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Implementation of Augmented Reality to Improve Vocabulary Mastery at Madrasah Tsanawiyah Negeri 2 Makassar

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Abstract: This study investigates the effectiveness of Augmented Reality (AR)-based learning media in improving *Mufradat* (vocabulary) mastery among 8th-grade students at Madrasah Tsanawiyah Negeri 2 Makassar. Titled "The Implementation of Augmented Reality (AR)-Based Learning Media to Improve *Mufradat* Mastery of Students in Class VIII.10 of MTsN 2 Makassar," the research aims to describe the application of AR media and its impact on students' vocabulary acquisition. The goal is to provide teachers with an innovative alternative for teaching Arabic and to help students learn Mufradat more engagingly. Employing a Classroom Action Research (CAR) approach with the Kemmis and McTaggart model, the study involves planning, action, observation, and reflection across two cycles, each with two meetings. The subjects were 34 students (17 male, 17 female) from class VIII.10 at MTsN 2 Makassar. Data was collected through observation, tests, and documentation, then analysed both quantitatively and qualitatively. The results indicate that AR-based learning significantly enhances student engagement and mastery *of Mufradat*. The average learning outcome scores increased from 60.91 in the pre-cycle to 74.35 in cycle I and further to 85.5 in cycle II. Learning completeness also rose from 14.71% in the pre-cycle to 47.05% in cycle I and 82.35% in cycle II. Thus, AR-based learning media proves effective in improving student learning outcomes, particularly in mastering Arabic *Mufradat*.

Keywords: Augmented Reality; Arabic Vocabulary (*Mufradat*); Language Learning

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1. Introduction

Arabic is one of the languages with the largest number of speakers in the world and plays a very important role, especially for Muslims. In addition to serving as a means of communication, Arabic is also the key to understanding Islamic teachings and various classical and contemporary scientific treasures. Therefore, mastery of Arabic is not only a linguistic competence but also a means to deepen religious and intellectual understanding (Agustini, 2023).

In the context of education, vocabulary mastery (*mufradat*) is a fundamental component of Arabic language learning. Students' ability to understand texts, speak, write, and listen depends heavily on their level of vocabulary mastery. Without adequate vocabulary mastery, students tend to have difficulty understanding sentence meaning, expressing ideas, and participating effectively in the learning process. Therefore, vocabulary learning is an important aspect that requires special attention (Rahman & Zainal, 2024).

However, the reality in the classroom shows that Arabic vocabulary learning still faces various challenges. Many students have difficulty memorising, understanding, and using new vocabulary appropriately according to context. Low motivation and interest in learning, differences in students' educational backgrounds, and a limited variety of learning methods are the main factors causing poor vocabulary mastery. The learning process, which is still dominated by conventional methods such as lectures and the use of textbooks, often makes students quickly feel bored and less actively involved in learning activities

Along with the rapid development of digital technology, innovative learning media are needed to address these challenges. One technology that has gained attention in the field of education is Augmented Reality (AR). Augmented Reality enables the integration of virtual objects into real-world environments, creating interactive, immersive, and contextually relevant learning experiences (Bara et al., 2025). In language learning, Augmented Reality can present vocabulary through three-dimensional objects, animations, and audio pronunciation, enabling students to connect abstract words with concrete visual representations.

From a cognitive perspective, children tend to learn more effectively through direct interaction with concrete objects. This approach aligns with Piaget’s theory of cognitive development, which emphasises that knowledge is constructed through active interaction with the environment (Nadira et al., 2024). By using Augmented Reality (AR), students can visually and physically interact with representations of vocabulary objects, which helps strengthen understanding and long-term memory retention. In addition, this learning process is supported by the dual coding theory, which states that information presented through both visual and verbal channels is more easily processed and retained in memory (Hayyu et al., 2025).

Previous studies have provided empirical evidence regarding the effectiveness of Augmented Reality (AR)-based learning media in improving Arabic vocabulary mastery. Ernawati et al showed that the development of AR applications that display three-dimensional objects can help students understand vocabulary more concretely and

increase their motivation to learn. Expert validation results and student responses from a Likert-scale questionnaire indicate that AR media is considered feasible and effective for use in Arabic vocabulary learning (Ernawati et al., 2024).

In line with these findings, research conducted by Qomah et al revealed that AR-based learning media are effective in improving Arabic vocabulary mastery among junior high school students. This is demonstrated by a significant increase in students' average scores from the pre-test to the post-test, indicating that AR helps students better understand and retain vocabulary than conventional learning methods. In addition, AR media has also been proven to increase students' interest and engagement in the learning process (Qomah et al., 2024).

Another study by Maulidiyah & Najah further reinforces these findings, concluding that the Augmented Reality-based Arabic Vocabulary application is highly feasible and effective for use in vocabulary learning. Expert validation and student evaluation showed very positive results in terms of content, language, presentation, and media. The application was considered capable of optimising the learning process and significantly improving students' mastery of Arabic vocabulary, especially at the secondary education level (Maulidiyah & Najah, 2025).

