Application of Augmented Reality-Based Learning Media to Improve Understanding of Basic Movements in View of Learning Style

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Abstrak

Meskipun teknologi AR memiliki potensi besar untuk meningkatkan pengalaman dan hasil belajar, penerapannya dalam konteks pendidikan, khususnya dalam pembelajaran PJOK, masih terbatas. Banyak sekolah dan institusi pendidikan yang belum memanfaatkan teknologi ini secara optimal untuk menyampaikan materi pembelajaran. Penelitian ini bertujuan untuk menganalisis penerapan media pembelajaran berbasis augmented reality terhadap peningkatan pemahaman gerak dasar ditinjau dari gaya belajar siswa. Jenis penelitian ini yaitu study eksperimen The One-Group Pretest-Posttest dengan uji ANOVA satu jalur. Sampel penelitian berjumlah 20 orang yang terdiri dari 10 laki-laki dan 10 orang Perempuan. Data dikumpulkan menggunakan metode pengumpulan data tes dengan instrumen berupa lembar tes. Hasil penelitian gaya belajar visual memiliki nilai yang masuk ked dalam kategori peningkatan tinggi, sedangkan gaya belajar auditori dan kinestetik memiliki nilai yang masuk pada kategori peningkatan sedang. Kesimpulan pada hasil uji anova satu arah untuk mengukur uji hipotesis nilai signifikansi interaksi penggunaan media berbasis AR. Melalui media AR bisa diketahui kemampuan pemahaman siswa yang memiliki gaya belajar kinestetik dan visual tingkatannya lebih besar daripada siswa auditori.Penelitian ini memiliki implikasi positif yang penting bagi pengembangan pendidikan. Temuan penelitian dapat mendorong pengembangan media pembelajaran berbasis teknologi lainnya yang mampu diaplikasikan pada berbagai gaya belajar siswa.

Kata Kunci: Penerapan, Media Pembelajaran AR, Tingkat Gerak Dasar.

Abstract

Although AR technology has great potential to improve learning experiences and outcomes, its application in the context of education, especially in PJOK learning, is still limited. Many schools and educational institutions have not optimally utilized this technology to deliver learning materials. This study aims to analyze the application of augmented reality-based learning media to improve understanding of basic movements in terms of student learning styles. This type of research is an experimental study of The One-Group Pretest-Posttest with one-way ANOVA test. The research sample amounted to 20 people consisting of 10 men and 10 women. Data were collected using a test data collection method with an instrument in the form of a test sheet. The results of the visual learning style research have values that fall into the high improvement category, while auditory and kinesthetic learning styles have values that fall into the medium improvement category. The conclusion on the results of the one-way ANOVA test to measure the hypothesis test of the significance value of the interaction of the use of AR-based media. Through AR media, it can be seen that the comprehension ability of students who have kinesthetic and visual learning styles is greater than auditory students.This research has important positive implications for educational development. The research findings can encourage the development of other technology-based learning media that can be applied to various student learning styles.

Keywords: Application, AR Learning Media, Basic Movement Level.

1. INTRODUCTION

Education has an important role and function in supporting the success of people's lives (Ali & Murdiana, 2020; Cahyono, 2021; Sulianti et al., 2020). By getting education, people have learning provisions regarding developing the potential of human resources, one of the learning that can develop potential from within is Physical Education. Physical education learning is considered to be able to make students' movements and development faster (Hanim, 2022; Muliadi, 2021). This can have an effect on changes in students' behavior motivation in learning. Utilizing the latest learning media is one way to achieve interactive and fun learning (Logayah et al., 2023; Oktavia et al., 2024; Rahmiati, 2021; Ruswan et al., 2024). Moreover, currently, with the increasingly rapid use of learning technology, physical education learning is increasingly leading to more varied and innovative learning media in physical education learning. The technological media that is currently often used in learning is augmented reality (AR) based learning media. Augmented reality media is a technology that combines two- dimensional or three-dimensional virtual objects into a real environment and projects these virtual objects in real-time. AR has become a highlight in various fields, including education, because of its ability to bring digital content into students' real world (Orleans et al., 2024; Sugiarso, 2024). In a learning context, AR offers an immersive and interactive learning experience, where students can interact directly with learning material in a real environment (Azmi et al., 2024; Tohir et al., 2024). In physical education learning, especially in teaching materials that prioritize bodily activities (basic movements), augmented reality-based learning technology should be used for advance and utilize learningbased AR technology which aims to provide understanding for students and a high learning experience for students to be able to use learning media in teaching physical education lessons specifically on learning movement. However, despite its positive potential, the application of AR in the educational context is still not widespread, many schools and educational institutions still do not utilize this technology optimally in presenting learning material. As is known, learning media has a big role in learning activities.

This is realized because learning media can increase students' enthusiasm and enthusiasm for subjects, and can make it easier for teachers in the process of delivering material to students, reducing or even reducing avoid feeling bored with learning, and efforts are made to increase student learning outcomes (Trisiana, 2020; Willya et al., 2023). Based on the conditions previously explained, there is a need for innovation in learning activities. One of the learning media breakthroughs that will be implemented is using Augmented Reality (AR) applied in learning media. Augmented Reality is a technology that combines a three-dimensional (3D) virtual object into a three- dimensional (3D) real object in the same duration and place, where the distance between the real object and the virtual object is combined to be connected in real time in the form of a three-dimensional display (Arena et al., 2022; Nelva Saputra et al., 2020). The assumption that has occurred so far is that utilizing technology in physical education learning can increase understanding of learning interesting for students, apart from that, the understanding gained from creating AR learning media can increase the creativity of actors in terms of developing and providing a touch of technology through physical education learning media. Currently there are (1) teachers and students not being able to prepare physical education learning media that combine technology in its application, (2) AR learning media has not yet become a mandatory menu taught for teachers and students to improve basic movement skills, (3) manufacturing AR learning media is still very minimal.

