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Implementation of Virtual Reality Based Learning Media At *Pesantren* Elementary School

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Abstract. This research aims to analyse the implementation of Virtual Reality (VR)-based learning media in public primary schools (SDN) to improve the effectiveness and engagement of students in the learning process. The problem raised in this research is the low engagement and motivation of students in conventional learning, which often results in a lack of understanding and academic achievement. This research used a qualitative approach with descriptive method. The research subjects consisted of 5th and 6th grade students, teachers, and principals at SDNs that have adopted VR-based learning media. Data collection techniques included observation, in-depth interviews, and documentation studies. Data validation was conducted using triangulation techniques to ensure the accuracy and reliability of the data obtained. The collected data were analyzed using interactive analysis method, which consists of data collection, data reduction, data presentation, and conclusion drawing stages. The results showed that the implementation of VR-based learning media was able to significantly increase student engagement and motivation. Students were more enthusiastic in attending lessons and showed improved understanding of the material, as well as improvement in cognitive ability and comprehension of subject matter, especially in science and history subjects. Constraints include the need for technical training for teachers and the limitations of VR devices. The implication of this research is the importance of developing and implementing technology-based learning media in primary schools to create a more interactive and engaging learning experience for students.

Keywords: implication; learning media; virtual reality

INTRODUCTION

Traditional learning in primary schools often has difficulty in increasing student engagement and motivation (Rofi'i et al., 2024).. Low levels of engagement have a negative impact on their understanding and academic achievement. This phenomenon also occurs at SDN Pesantren, where many students show low interest in learning, lack motivation, and often have difficulty in understanding the subject matter. This is due to less interactive learning methods and the minimal use of technology in the learning process. In today's digital era, innovation in learning methods is essential to create a more engaging and effective learning experience. One promising innovation is the use of Virtual Reality (VR) based learning media. VR can create an interactive and immersive learning environment, which can increase student engagement and motivation. (Zulfikri, 2023). Learning with VR, students can experience more visual and explorative learning, thus improving understanding and retention of information. Research shows that the use of VR in classroom education can provide a range of benefits, including increased student engagement, visualization of complex concepts, experiential learning, and personalized learning. (Redhana, n.d.). VR allows students to conduct virtual simulations and experiments that may be difficult to do in the real world due to cost, time, or safety limitations. (Siyamsih, 2024). In addition, immersive learning experiences through VR technology can help students more effectively remember and understand the subject matter. With VR, students can engage in visual and interactive simulations that resemble real situations, so that concepts that are difficult to understand or abstract become clearer and more accessible. Through active engagement in the learning process, students not only passively receive information, but also experience deeper learning. Since it involves more senses, this experience is more easily stored in long-term memory. For example, in science learning, students can 'explore' the human body or the solar system, which makes learning more interesting and relevant. VR not only enriches concept understanding, but also fosters students' motivation and curiosity in learning.

The use of technology in learning at SDN Pesantren is still very limited to traditional tools and has not maximized the potential of advanced digital technology. This poses a challenge in improving the quality of education, especially in an era that increasingly relies on technology in the learning process. To overcome this challenge, this study aims to evaluate the implementation of

Virtual Reality (VR)-based learning media at SDN Pesantren. VR technology, which offers interactive and immersive experiences, is considered to provide a new approach to learning. This research aims to assess how the use of VR can affect students' engagement in learning, increase their motivation, as well as encourage better academic achievement. Students can more easily understand abstract or difficult subject matter through near-reality experiences. Furthermore, this research is expected to make a significant contribution in developing more innovative and effective learning methods, which support the achievement of Merdeka Curriculum objectives. This curriculum prioritizes learning that is flexible, contextual, and focuses on developing student character and competencies. The use of VR is also in line with the objectives of the Pancasila Student Profile, which aims to form students with noble morals, critical thinking, creativity, independence, a spirit of mutual cooperation, and global awareness. (Muliastrini, 2024). The implementation of VR at SDN Pesantren is expected to not only increase the effectiveness of learning, but also contribute to the formation of a superior generation in accordance with the ideals of national education. The use of VR in education has been widely researched and proven to provide various benefits. Some of the main benefits of using VR in education include: 1) VR creates an interactive and immersive learning environment, which can make students feel more interested and involved in the learning process. With an immersive experience, students can be more focused and motivated. 2) Some concepts that are difficult to understand through verbal explanations or static images can be more easily understood through 3D visualizations provided by VR. For example, concepts in science such as atomic structure or solar system. 3) Students can conduct virtual simulations and experiments that may not be possible in the real world due to cost, time, or safety limitations. For example, exploration of different natural environments or complex chemistry experiments. 4) Learning through immersive experiences can improve information retention. Students tend to remember more easily what they see and do in a VR environment compared to what they read or hear. 5) VR can be used to provide learning experiences tailored to individual needs. (Lisnawati et al., 2023). Students can learn according to their own pace and learning style. In Indonesia, especially in Islamic boarding schools, the use of VR in education is still relatively new and has not been widely researched. Therefore, this research is expected to make a significant contribution to the development of VR-based learning methods in Indonesia, especially at SDN Pesantren.

