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Discovering The Implementation of Augmented Reality-Based Media in enhancing Arabic Language Learning Process

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Abstract
Augmented Reality (AR) is increasingly recognized as a technology that can improve learning, especially in language education. This study aims to explore the application of AR-based media in improving Arabic language learning at the elementary school level at the University of Muhammadiyah Makassar (UNISMUH). The main focus of this research is how AR can support students in learning Arabic.
This study uses a qualitative approach, used a direct observation methods, and in-depth interviews with students from grades 1 to 5 who are involved in learning Arabic using AR. Data was also collected from observations of student participation, engagement levels, and learning outcomes during the implementation period.
The results showed that using AR-based media significantly increased student engagement in the learning process, especially in grades 1 and 2. Students showed greater enthusiasm and interest and improved memory of new vocabulary. However, in 3rd graders, there was a slight decrease in engagement, which may be due to a lack of variety in the challenge. The improvement was again seen in students in grades 4 and 5, which showed that more complex material that matched their level of cognitive development gave better results.
In conclusion, using AR to learn Arabic is very effective in increasing student motivation and learning outcomes. AR can be an important tool in modernizing language education by offering immersive and engaging learning experiences for students of all ages.
Keywords: Augmented Reality, Arabic language learning, Student Engagement

مستخلص البحث

يُعترف Augmented Reality بشكل متزايد باعتباره تقنية يمكنها تحسين التعلم، وخاصة في تعليم اللغة .تهدف هذه الدراسة إلى استكشاف تطبيق الوسائط القائمة على Augmented Reality في تحسين تعلم اللغة العربية على مستوى المدرسة الابتدائية في جامعة محمدية مكسر. ويركز هذا البحث بشكل رئيسي على كيفية دعم الواقع المعزز للطلاب في تعلم اللغة العربية.

يستخدم هذا البحث منهجا نوعيًا، بأساليب الملاحظة المباشرة، والمقابلات المتعمقة مع الطلاب من الصف الأول إلى الخامس الذين يشاركون في تعلم اللغة العربية باستخدام Augmented Reality. أما أساليب جمع البيانات من ملاحظات مشاركة الطلاب ومستويات المشاركة ونتائج التعلم خلال فترة التنفيذ.

ونتائج هذا البحث هي أن استخدام الوسائط القائمة على Augmented Reality زاد بشكل كبير من مشاركة الطلاب في عملية التعلم، وخاصة في الصفين الأول والثاني. أظهر الطلاب حماسًا واهتمامًا أكبر وتحسنًا في ذاكرة المفردات الجديدة .ومع ذلك، كان هناك انخفاض طفيف في المشاركة لدى طلاب الصف الثالث، والذي قد يكون بسبب نقص التنوع في التحدي .وقد لوحظ التحسن

مرة أخرى لدى الطلاب في الصف الرابع والخامس، مما أظهر أن المواد الأكثر تعقيدًا والتي تتناسب مع مستوى تطورهم المعرفي أعطت نتائج أفضل.

وفي الخلاصة، فإن استخدام Augmented Reality لتعلم اللغة العربية فعال للغاية في زيادة دافعية الطلاب ونتائج التعلم. ويمكن أن يكون Augmented Reality أداة مهمة في تحديث تعليم اللغة من خلال تقديم تجارب تعليمية غامرة وجذابة للطلاب من جميع الأعمار.

الكلمات المفتاحية: **Augmented Reality** ، تعلم اللغة العربية، إشراك الطلاب

Introduction

Arabic is recognized as a globally significant language with widespread influence beyond the Arab world and Islamic tradition (Ernst, 2013). Its importance stems from being the language of the Qur'an, making it essential for over 2 billion Muslims worldwide in their religious practices (Yusuf Abdullahi et al., 2023). Arabic has unique features that distinguish it from other languages and serves as a gateway to understanding various religious, cultural, and intellectual issues (Mohamed Ismaili Alaoui, 2020). The language has influenced numerous other languages globally, particularly in Muslim cultures (Yusuf Abdullahi et al., 2023). However, globalization and the rise of English as a lingua franca challenge Arabic's status, especially in regions like the United Arab Emirates (Al Allaq, 2014). Despite these challenges, Arabic remains crucial for sustaining cultural identity, and its significance extends beyond religious contexts to international business and media communication.

