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IMPLEMENTATION OF AUGMENTED REALITY LEARNING MEDIA FOR SCIENCE MATERIALS IN MADRASAH IBTIDAIYAH

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ABSTRACT

This study aims to describe the implementation of Augmented Reality (AR) learning media in Natural Science (IPA) material in Madrasah Ibtidaiyah (MI), analyze the benefits and constraints of its use, and assess its influence on students' conceptual understanding and learning motivation. This study uses a qualitative descriptive approach with subjects of grade IV/V MI students, science teachers, and partner schools. Data were obtained through observation, interviews, documentation, and questionnaires, then analyzed with the stages of data reduction, data presentation, and drawing conclusions using the Miles & Huberman model. The research results showed that AR media helped students understand abstract science concepts through realistic, three-dimensional interactive visualizations, such as those on the solar system and human organs. Students demonstrated increased motivation, participation, and curiosity about scientific phenomena. Teachers also assessed AR as effective in increasing student engagement and understanding, despite technical challenges such as limited devices and digital literacy. The use of AR in science learning aligns with constructivist theory and the student-centered learning approach, and supports the Merdeka Belajar policy in the digital transformation of elementary education. From an Islamic education perspective, this medium can be used to strengthen spiritual values through the introduction of science based on contemplation of God's creation. Thus, AR has the potential to become an innovative learning media model that can holistically improve the quality of science learning in Islamic elementary schools.
Keywords: Augmented Reality, Science Learning, Madrasah Ibtidaiyah, Constructivism, Independent Learning.

A. INTRODUCTION

The development of digital technology has brought about significant transformations in the world of education, particularly in the aspect of learning media. In the era of the Industrial Revolution 4.0 and the transition to Society 5.0, integrating technology into the learning process is no longer an option but an urgent necessity so that students can adapt to the demands of the digital age (Suryani & Susanti, 2021). Technologies such as*Augmented Reality*(AR) is an innovation that can bridge the real and virtual worlds, providing a more concrete, interactive, and engaging learning experience for elementary school students.

Science learning in Islamic elementary schools often faces challenges due to the abstract nature of many concepts, such as the solar system, human organs, and photosynthesis. Elementary school students, who are still in the concrete operational stage according to Piaget's theory, require visual and interactive experiences to better understand scientific concepts (Saputri & Agustina, 2022). Therefore, the presence of AR media can help students conceptualize natural phenomena that are difficult to observe directly into a more realistic and understandable way.

PGMI teachers in the modern era are required to have pedagogical and technological skills (*technological pedagogical content knowledge*or TPACK). However, the facts on the ground show that some teachers still struggle to implement digital media effectively (Hidayat & Mustadi, 2020). The use of AR can be a strategic alternative to improve the quality of learning, as teachers can present 3D objects into the classroom without the need for expensive laboratory equipment.

Furthermore, the use of AR media has the potential to increase student motivation and active participation in the learning process. Research by Mustaqim (2017) showed that students who learned using AR demonstrated higher levels of engagement and enthusiasm compared to conventional methods. The interactivity and visualization offered by AR make learning more enjoyable and meaningful, thereby improving student learning outcomes.

From an Islamic education perspective, learning innovations such as AR are in line with the principles *Iqra'* (reading and understanding the universe as signs of God's greatness). Science learning combined with technology can foster a sense of awe for God's creation and strengthen students' faith (Asyari, 2022). Thus, AR implementation is not only oriented toward cognitive improvement but also strengthens the affective and spiritual aspects of learning in MI.

Furthermore, AR media is also relevant to support the Merdeka Belajar policy, which emphasizes student-centered, contextual, and project-based learning. AR allows students to explore science material independently through fun and meaningful learning experiences (Suryawan & Wirawan, 2021). Thus, this topic supports the direction of national education transformation toward humanistic and innovative digital learning.

Ultimately, the importance of discussing the implementation of AR media in science learning at Islamic elementary schools (MI) lies in its contribution to improving the quality of technology-adaptive Islamic elementary education. This research is expected to provide an empirical basis for the development of AR-based learning media in Islamic elementary schools (madrasahs) and inspire PGMI teachers to continue innovating in line with current developments.