METHODS

This research uses a qualitative approach to examine the implementation of VR-based learning media at SDN Pesantren. The qualitative approach is used to gain an in-depth understanding of the experiences and perceptions of teachers and students towards the use of VR in learning. The research subjects consisted of 5th and 6th grade students, teachers, and principals at SDNs that have adopted VR-based learning media. Data collection was conducted through observation, interviews, and questionnaires (Creswell, 2021). (Creswell, 2021). Observations were made to see firsthand how VR is used in the learning process and how students interact with the technology. Interviews were conducted with teachers and students to obtain information about their experiences and perceptions of the use of VR. Questionnaires were used to measure students' level of engagement, motivation, and academic achievement before and after the use of VR. Data validation was conducted using triangulation techniques to ensure the accuracy and reliability of the data obtained. The collected data were analyzed using the interactive analysis method, which consists of data collection, data reduction, data presentation, and conclusion drawing stages. (Mik-Meyer, 2020).

RESULTS AND DISCUSSION

This research shows that the use of Virtual Reality (VR) based learning media at SDN Pesantren has a significant positive impact on student engagement and motivation. This is in line with Lestari, (2023) Students showed greater enthusiasm when taking lessons with VR media compared to traditional methods, and their active participation in class discussions and interactive learning activities increased. The application of VR in learning significantly increases students' learning motivation, which can be seen from their enthusiasm in completing assignments and projects that use this technology. VR provides opportunities for students to interact directly with the subject matter, making the learning process more interesting and challenging. In science lessons, for example, students can simulate experiments that are difficult to do in a regular

classroom, while in history, they can "experience" historical events first-hand. This approach not only makes the material more relevant and alive, but also fosters students' interest in subjects that they may have previously found difficult or uninteresting. Especially in science and history, the use of VR is proven to capture students' attention and motivate them to learn more actively and explore the material further.

VR is a powerful tool in increasing students' enthusiasm for learning and interest in various topics. (Sukmawati et al., 2023). VR is a very effective tool in increasing students' motivation and interest in various subjects. With its ability to create interactive and immersive learning experiences, VR can transform the way students interact with subject matter. The technology allows students to 'experience' concepts that they have previously only read or seen in textbooks. For example, in science lessons, VR can take students on a virtual tour inside the human body or into space, giving them a first-hand perspective on the topic. In history lessons, students can 'visit' historical locations or witness important events virtually, which helps them understand the context and meaning of history in a more lifelike way.With VR in the classroom, students become more motivated to actively participate in the learning process. This exciting and fun learning can reduce boredom and increase their engagement. Immersive learning experiences often make students more enthusiastic to delve further into the material and conduct additional research outside of class hours. In addition, VR supports a variety of learning styles by enabling visualization and hands-on experience, thus creating more inclusive and effective learning.

VR not only enriches the learning experience, but also becomes a key driver to increase students' interest and motivation. The use of VR in education can create a more engaging and dynamic learning environment, which ultimately helps better academic achievement and build positive learning attitudes. VR media provides a more immersive and interactive learning experience, which interests students and motivates them to learn. The real and interactive visualization allows students to better understand the concepts being taught and feel more connected to the material. This is in accordance with constructivist learning theory which states that immersive and interactive learning experiences can increase student engagement and motivation. Constructivist learning theory emphasizes that students actively form their own knowledge through interaction with the environment and learning experiences. In this case, immersive and interactive learning experiences are essential to increase students' participation and motivation. In-depth learning experiences help students engage critically with the subject matter, encouraging them to think more deeply, analyze, and connect new concepts with existing knowledge. This allows for more meaningful understanding, so students are not just memorizing information, but are also able to apply it in a real context. Interaction in learning, through group discussions, cooperation, or hands-on experiments, gives students the opportunity to play an active role in the learning process. This is in line with the idea that learning is not just a process of passively receiving information, but an active one, where students solve problems, exchange ideas and build understanding through dialog. Student engagement increases when they feel they have control over their learning process, so they feel responsible and more autonomous. (Irawan et al., 2024). Intrinsic motivation also grows when learning is perceived as relevant to their interests and needs, and they see the benefits of what they are learning. A constructivist approach that emphasizes immersive and interactive learning experiences creates a richer learning environment, where students are engaged emotionally, cognitively, and socially, supporting better understanding and sustained learning. (Saksono et al., 2023).