Non-native speakers of Arabic face numerous challenges in mastering the language. These include difficulties in communication, such as putting thoughts into words, maintaining continuous speech, pronunciation issues, LFLK, and applying grammar correctly (Al-Busaidi, 2019). Learners struggle with complex writing systems, unfamiliar sounds, and sentence structures that differ from many other languages (Alsrhid, 2013). Cultural differences and adapting to Arab customs and traditions also pose significant obstacles (Alsrhid, 2013). The COVID-19 pandemic introduced additional challenges in distance learning for Arabic language classes, affecting students'

linguistic progress (Al-Assaf, 2021). However, implementing artificial intelligence (AI) technology to teach Arabic to non-native speakers offers promising solutions. AI enables personalized learning experiences, instant feedback, and diverse learning tools, potentially enhancing language acquisition and making Arabic more accessible and engaging for learners worldwide (M Mohideen, 2024). Combining AI with traditional teaching methods may help address these challenges and improve learning outcomes.

Augmented Reality (AR) is a technology that overlays digital content onto the real world, enhancing user experiences across various domains (Berryman, 2012; Billinghurst, 2011). AR systems typically use devices like smartphones, tablets, or smart glasses to capture real-world input and superimpose computer-generated images, videos, or audio onto the user's view (Mendigochea, 2017). This technology differs from virtual reality, which creates entirely digital environments (Berryman, 2012). AR applications have seen increased popularity due to the availability of commercial SDKs and improved display capabilities (Mendigochea, 2017). The technology has potential applications in numerous fields, including medicine, marketing, museums, and fashion (Berryman, 2012). AR can engage users by creating an interactive experience that combines digital elements with the physical world, potentially changing how we perceive and interact with our environment. As AR continues to evolve, it is expected to become an integral part of everyday life in the future (Billinghurst, 2011).

Augmented Reality (AR) has shown promising applications in education, particularly in language learning and spatial skills development. AR enhances natural environments with computer-generated content, allowing for interactive and immersive experiences (Zhang, 2018). In language education, AR can support skill development, vocabulary acquisition, and cultural learning (Karacan & Akoğlu, 2021; Zhang, 2018). Studies have demonstrated AR's potential to improve spatial abilities and encourage experimentation in mathematics and geometry education (The Mendeley Support Team & Kaufmann, 2003). While AR offers numerous benefits for language learning, including increased engagement and contextualized learning, it is not yet fully integrated into language classrooms due to various challenges (Karacan & Akoğlu, 2021). Recent

technological advancements and reduced hardware costs have led to significant growth in the educational AR market, creating new opportunities for its adoption in language education (Panagiotidis, 2021). However, further research is needed to support widespread implementation and address limitations in AR applications for language learning.

Augmented Reality (AR) is emerging as a transformative technology in education, offering immersive and interactive experiences that enhance student engagement and learning outcomes across various subjects (Dhaas, 2024; Huri et al., 2024). AR overlays digital content in the real world, providing a unique blend of virtual and physical environments that can revolutionize traditional teaching methods (P & K S, 2024). Studies have shown that AR can foster more profound understanding, creativity, and student collaboration (Huri et al., 2024). It has demonstrated potential in diverse fields, including medicine, chemistry, mathematics, and history, offering advantages over conventional educational technologies (Dhaas, 2024). Implementation of AR in primary education has shown promising results, with significant improvements in academic performance and student engagement (Abinaya & G, 2023). However, to fully harness AR's benefits, educators and researchers must address its limitations and continue exploring its integration into educational practices.