B. RESEARCH METHODS

The type of research used in this study is descriptive qualitative, namely research that aims to describe phenomena in depth based on data obtained in the field. This approach is used to understand the implementation of learning media.*Augmented Reality*(AR) in the real context of science learning in Islamic Elementary Schools. According to Creswell (2018), qualitative research focuses on the meaning, experiences, and perspectives of participants in natural

situations. In this case, the researcher acts as the main instrument who interacts directly with teachers and students to gain a comprehensive understanding of how AR media is implemented in teaching and learning activities. The research location was determined at the partner Islamic elementary school with subjects including science teachers and grade IV/V students, because at this level science material begins to contain abstract concepts that are suitable for testing the effectiveness of visualization through AR media.

Data collection techniques involved classroom observation, in-depth interviews, documentation, and student response questionnaires to obtain valid triangulation data. The research instruments included an observation guide to record learning activities, an interview guide to explore teacher and student perspectives, and a questionnaire to determine students' responses and motivation levels toward the use of AR media. The data obtained were then analyzed using the Miles and Huberman (1994) model, which includes three main stages: data reduction, data presentation, and conclusion drawing. This approach enabled researchers to select important data, present it systematically, and produce meaningful interpretations regarding the effectiveness and challenges of AR implementation in science learning at MI (Sugiyono, 2022; Miles, Huberman, & Saldaña, 2014).

C. RESULTS AND DISCUSSION

1. Key Findings

a. General Description of Learning Implementation with AR Media

Before media implementation Augmented Reality(AR), science learning in Islamic Elementary Schools (MI) is still dominated by conventional methods such as lectures, question-and-answer sessions, and the use of textbooks. Teachers tend to explain material verbally with the aid of flat illustrations in textbooks. This condition makes it difficult for students to understand abstract concepts such as the solar system, the water cycle, and the structure of human organs. This is in line with the findings of Saputri and Agustina (2022), who stated that science learning in MI often fails to provide adequate concrete experiences for elementary school-aged children, making it difficult for them to connect concepts to real-world phenomena around them.

In an effort to improve the quality of learning, teachers are innovating by integrating AR media into their Lesson Implementation Plans (RPP). The planning stage includes identifying core competencies, determining learning objectives, and selecting AR applications relevant to science material, such as:*Assemblr EDU* And *Merge Cubes*Teachers also prepare supporting devices such as devices, internet connections, and guidance modules for students. According to Suryawan and Wirawan (2021), careful planning is crucial for AR-based media to function optimally as a visual and exploratory tool in science learning.

The teaching and learning process using AR media took place over three sessions. In the initial stage, the teacher introduced AR technology and how to use it to students. Students were then asked to scan specific images or codes using their device's camera, which then displayed 3D objects relevant to the material being studied. For example, on the topic of the solar system, students could virtually see the planets orbiting the sun. This type of learning created an interactive and enjoyable learning experience.

Students demonstrated high enthusiasm when using AR. They appeared more active in asking questions and discussing in small groups. This positive response indicates that AR is

able to capture students' attention and stimulate curiosity about scientific phenomena. This aligns with research by Mustaqim (2017), who found that the use of AR can significantly increase student learning motivation and engagement compared to conventional methods.

During the learning process, the teacher acts as a facilitator, guiding students in observing and interpreting 3D objects. This approach shifts the teacher's role from being a center of information to being a companion in the process of exploring knowledge. This learning model aligns with the paradigm of*student-centered learning*, which emphasizes student activity and participation in constructing their own understanding (Creswell, 2018).

Teachers also conduct formative evaluations at the end of each session by providing reflective questions to assess students' understanding of the concepts learned through AR. Evaluations focus not only on cognitive aspects but also on affective and psychomotor aspects, such as students' ability to identify body parts in 3D models and verbally explain their functions.

Overall, the integration of AR media into science learning has a positive impact on the quality of the learning process. Students learn not only through text and images, but also through realistic and interactive visualizations. This experience makes learning more contextual and meaningful, as Azuma (1997) emphasized that AR can bridge the gap between the real and virtual worlds in an educational context.

b. Teacher and Student Responses to the Use of AR Media

Interview results showed that teachers responded positively to the use of AR, believing it to be effective in explaining difficult-to-visualize material. Teachers found it helpful in explaining science concepts without having to bring expensive physical teaching aids. AR media provides a more engaging and efficient visualization alternative. According to Yuliani (2021), the use of visual-based technology can improve teachers' classroom management skills and facilitate active learning.