Although various studies have proven the pedagogical benefits of Augmented Reality (AR)-based learning media, most studies still focus on media development using a Research and Development (R&D) approach, with an emphasis on product validation and effectiveness testing. Research examining the direct implementation of AR media in classroom learning through a Classroom Action Research (CAR) approach, particularly in improving Arabic vocabulary mastery at the Madrasah Tsanawiyah level, remains relatively limited. In addition, studies examining students' responses, participation levels, and the obstacles and barriers to the application of AR media in the classroom are rare.

Therefore, this study aims to fill this gap by focusing on the application of Augmented Reality (AR)-based learning media in improve Arabic vocabulary mastery among eighth-grade students at MTsN 2 Makassar through a Classroom Action Research (CAR) approach. The novelty of this study lies in its emphasis on the practical implementation of AR media in classroom learning activities and in its analysis of their impact on vocabulary mastery, learning motivation, and active student participation. Thus, this study is expected to contribute, both theoretically and practically, to the development of innovative, contextually grounded, technology-based Arabic language learning in line with the characteristics of students in the digital era.

2. Method

This Classroom Action Research (CAR) employs a collaborative approach using the Kemmis and McTaggart model to investigate the effectiveness of Augmented Reality (AR) media in enhancing Arabic *Mufradat* mastery among 34 eighth-grade students at MTsN 2 Makassar. Conducted over two cycles with two meetings each, the research involves planning, action, observation, and reflection, utilising pre-tests, post-tests, observation sheets, and documentation to gather data on student activity and

vocabulary acquisition. Data is analysed using mixed-methods (quantitative and qualitative) to assess the impact of AR media on student learning outcomes, aiming to improve both student engagement and *Mufradat* retention, with success indicated by improved test scores and increased student participation, as measured against established Minimum Completeness Criteria (KKM).

3. Results and Discussion

3.1. Implementation of AR-Based Learning Media to Improve Vocabulary Mastery in Arabic Learning in MTsN 2 Makassar.

Augmented Reality (AR)-based learning media refers to the use of digital technology that overlays virtual objects, such as three-dimensional images, animations, and audio, onto the real-world environment to create interactive learning experiences. In language learning, AR-based media enable students to visualise vocabulary in concrete and contextualised forms, thereby facilitating deeper understanding and retention (Mu'minah et al., 2025). This approach transforms abstract linguistic concepts into meaningful representations that learners can directly explore, making vocabulary learning more engaging and effective.

In Arabic language instruction, AR-based learning media play a significant role in improving vocabulary mastery (mufradat), which serves as the foundation of language skills (Ernawati et al., 2024). Vocabulary mastery is essential for students' ability to comprehend texts, express ideas, and participate in communication. However, traditional teaching methods that rely heavily on memorisation and textbooks often fail to provide meaningful contexts for vocabulary acquisition, leading to low motivation and limited learning outcomes (Wildan & Fuad, 2019).

The implementation of AR-based learning media at MTsN 2 Makassar was conducted through a structured, reflective process comprising a pre-cycle phase and two instructional cycles. The pre-cycle phase served as a diagnostic stage to identify the main challenges students face in mastering Arabic vocabulary. Observations revealed that learning activities were predominantly teacher-centred and less responsive to the learning characteristics of digital-native students.

In addition to instructional limitations, the pre-cycle analysis indicated significant differences in students' educational backgrounds. Several students lacked prior learning experience at Madrasah Ibtidaiyah, resulting in limited foundational Arabic knowledge. This heterogeneity created learning gaps within the classroom and made it difficult for teachers to apply uniform instructional strategies. Consequently, an innovative and adaptive learning approach was required to address these challenges effectively (Eku et al., 2024).

Cycle I marked the initial implementation of AR-based learning. The theme الساعة (time) was selected because of its concreteness and relevance to students' daily experiences. The use of the Assemble Edu application enabled the integration of three-dimensional objects into classroom instruction, transforming abstract vocabulary concepts into visually engaging representations. The instructional process combined teacher explanations, direct interaction with AR media, and interactive games to accommodate

diverse learning styles. While Cycle I resulted in increased student engagement and interest, several challenges emerged, including technical difficulties in operating digital devices and the need for more structured instructional guidance during AR activities. These challenges highlighted the importance of scaffolding and pedagogical support when introducing educational technologies in classroom settings (Kamaruddin et al., 2018).

Cycle II was characterised by a deliberate effort to refine the implementation strategy based on the insights gleaned from Cycle I. The shift to the theme يومياتنا (daily activities) broadened the scope of vocabulary acquisition and allowed for the introduction of grammatical concepts, such as fi'il māḍī (past tense verbs) and fi'il muḍāri' (present/future tense verbs). The introduction of the COC Memory Games provided a gamified approach to vocabulary reinforcement, tapping into students' intrinsic motivation. The emphasis on collaborative learning and peer support fostered a sense of community within the classroom. The observational data from Cycle II painted a picture of a more engaged, focused, and collaborative learning environment, reflecting the positive impact of the refined implementation strategy.