Augmented Reality (AR) offers numerous benefits in educational contexts, including enhanced engagement, motivation, and knowledge retention (Alzahrani, 2020; Kiourexidou et al., 2024). AR supports various learning styles, such as kinesthetic, collaborative, and creative learning, while improving spatial abilities and information accessibility (Alzahrani, 2020). It enables personalized learning experiences, allowing students to interact with content at their own pace (Brown & Gabbard, 2015; Kiourexidou et al., 2024). AR-based interactive media can increase children's motivation to learn by incorporating 3D objects into the natural environment, stimulating reasoning and imagination (Iksan & Djuniadi, 2017). However, challenges exist, including information overload, technical issues, and teacher resistance (Alzahrani, 2020). Effective interface design is crucial for seamlessly integrating AR elements with reality and maximizing

educational benefits (Kiourexidou et al., 2024). As AR technology evolves, it promises significant advancements in how users interact with and personalize learning content.

Studies have demonstrated that AR-based vocabulary learning tools can improve long-term recall rates compared to traditional flashcard methods (Beder, 2012). AR applications that visually annotate objects in the user's surroundings with corresponding words in multiple languages have been found to outperform non-AR systems in immediate recall, mental effort, and task completion time (Weerasinghe et al., 2022). Additionally, AR vocabulary learning in context-dependent scenes has proven beneficial for leveraging recall of meaning and form (Dabrowski, 2023). AR apps have been developed for pronunciation practice to provide multimodal visualizations and auditory support for language learners, particularly in Mandarin pinyin (Sinyagovskaya & Murray, 2021). Overall, AR-based language learning tools are engaging, motivating, and effective for vocabulary acquisition and pronunciation improvement.

Augmented Reality (AR) has emerged as a promising technology for enhancing language learning, particularly in Arabic education (Mulyanto et al., 2024). AR applications primarily focus on vocabulary acquisition and utilize mobile devices for learning activities (Schorr et al., 2024; Shadiev & Liang, 2024). The technology offers personalized, adaptive learning environments that improve vocabulary, grammar comprehension, and conversational skills (Mulyanto et al., 2024). AR's potential lies in contextual learning, combining traditional teaching methods with immersive experiences (Schorr et al., 2024). Benefits include increased engagement, satisfaction, and improved speaking abilities. However, challenges persist, such as proficiency in using AR, cooperation issues, and application-related problems. Despite these challenges, AR shows promise in revolutionizing language education, particularly in addressing the complexities of Arabic learning (Mulyanto et al., 2024).

Recent studies highlight the limited use of Augmented Reality (AR) in Arabic language learning and the need for more research to validate its effectiveness. While AR has shown promise in enhancing language skills, motivation, and resource availability (Ghalib et al., 2017), its application in Arabic learning still needs to be explored. A review

of AR in language education revealed a scarcity of empirical research on language skills beyond vocabulary acquisition (Punar Özçelik et al., 2022). Although AR has demonstrated potential for revitalizing Arabic vocabulary learning through interactive and contextual experiences (Haryati & Salamah, 2024), its use in more complex language skills like reading and writing is rare (Majid & Salam, 2021). These findings underscore the need for further research to develop AR applications for Arabic language learning, incorporate higher-order learning outcomes, and conduct qualitative investigations to validate AR's effectiveness in enhancing various Arabic language skills.

The research aims to explore how AR-based media can effectively improve the learning process in Arabic language, especially for UNISMUH elementary school students.

Result and Discussionult and Discussion

Implementing Augmented Reality (AR)-based learning media for elementary school students from grades 1 to 5 at UNISMUH can be a highly interactive and engaging method to teach Arabic, especially with the involvement of students from the Arabic Language Education program. Here is a detailed implementation of Augmented Reality (AR)-based learning media for elementary school students from grades 1 to 5:

1. Group and Pair Work

In order to foster collaborative learning and effective use of the AR media, students in each classroom are placed in small groups of 3-5. This is designed so that every student has to answer the discussion question so no student can hide from the class. Smaller groups also mean every student can experience the AR content and have a role in learning. Young students develop teamwork, communication, and problem-solving skills through group-based learning.