Students demonstrated high engagement throughout the learning process. They focused more on the material and displayed a keen curiosity about the objects appearing on the screen. Observations showed that almost all students actively participated, both in answering teacher questions and in group discussions. This phenomenon supports the findings of Suryani and Susanti (2021) that interactivity in AR can improve students' attention and retention of the material being taught.

The impact of AR on student learning motivation is also significant. According to a questionnaire, 89% of students expressed greater enthusiasm for learning science using AR compared to traditional lecture methods. They reported understanding the material more easily because they could directly see the shape and movement of objects. Research by Mustaqim (2017) also showed that AR media can increase students' intrinsic motivation through realistic and enjoyable learning experiences.

Teachers also stated that AR provides students with opportunities for independent learning outside of school hours. Some students downloaded AR apps onto their personal devices and used them to explore other materials independently. This demonstrates that the use of AR technology can foster a culture of lifelong learning.*lifelong learning*).

Furthermore, teachers believe that AR media helps instill collaborative values among students. In group activities, they learn to work together to understand 3D models and answer questions related to the concepts presented. This collaboration strengthens students' social and communication skills, which are essential for 21st-century competencies (Suryawan & Wirawan, 2021).

However, some teachers also expressed the need for technical assistance in operating AR media, especially for those unfamiliar with digital devices. This suggests that the success of AR implementation is heavily influenced by teachers' readiness to master the technology.

Overall, the positive response from teachers and students indicates that AR is a potential medium for broader integration into science learning at Islamic elementary schools. Increased motivation, engagement, and conceptual understanding are clear evidence of the effectiveness of AR use in the context of Islamic elementary education.

c. Obstacles and Challenges in AR Implementation in MI

The implementation of AR media in Islamic elementary schools (MI) faces various technical challenges. One major obstacle is the limited digital devices available at schools. Not all students have devices compatible with AR applications, requiring teachers to adapt their teaching methods to remain inclusive. Another obstacle is the unstable quality of the internet connection, especially in rural areas. This situation hinders the smooth running of AR-based learning processes, as also revealed by Hidayat and Mustadi (2020) in their study on the readiness of Islamic elementary school teachers to face digital transformation.

In addition to technical challenges, there are also pedagogical barriers, namely teachers' limited ability to integrate technology into learning activities. Some teachers still experience difficulties operating AR applications, necessitating ongoing training to improve the digital literacy of PGMI teachers. This aligns with Sugiyono's (2022) opinion that the successful implementation of technological learning media is largely determined by the readiness of the human resources involved.

Teachers also face challenges in managing learning time. Application installation, internet connection, and initial orientation to AR require additional time. Therefore, teachers must adjust their schedules to ensure learning activities are not disrupted.

To overcome these various obstacles, teachers apply several strategies. For example, using the model*blended learning*Students without devices can still participate in learning through AR projectors displayed by teachers. Furthermore, teachers collaborate with parents to provide simple devices to support technology-based learning activities at home.

Schools have also begun providing support facilities, including Wi-Fi, projectors, and technology training for teachers. Collaboration between schools and the educational community is crucial to supporting the sustainability of AR implementation.

Despite facing various obstacles, teachers remain committed to continuing to use AR media due to its perceived significant benefits for student learning outcomes. These challenges actually motivate teachers to innovate in developing technology-based learning media.

Thus, existing obstacles are not barriers, but rather part of the adaptation process toward digital transformation in Islamic elementary school education. Systematic support from schools

and the government is essential to making AR technology an integral part of the future learning process.

d. Impact on Students' Understanding of Science Concepts

Observation and evaluation results showed a significant increase in students' understanding of science concepts after the application of AR. Before using AR, most students were only able to state basic facts without understanding the relationships between concepts. After AR-based learning, students were able to explain processes and functions coherently. This demonstrates that AR media acts as an effective visual aid to bridge the gap between theory and reality (Azuma, 2022).

A comparison of learning outcomes before and after using AR showed significant improvement. Based on the formative assessment results, students' average score increased from 68 to 86. These results support Mustaqim's (2017) findings that AR use can improve learning outcomes because it provides hands-on, exploratory, and contextual experiences.