Students' enthusiasm in participating in lessons has increased significantly with the use of VR. (Afifah et al., 2024).. Students are more excited and show greater interest in learning the subject matter. They are more active in asking questions and finding out more about the topic being studied. Assessment of material comprehension showed that students who learned with VR had a better improvement in material comprehension. The use of VR allows students to see, hear, and interact with lesson content in ways that are not possible with traditional media, thus improving their understanding of the concepts being taught.

The use of VR helps students understand complex concepts better. Their understanding of the subject matter, especially in science and history, improves significantly. Students can recall and apply the knowledge they gained through VR immersive experiences more effectively (Rahma et al., 2024). Students' cognitive abilities also improved, which was reflected in the increase in test scores and learning evaluations. They are better able to analyze,

synthesize, and evaluate the information learned. VR helps students develop critical thinking and problem-solving skills through simulations and realistic scenarios. (Kurdi, 2021). Science subjects, students can conduct virtual experiments and see the results in real-time, which reinforces the concepts learned. In history subjects, students can "visit" historical places and "witness" important events, which helps them understand the context and significance of the material studied. (Nugroho, 2023). This learning approach enhances students' cognitive abilities by facilitating deeper and more concrete understanding.

Despite the positive results, the implementation of VR in learning also faces some obstacles. Although Virtual Reality (VR) technology has provided positive results in learning, its implementation also faces a number of challenges (Azwar et al., 2023). One of the main obstacles is the high cost. VR devices, such as headsets and computers that support this technology, are still quite expensive for many educational institutions, especially schools in remote areas or with limited budgets. In addition, not all schools have adequate infrastructure, such as fast and stable internet connections, which are needed to run VR applications smoothly. Another obstacle is the limited availability of learning content that is relevant to the local curriculum. Although there are various VR applications, not all of them are suitable to be applied in educational contexts in different countries or educational levels. This requires additional effort to develop relevant and quality materials. In addition, teachers' skills in utilizing VR technology is a challenge, as many teachers are not familiar with this technology and require additional training in order to use it effectively in learning. While VR provides an immersive and interactive learning experience, there are concerns about the negative impacts of its use, such as eyestrain or nausea that some users experience after using a VR headset for a long time. (Christianingrum et al., 2024).. VR has great potential to improve the quality of learning, it is necessary to pay attention to and overcome these various obstacles so that its application can be more optimal and equitable. Teachers need adequate technical training to be able to use VR technology effectively in learning. Without adequate training, teachers may struggle to integrate VR into the curriculum. The solution is to provide regular training programs and workshops to improve teachers' skills in using VR. In addition, the limitations of VR devices, such as the number of headsets available and the quality of the devices, can be an obstacle in the implementation of VR-based learning. (Mirza, 2024). Schools can seek additional funding sources or partner with private parties to obtain adequate VR devices (Dacholfany et al., 2014). (Dacholfany et al., 2023). Alternating the use of devices with a structured schedule can also help overcome this limitation.

This research has several important implications. The development and application of technology-based learning media in primary schools is important to create a more interactive and engaging learning experience for students. VR as a learning tool can help overcome the limitations of conventional methods and provide a richer and more varied learning experience. (Yasin et al., 2023). The results of this study can also be the basis for educational policy makers to encourage the use of VR technology in the elementary school curriculum. Support from the government and educational institutions is needed to provide the infrastructure and resources needed for VR implementation. By increasing student engagement, motivation, and understanding, the use of VR can contribute to improving the overall quality of learning. (Menhard, 2024). Schools can adopt VR technology as part of innovative learning strategies to improve student academic achievement (Halim & Manurung, 2024). (Halim & Manurung, 2023).. This research shows that VR has great potential to enhance students' learning experience. By overcoming existing obstacles and developing supportive policies, the use of VR in education can provide significant benefits for students and teachers.

CONCLUSION

Based on the research findings, it can be concluded that the application of Virtual Reality (VR) technology in learning at SDN Pesantren shows that the implementation of VR-based learning media is able to significantly increase student engagement and motivation. Students are more enthusiastic in following the lessons and show improved understanding of the material, as well as improvement in cognitive ability and comprehension of the subject matter, especially in science and history subjects. Constraints include the need for technical training for teachers and the limitations of VR devices. The implication of this research is the importance of developing and implementing technology-based learning media in elementary schools to create a more interactive

and engaging learning experience for students.

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