2. Arabic Language Education Students guidance

There is also a student of the Arabic Language Education Study Program Faculty, Institute for Islamic Studies, Muhammadiyah Universitas Makassar (UNISMUH). These big kids function as mentors to lead the little ones through learning, vocabulary,

pronunciation, and grammar. This way, the younger dancers will learn more efficiently with the guidance of an expert who can correct them immediately if they have a misconception. This will take a step further and improve the facilitation skills of Arabic Language Education students, offering mutual help as they learn and grow.

3. AR Support in E-Learning

Specifically, the students of Arabic Language Education are expected to ensure their group's smooth working in using AR-based media for learning Arabic vocabulary and grammar. AR media offers an engaging and visually intense learning experience that can be a great way for elementary students to learn about abstract concepts. With AR, learners can be given access to view 3D models or images so that they can associate the visual cues with Arabic words. Facilitators monitor students according to their use of the AR media and navigate them through words or concepts.

4. Grade-wise Theme-Based Learning

Each grade has a different theme to help unify the learning and make it more structured and theme-specific:

Grade 1: “At-Taaruf” (introductions; basic greetings)

Class 2: Parts of the school (e.g., classroom objects): "Afradul Madrasati"

Class 3: Asmaul Hayawanat (names of animals)

Almihnatu (occupations) Grades 4 – 5

The theme-based approach is good because then students can learn sets of vocabulary that are focused and relevant to their age group. So, grade 1 students can be introduced to simple words and basic greetings, while as the grades become higher, they are given more complex ones such as names of animals, professions, etc. It has a natural progression in building up the students' vocabularies based on students' brain development.

5. The AR Article Scanner on Smartphones

Quizzes are given using AR markers or QR codes, and the facilitator hands out a smartphone to each group. Scanning the markers will show them augmented reality

content about the theme they are studying in 3D models, images, or animations. This interactive feature of AR makes the learning experience more interesting as they can visualize objects on their screen. The school has now integrated this technology into the curriculum, improving student engagement considerably. More significantly, there is increased retention in vocabulary amongst students where they are learning via visual cues.

6. English vocabulary learning using AR

Each time an image or 3D model of an Arabic word appears on screen, students are asked to name it and repeat its pronunciation. For example, if a 3D model of a cat (قط) pops up, the student must say the word cat in Arabic. This tactile interaction solidifies learning by associating pictures with language ideas. Speaking the exact words repetitively fine-tunes your pronunciation and memory. Additionally, the collaborative environment helps students learn from each other and creates peer learning.

7. Matching Vocabulary with Arabic Language Rules

In addition to vocabulary learning, students are also asked to match the words with the Arabic language rules they are studying, such as gender agreement (مذكر ومؤنث), plural forms (جمع), or possessive structures. This helps students apply their vocabulary in a grammatically correct context, ensuring a deeper understanding of the language. For example, they might be asked to identify whether a word is masculine or feminine or to form plurals correctly. By integrating grammar with vocabulary learning, students not only expand their word bank but also gain insights into the structure of the Arabic language.

Conclusion

This structured approach to AR-based learning media offers an immersive, engaging, and highly interactive way to teach Arabic to elementary students. It combines visual and auditory learning techniques, reinforces collaboration, and integrates technology effectively into the classroom. The presence of university students as

facilitators adds a layer of support, ensuring that the learning experience is enjoyable and academically productive.

The implementation of Augmented Reality (AR)-based media in enhancing the Arabic language learning process has been highly effective, especially in increasing student engagement and interest across different grade levels. The following analysis discusses the observed outcomes based on specific indicators of student interest after using AR media.

Grade 1: Exceptionally High Interest

The Grade 1 students displayed an exceptionally high level of interest in learning Arabic using AR media. All six indicators—feeling happy, enthusiasm in learning, not feeling bored, interest, wanting to be actively involved, and attention—demonstrated overwhelmingly positive results.