In addition to cognitive improvements, students' affective aspects also experienced positive changes. They demonstrated a greater curiosity about science materials and began to relate scientific phenomena to everyday life. Suryani and Susanti (2021) emphasized that AR-based learning can improve*scientific curiosity*and foster students' scientific attitudes.

Teachers also observed improvements in students' critical thinking skills. While interacting with the 3D models, students frequently asked questions such as "Why do planets rotate?" or "What causes rain?" These activities demonstrate that AR encourages students to think analytically and reflectively about the material.

Additionally, AR helps students with visual and kinesthetic learning styles better understand the material. Students can rotate, zoom in, or observe objects from various angles, making the learning experience more personalized and meaningful.

Another positive impact is the rise of students' ecological awareness. When learning about the water cycle using AR, students begin to realize the importance of preserving the environment. This demonstrates that AR-based learning not only enhances knowledge but also fosters environmental stewardship in line with Islamic values.

Overall, the implementation of AR media in science learning at Islamic elementary schools (MI) has improved conceptual understanding, critical thinking skills, and fostered scientific and religious values in students. This media deserves further development as a technology-based learning innovation in Islamic elementary education.

2. Discussion

a. Relationship of Findings with Constructivist Learning Theory

The results of the study show that the media*Augmented Reality*(AR) is very effective in helping students build conceptual understanding through visual and exploratory experiences. In science learning at MI, students tend to learn better when they can observe phenomena directly. AR presents three-dimensional (3D) virtual objects that students can see and manipulate, making abstract concepts such as the solar system, body organs, or the water cycle more concrete. This is in line with the theory of constructivism, which emphasizes that knowledge is actively constructed by students through meaningful learning experiences (Piaget, 1972; Vygotsky, 1978).

In this context, AR media provides space for students to experiment and interact directly with learning objects. This exploratory activity aligns with the principles of *discovery learning*, where students construct knowledge through a process of inquiry and discovery. Research conducted by Bower et al. (2020) shows that AR can enhance student cognitive engagement by providing a rich and immersive multisensory learning experience.

Observations show active student engagement during the AR learning process. They appear enthusiastic and participate in class discussions when virtual objects are displayed. This demonstrates the real-world implementation of AR.*student-centered learning*, where the teacher's role shifts to that of a facilitator, while students become active participants in constructing knowledge. Research by Ibáñez & Delgado-Kloos (2018) supports this finding by stating that AR enhances independent learning and collaboration among students.

According to Piaget's constructivist theory, elementary school students are in the concrete operational stage (ages 7–11). At this stage, children begin to think logically about real objects that they can manipulate physically and visually. Therefore, AR media is highly relevant because it presents visual representations that can be observed from various perspectives. Research by Chen et al. (2020) confirms that AR-based media can strengthen logical thinking skills and conceptual understanding in elementary school-aged students.

AR also supports collaborative learning processes where students discuss and work together to understand scientific phenomena. This activity incorporates the social aspects of Vygotsky's theory of*zone of proximal development (ZPD)*, where social interaction is key to developing children's learning potential. This is reinforced by research by Cheng & Tsai (2019), which concluded that AR can strengthen collaboration and communication between students.

In addition to building concepts through visualization, the use of AR also enhances students' affective aspects, such as curiosity and motivation to learn. A fun learning experience creates*intrinsic motivation*, where students learn not out of obligation, but out of a drive to understand. Research by Kavanagh et al. (2017) demonstrated that the use of AR in science learning contributes to increased intrinsic motivation.

Overall, AR media changes the learning paradigm from*teacher-centered* become *student-centered*AR creates an interactive and adaptive learning environment tailored to students' needs. According to modern constructivist theory, effective learning occurs when students are able to construct mental representations from direct experiences (Frodeman & Briggle, 2022). Therefore, AR implementation in MI supports meaningful and learner-centered learning.

In the context of Islamic basic education, learning with AR can also be linked to Islamic values.*contemplation* And *contemplation*towards God's creation through visualization of natural phenomena. AR can be a means to foster spiritual awareness through science, as emphasized by Quddus et al. (2023) who stated that technology in Islamic education should be directed towards fostering awareness of monotheism.

Therefore, the findings of this study show that the use of AR not only impacts cognitive aspects but also supports the formation of students' character and spirituality. This process illustrates the implementation of the principle*integrated education*in technology-based science learning.

