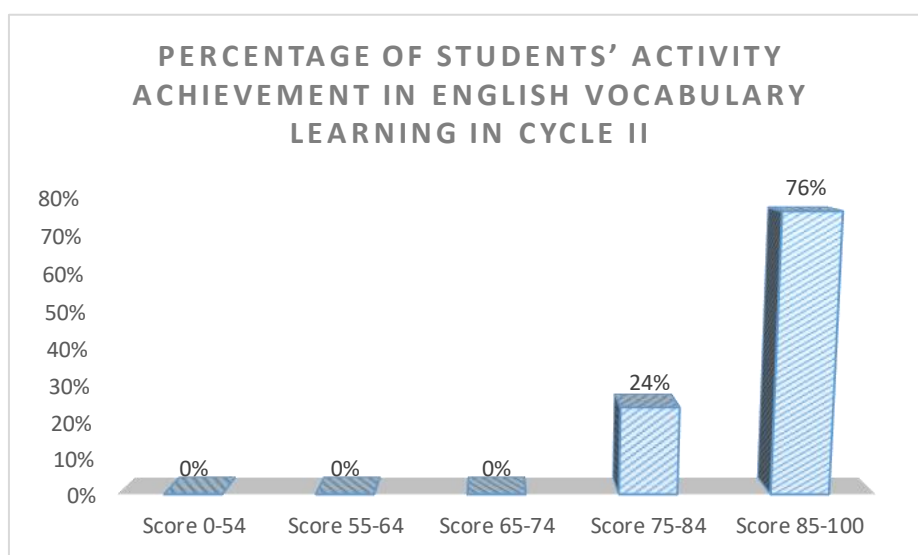


Figure 3. Student Activity Achievement Percentage in Vocabulary Learning Using Augmented Reality in Cycle II

The following are the results of students' mastery scores in Cycle II, measuring vocabulary acquisition after the implementation of Augmented Reality-based learning. The classical completeness percentage of students' vocabulary mastery is calculated as follows:

$$P = \frac{\sum \text{students who achieved mastery}}{\sum n \text{ total student}}$$

$$P = \frac{25}{25} \times 100\%$$

$$P = 100\%$$

The average score obtained by students in the cycle II stage is calculated using the following formula:

$$\text{Mean} = \frac{\text{Total Score}}{\text{Number of students}}$$

$$\text{Mean} = \frac{2184}{25}$$

$$\text{Mean} = 87.36 \text{ rounded to } 87.4.$$

Based on the test results in Cycle II, there was a significant improvement in students' English vocabulary mastery. All students (100%) reached the mastery threshold, indicating that the AR-based learning method had a very effective impact on learning outcomes. With a total score of 2184 across 25 students, the class average rose sharply to 87.4 – an increase from both Cycle I and the pre-cycle phase. A total of 19 students (76%) reached the very good category (85–100), while the remaining 6 students (24%) were in the good category (75–84).

These results show that the instructional improvements made in Cycle II, such as increasing the interactivity of AR media, adjusting instructional time, and providing more intensive guidance, successfully optimized learning outcomes. With 100% classical mastery and a significant increase in average scores, the intervention in Cycle II can be considered successful.

Analysis N-Gain Score

To measure the effectiveness of learning improvement between the pretest and posttest, the **N-Gain Score** formula was used:

$$N - Gain = \frac{Posttest\ Score - Pretest\ Score}{Maximum\ Score - Pretests\ Score}$$

$$N - Gain = \frac{87,4 - 64,5}{100 - 64,5}$$

$$N - Gain = \frac{22,9}{33,5}$$

$$N - Gain = 0.645$$

An N-Gain score of 0.645 falls within the moderate category according to the following interpretation:

< 0,3 = Low

0,3 - 0,7 = Medium

> 0,7 = High

This indicates that the learning improvement from pre-test to post-test is moderately effective, showing that students' understanding of the material significantly increased after the AR-based intervention. This finding is consistent with recent studies showing that AR can enhance students' motivation and engagement by providing a more engaging and immersive learning experience (Garzon & Acevedo, 2019). Through interactive visual displays, students can more easily understand the meaning of vocabulary because the information is presented in a tangible form through three-dimensional objects.

In addition, the effectiveness of AR in improving vocabulary mastery can be explained through the multimodal learning approach. According to Mayer (2020), the use of media that integrates text, images, and sound can strengthen students cognitive processes in understanding new concepts. AR provides a combination of visual and auditory inputs that enable students to retain vocabulary longer in memory. Similarly, research by Chen et al. (2021) shows that the use of AR in language learning has a positive effect on memory retention and language skills because students are actively involved in the process of exploring vocabulary.

From the perspective of collaboration, AR also fosters better social interaction among students. Observations indicate that interaction with teachers and group collaboration were already quite optimal, although individual enthusiasm still needs improvement. This aligns with Vygotsky's view on the importance of social interaction in learning, which has been reinforced by recent studies showing that AR can support group work, discussions, and shared understanding in the context of language learning (Akçayır, 2022). Thus, AR not only functions as a visual aid but also as a medium that enriches collaborative learning experiences.

Overall, the improvement of students' learning activities in Cycle I demonstrates that AR plays an important role in presenting contextual, enjoyable, and meaningful learning. This improvement can be explained by the fact that AR reduces students' cognitive load by presenting real objects directly, enabling students not only to memorize but also to understand the meaning of vocabulary within its usage context. Supported by consistent previous

research, it can be concluded that AR is effective in enhancing vocabulary mastery and student engagement because it integrates interactive visual displays, multimodal input, learning motivation, and richer collaborative experiences.

CONCLUSIONS

This study demonstrates that the implementation of Augmented Reality (AR)-based learning is effective in enhancing the English vocabulary mastery of eighth-grade students at SMP IT AL-IHYA. Observations during the pre-cycle stage revealed low vocabulary proficiency, with an average score of 64.48 and a classical mastery level of only 24%. After integrating AR media in Cycle I, the average score increased to 70 with 40% mastery, and significantly improved in Cycle II, reaching an average of 87.4 and a classical mastery of 100%.

This improvement is also reflected in student learning activities, where observational scores rose from 52.38% in the pre-cycle, to 76.19% in Cycle I, and 85.7% in Cycle II. Moreover, the N-Gain Score analysis of 0.645 falls into the moderate category, indicating a reasonably effective improvement from pre-test to post-test. Therefore, it can be concluded that AR media not only enhances students' cognitive outcomes but also fosters active engagement and enthusiasm in the learning process. AR-based vocabulary learning has proven to be a feasible and innovative strategy to improve the quality of English language education at the junior high school level.

In practical terms, teachers are encouraged to integrate AR into their classroom practices to maximize its benefits. This can be done by selecting AR applications that align with the learning objectives, designing activities that combine AR with collaborative tasks, and providing sufficient guidance so that students can explore AR content effectively without being overwhelmed. Moreover, teachers should gradually integrate AR into their lesson plans, starting with simple vocabulary topics before moving on to more complex materials, ensuring that students remain motivated while building confidence in their language skills.

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