- Feeling Happy (100%): Every student expressed joy and satisfaction during the learning process, which indicates that AR media effectively creates an enjoyable learning environment.
- Enthusiasm in Learning (100%): AR's interactive nature encouraged full participation, motivating students to stay excited about learning new Arabic words and concepts.
- Not Feeling Bored (100%): None of the students experienced boredom, which implies that AR media successfully combats the usual monotony associated with traditional language learning methods.
- Feeling Interested (96%): Nearly all students were deeply interested in the lesson content, showing that AR technology captures the imagination of young learners.
- Wanting to Be Actively Involved (96%): This figure suggests that students were eager to engage, ask questions, and participate in AR-based activities.
- Attention (91%): While attention was slightly lower than other indicators, it still reflects a strong focus on the lessons.

This data indicates that for Grade 1, AR-based media enhances engagement and instills a love for learning Arabic by making it visually and emotionally stimulating.

Grade 2: High and Consistent Engagement

In Grade 2, the level of interest remained consistently high, with all indicators either at 100% or close to it. This demonstrates that AR is equally effective in maintaining student engagement as they advance in their studies.

- Feeling Happy and Enthusiasm (100%): Students continued to find the learning experience enjoyable and were excited about using AR to learn Arabic vocabulary, which speaks to the long-term engagement benefits of AR technology.
- Not Feeling Bored (90%): Although a slight decrease compared to Grade 1, most students still found the lessons engaging.
- Feeling Interested, Active Involvement, and Attention (100%): The desire to be involved and attentive during AR activities remained at the highest level, suggesting that AR effectively caters to different types of learners, keeping them fully immersed.

The data from Grade 2 confirms that AR sustains high student interest and participation levels, making it a useful tool as students grow older and the content becomes more complex.

Grade 3: Noticeable Drop in Interest but Still Positive

While the level of interest remained generally high in Grade 3, some indicators slightly dropped compared to Grades 1 and 2.

- Feeling Happy, Enthusiasm, and Not Feeling Bored (93%): These indicators still reflect a positive learning experience. However, the slight reduction in engagement might suggest that students at this level are beginning to seek more challenging or varied activities.
- Feeling Interested, Active Involvement, and Attention (80%): These indicators dropped more noticeably, indicating that while students still benefited from AR, the novelty may have slightly worn off, or they may need additional challenges to maintain peak interest.

The decline suggests that while AR is still beneficial in Grade 3, further innovations or supplemental content (such as more challenging tasks or integrating grammar lessons) might be needed to sustain the same high level of engagement.

Grade 4: Exceptional Engagement Across All Indicators

In Grade 4, all indicators were at 100%, demonstrating an extraordinary level of interest across the board.

- All Indicators (100%): This total engagement indicates that AR-based media for this age group continues to be highly effective, possibly due to the content's alignment with the student's cognitive and linguistic development. The ability to visualize more complex topics or engage in interactive tasks related to Arabic grammar might be reasons for the increased enthusiasm and focus.

Grade 5: Consistently High Interest

Grade 5 students showed similarly high levels of interest, with all indicators at 100%, matching the engagement level in Grade 4.

- All Indicators (100%): The fact that all students remained fully engaged and interested suggests that AR-based media is equally effective for older elementary students, mainly when the content is appropriately challenging and relevant to their learning needs. By Grade 5, students might be dealing with more abstract concepts (e.g., occupations or grammatical rules), and AR helps simplify these by providing visual aids, making learning more comprehensible and enjoyable.

Conclusion

Implementing AR-based learning media has proven to be a highly effective strategy in increasing student engagement and interest in Arabic language learning across all elementary grades. While interest and engagement were consistently high across Grades 1, 2, 4, and 5, a slight decline in some indicators was observed in Grade 3. This suggests that while AR media can maintain high interest, periodic updates to the

content and structure of lessons may be necessary to continue challenging students and keeping them fully engaged as they progress.

In general, AR technology not only enhances the learning process by making it interactive and fun but also supports different learning styles, contributing to a more dynamic and inclusive classroom environment. The data strongly supports the idea that AR-based media can be crucial in modernizing Arabic language education, particularly in creating an immersive, student-centered learning experience.

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