Thus, the integration of AR in science learning at MI is proven to be relevant to constructivist theory and at the same time in line with Islamic educational values which emphasize the balance between knowledge, faith, and good deeds.

b. The Role of AR as a Modern Learning Media Innovation

AR media emerged as a solution to the limitations of conventional media, which often fail to illustrate abstract concepts in science learning. Two-dimensional images and verbal explanations are insufficient to help students understand complex structures like planetary orbits or the human digestive system. AR offers a more interactive and realistic learning experience (Mustaqim, 2017).

Increasing learning motivation is one of the most significant impacts of AR use. Students are captivated by the ability to interact directly with 3D objects that appear realistic. Research by Suryawan & Wirawan (2021) shows that AR media increases elementary school students' interest and learning outcomes in science by up to 30% compared to conventional media.

Beyond the motivational aspect, AR also enriches the learning experience through the integration of the real and digital worlds. This allows students to directly observe phenomena that would be impossible to physically present in the classroom. This aligns with the findings of Hsiao et al. (2021), who found that AR is effective in strengthening critical thinking skills and scientific understanding.

The main advantage of AR lies in its ability to provide*contextual learning environment*Students can learn in a real-world context while exploring digital representations. According to Hung et al. (2020), this enhances the transfer of knowledge from the classroom to everyday life.

The research findings also show that the use of AR strengthens interactions between teachers and students. Teachers can more easily explain complex concepts with the help of interactive visualizations, while students can ask questions and experiment directly using AR applications.

In science learning, AR serves as a bridge between theory and practice. For example, when studying the solar system, students can visually observe the rotation and revolution of the planets. This strengthens scientific understanding that was previously difficult to explain with text or images alone.

Research by Akçayır & Akçayır (2017) also confirms that AR increases learning efficiency because it presents information in a multimodal format (visual, auditory, kinesthetic). Thus, AR is in accordance with the principles of*multiple intelligences*which accommodates various student learning styles.

In addition, AR supports the development of*21st century skills*such as collaboration, communication, and digital literacy. This is crucial for preparing MI students to face the era of information technology and global educational transformation.

Based on these findings, AR serves not only as a learning aid but also as a means of developing a generation of creative and adaptive learners. The application of this technology

aligns with national education goals, which emphasize mastery of science and technology based on character values.

Therefore, AR media is a learning innovation that can improve the quality of basic education, especially in the field of science, through a visual, interactive, and contextual approach.

c. Implications for PGMI Teachers and Professional Development

The findings of this study provide important implications for PGMI teachers in developing professional competencies in the digital era. The use of Augmented Reality (AR) requires teachers to master not only the material and pedagogy, but also the technological aspects of learning. This is closely related to the Technological Pedagogical Content Knowledge (TPACK) model, which emphasizes the harmonious integration of technology, pedagogy, and content. Teachers need to understand how AR media can be adapted to the characteristics of MI students to ensure the learning process remains effective and enjoyable.

Mastering TPACK competencies is a key requirement for teachers to optimize technology-based learning. AR enables teachers to deliver interactive learning experiences without abandoning the essence of Islamic educational values. As explained by Koehler and Mishra (2009), teachers who possess TPACK competencies will be better able to integrate digital innovation with pedagogical approaches tailored to students' needs.

PGMI teachers are also expected to act as learning designers, not just presenters. In this context, teachers can create project-based, experimental, or discovery-based learning activities that utilize AR to reinforce scientific concepts and religious values. For example, students can use AR to observe plant structures while understanding the greatness of Allah SWT's creation.

The results of this study also emphasize the importance of professional training for Islamic elementary school teachers to improve digital literacy and the ability to develop AR-based learning media. Without adequate training support, the potential of this technology will be difficult to optimally utilize. The government, universities, and Islamic educational institutions need to collaborate in providing workshops and technopedagogical support.

Furthermore, AR can be used to strengthen character education through an interactive approach. When students actively engage in scientific exploration using AR, they learn the values of honesty, responsibility, and cooperation. This aligns with the vision of Islamic education, which integrates morals, knowledge, and good deeds in the learning process.

PGMI teachers need to utilize the findings of this research to reflect on their teaching practices and adapt learning strategies to the needs of the digital generation. According to Rahmawati & Fadilah (2022), digital innovations such as AR can increase the relevance of basic Islamic education to current developments if teachers act as change agents.