From a pedagogical perspective, the implementation of AR-based learning media encouraged a shift in the teacher's role from a knowledge transmitter to a learning facilitator. Teachers guided students through exploration, interaction, and reflection, allowing learners to actively construct their understanding of vocabulary. Moreover, the AR-based learning environment supported differentiated instruction by accommodating students with varying levels of Arabic proficiency. Students with limited foundational knowledge benefited from concrete visual cues, while more advanced learners were challenged to apply vocabulary within grammatical and communicative contexts. This adaptability demonstrates the potential of AR to address heterogeneity in language classrooms (Fauzan et al., 2020).

Additionally, the implementation of AR contributed to the development of students' digital literacy skills. As students interacted with AR applications, they became more confident and responsible users of educational technology. This outcome is particularly relevant in the context of 21st-century education, where digital competence is considered an essential skill alongside linguistic proficiency. Therefore, the use of AR not only supported Arabic vocabulary acquisition but also contributed to students' broader academic and technological development.

3.2. Results of Implementing AR-Based Learning Media to Improve Vocabulary Mastery in Arabic Learning in MTsN 2 Makassar.

The quantitative and qualitative data collected throughout the study demonstrate that the implementation of AR-based learning media had a positive impact on students' mastery of Arabic vocabulary. A comparison of learning outcomes across the pre-cycle, Cycle I, and Cycle II stages reveals a consistent improvement in both average scores and mastery levels.

Table 1: Comparison of Student Learning Outcomes Across Cycles

Metric	Pre-Cycle	Cycle I	Cycle II
Average Score	60,91	74,35	85,5
Percentage of Completeness	14,71%	47,05%	82,29%

As shown in Table 1, there was a substantial increase in students' average scores and mastery percentages from the pre-cycle to Cycle II. These results indicate that AR-based learning media effectively supported students in understanding, retaining, and applying Arabic vocabulary. This finding is consistent with the multimedia learning theory, which asserts that learners achieve better outcomes when instructional content is delivered through integrated visual and verbal channels (Handoyo et al., 2025).

The quantitative improvements were further supported by qualitative observations that revealed positive changes in students' learning behaviours. Students demonstrated greater enthusiasm, confidence, and active participation during AR-based learning activities. Direct interaction with AR media encouraged students to take an active role in the learning process, transforming the classroom environment from passive to student-centred. This finding corroborates previous studies indicating that AR-based instruction enhances learners' attitudes and engagement in language learning contexts (Sumatraputra et al., 2023).

Beyond improved engagement, the findings also suggest that AR-based learning supported deeper cognitive processing. Through interaction with visual representations and contextualised vocabulary, students moved beyond rote memorisation toward meaningful understanding and application. This indicates that AR facilitates higher-order thinking processes, such as analysis and synthesis, which are essential for long-term language mastery and communicative competence.

The notable success of Cycle II suggests that the effectiveness of AR-based learning is closely related to instructional design rather than technology alone. The integration of AR visualisation, gamified reinforcement through COC Memory Games, collaborative learning strategies, and intensive teacher feedback created a comprehensive learning environment that supported students with varying proficiency levels. Similar conclusions were drawn by Fatima et al, who emphasised that AR-based Arabic learning media yield optimal results when combined with interactive activities and continuous teacher facilitation (Fatimah et al., 2022).

Moreover, the sustainability of learning outcomes observed in Cycle II suggests that AR-based learning media can be effectively integrated into regular classroom practice. When supported by reflective teaching, collaborative learning, and continuous assessment, AR can serve as a long-term instructional strategy rather than a temporary innovation. This reinforces the importance of pedagogically driven and context-sensitive technology integration in language education.

Overall, the findings of this study confirm that Augmented Reality-based learning media constitute an effective instructional innovation for improving Arabic vocabulary mastery among junior secondary school students at MTsN 2 Makassar. When implemented through a structured, reflective, and collaborative approach, AR has the potential to transform Arabic language learning into a more engaging, meaningful, and effective educational experience.

4. Conclusion

This research provides strong evidence that AR-based learning media can be a powerful tool for improving mastery of Mufradat among eighth-grade students at MTsN 2 Makassar. The implementation of AR media led to significant gains in student learning outcomes, increased student engagement, and a more positive learning environment. These findings have implications for the design and implementation of Arabic language instruction, suggesting that AR media can transform the learning experience, making it more engaging, effective, and relevant to today's students' needs. Furthermore, this research highlights the importance of a collaborative and iterative approach to educational innovation. The success of the AR intervention was not solely due to the technology itself, but also to careful planning, implementation, and refinement informed by ongoing data collection and reflection. This underscores the need for educators to embrace a spirit of experimentation and continuous improvement, continually seeking new ways to enhance their students' learning experience.

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