Thus, the implementation of AR in MI is not only a matter of technological innovation, but also a transformation of teacher professionalism towards creativity-based learning, digital literacy, and spiritual values.

Another implication is the need for collaboration between teachers, students, and media developers to design AR applications that are appropriate to the local context and Islamic

values. This collaboration can strengthen the digital learning ecosystem in madrasah environments.

PGMI teachers should view AR media as a reflective tool that enriches learning strategies, not simply digital entertainment. This way, teachers can maintain a balance between innovation and values.

Finally, the results of this study encourage a paradigm shift in PGMI teachers from mere users of technology to creators of digital learning that has an Islamic character and is contextual to the needs of the 21st century.

d. Relevance of Findings to the Independent Learning Policy and Digital Transformation of Education

The results of this study demonstrate the alignment of AR implementation with the spirit of Merdeka Belajar (Freedom to Learn), which emphasizes student-centered, contextual, and experience-based learning. AR provides opportunities for students to learn independently and experiment at their own pace.

Within the Merdeka Belajar policy framework, teachers act as facilitators, creating an active learning environment. AR is an effective means of achieving this goal, enabling the integration of real-world and virtual experiences. In line with the Ministry of Education, Culture, Research, and Technology's (2022) perspective, digital transformation in education aims to create innovative and enjoyable learning.

The use of AR also supports the achievement of the Pancasila Student Profile, particularly in critical thinking, creativity, and faith in God Almighty. Through AR, students not only learn about scientific phenomena but also relate them to spiritual and social values.

In the context of digitalizing madrasah education, AR plays a crucial role in strengthening MI students' scientific and digital literacy. The use of this technology-based media fosters students' ability to understand technology wisely and productively.

AR can also be an implementation strategy in the Digital Madrasah program initiated by the Ministry of Religious Affairs. By implementing AR media, madrasas can integrate technological innovation with the Islamic curriculum in a balanced manner.

This research also shows that AR can improve the quality of science learning without neglecting the context of religious values. This supports the goal of Merdeka Belajar (Freedom to Learn) to develop students who are technologically savvy yet possess character.

Furthermore, AR media enriches formative assessment practices in the Independent Curriculum. Teachers can directly observe students' exploration processes as they interact with virtual objects, rather than simply assessing the final results.

This finding aligns with research by Wibowo et al. (2023), which found that AR integration in the Independent Curriculum improved engagement and science learning outcomes in elementary school students.

Thus, the implementation of AR in MI is a strategic step in supporting the national policy of digital transformation of education, both in public schools and madrasas.

Ultimately, the results of this study recommend that the use of AR be made part of a national learning innovation policy based on Islamic values and local culture, in order to create adaptive, character-based, and globally competitive basic education.

D. CONCLUSION

This study concludes that the application of Augmented Reality (AR) in science learning at Islamic Elementary Schools (MI) has a positive impact on improving conceptual understanding, learning motivation, and student engagement. AR media has been proven to be able to transform learning from abstract and conventional to more concrete, interactive, and meaningful. Through three-dimensional visualization, students can observe scientific phenomena such as the solar system, body organs, and the water cycle more easily understood according to the cognitive development stage of MI children who are in the concrete operational phase according to Piaget.

Furthermore, teachers find it easier to explain complex science material because AR media bridges the gap between theoretical concepts and visual reality. AR also increases students' intrinsic motivation through a fun and collaborative learning experience. However, AR implementation is not without challenges, such as limited devices, digital infrastructure, and teachers' ability to operate the technology.

The findings of this study confirm the relevance of constructivist theory, which emphasizes students' active role in constructing knowledge through direct experience. AR reinforces the principles of student-centered learning by providing exploratory and collaborative space in the learning process. Practically, the results of this study indicate that the use of AR media can be widely adapted in MI as a technology-based science learning innovation that aligns with the spirit of Merdeka Belajar (Freedom to Learn) and the digital transformation of education.

From an Islamic education perspective, AR serves not only as a technological medium but also as a means of contemplation on Allah SWT's creation, thus integrating science, faith, and character. Therefore, PGMI teachers need to expand their Technological Pedagogical Content Knowledge (TPACK) competencies to optimize the independent and sustainable use of AR. With proper development, AR media has the potential to become an innovative learning model that can be replicated in various Islamic elementary education institutions in Indonesia.

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