So from this statement the researcher tried to examine several previous researches to see what the researchers were trying to offer through AR learning media. The media designed

for the PJOK subject, Augmented Reality-based Pencak Silat material, can help students so that learning feels very interesting, interactive and easy to use and fosters a sense of understanding in students with the material that has been explained in the learning. A number of The research put forward by the researcher is the basis for researchers in uncovering and solving current problems related to augmented reality-based learning media to improve basic movement abilities in physical education learning. The Novelty that researchers offer in this research is AR learning media for increasing basic movement learning abilities which are a characteristic of physical education learning that utilizes technology based AR in learning physical education. The main purpose of this study is to analyze the application of augmented reality-based learning media to improve understanding of basic movements in terms of student learning styles. The implications of this research indicate that AR technology can significantly improve learning experiences and outcomes in physical education, providing a valuable tool for both educators and students. (Miftah, 2014)

Using innovative and interactive media can support students' interest in learning so that it can increase students' learning motivation. Interactive learning can make students have an imagination that will encourage them and create a desire to make a change in behavior. The use of Augmented Reality media can be used as an alternative in the learning process because Augmented Reality media is an interactive and innovative media, media that can make three dimensions or two dimensions real. in learning so that students will develop a sense of interest and curiosity.

2. METHOD

The research methodology used in this research uses the One-Group Pretest-Posttest experimental study. This research implemented a Pretest-Posttest Group involving sports science faculty students. The quantitative research technique used in this research is the experimental method using instrument basic movement understanding ability tests in terms of learning style. To determine the magnitude of the increase in students' ability to understand basic movements, the data was analyzed quantitatively using statistical tests. The data was processed in the form of test data. Scores obtained from the pretest and the students' posttests were then processed to find the n-gain for each understanding of basic movement learning. After the n-gain data is obtained, the test continues prerequisite analysis, namely normality test and test homogeneous. If it meets the test prerequisite The analysis was then continued with a one-way ANOVA test.

Population in study is the student Unimed Faculty of Sports Sciences. Determining the population in research based on basic movement teaching material which is one of the mandatory subjects taught in physical education learning. Determining the research sample uses a purposive sampling technique with sampling using certain considerations in accordance with the desired criteria to be able to determine the number of samples to be studied so that which has the following requirements: (1) the sample is a given learning style auditorium, (2) the sample was given a visual learning style, (3) the sample was given a kinesthetic learning style, from these results it is known that there were 20 research samples consisting of 10 men and 10 women. Therefore, 20 research samples were given AR learning media to improve ability and understanding in learning basic movements. Research design Which used is a one group pretest-posttest design, namely experimental research carried out on a group that is selected randomly and no tests are carried out for the stability and clarity of the group's condition before being given treatment (Agustianti et al., 2022; Sumiati et al., 2024). This one group pretest-posttest design is measured using a pretest which is carried out before being given treatment. treatment and posttest carried out after being given treatment for each learning

series. Next, the sample was given a test after and before treatment which contained six questions about the ability to understand basic movements in the form of description questions. AR Media used as a learning tool to build students' basic movement understanding abilities.

3. RESULTS AND DISCUSSION
Results

Based on results processing of result data post test, pretest, and N-gain are seen from student learning styles, which can be seen in Table 1 as follows.

Tabel 1. Skema One Group Pretest-Posttest Design

Learning Style	Rate-Rata Pretest	Rate-Rata Posttest	Skor N- Gain	Category
Visual	41,9	87,9	0,72	High
Auditorium	46,0	86,9	0,61	Currently
Kinesthetic	45,7	83,9	0,65	Currently

Based on Table 1, it is known the results of the N-gain, posttest and pretest of the ability to understand basic movements in terms of learning style. In Table 2 it can be seen that the visual learning style has an n-gain value of 0.72 and is in the high improvement category, while the auditory and kinesthetic learning styles have values of 0.61 and 0.65 respectively which are in the moderate improvement category. The one-way ANOVA test with the help of SPSS 16 was used to confirm the hypothesis presented in Table 2.

Tabel 2. One Way Anova Ability Basic Movement Understanding

	Sum of Squares	Df	Mean Square	F	Say	Hypothesis	Results
Between Groups	4.257	2	2.533	3.038	0.065	Hthe accepted	Not available differenc
Within Groups	23.300	26	0.867				
Total	**27.567**	**28**					

Conclusions can be drawn based on the results of the one way anova test in Table 2, stating that the significance figure of 0.065 is more than 0.05 which means interpreted In this research, there was no difference in students' ability to understand basic movements to differentiate between those with kinesthetic, visual and auditory learning styles through Augmented Reality media. This research uses three categories: the category learning style auditorium, visual, and kinesthetic which form the basis of the reasons for selecting research samples. Based on the results of processing the learning style questionnaire and the results of discussions with the school, the VA class was chosen as the research sample. Therefore, the VA class will receive learning using AR-based learning media with a total of 28 students. Next, the VA class was given a test after and before the treatment which contained 6 questions about mathematical understanding ability in the form of description questions. AR media is used as a learning tool to build students' basic movement abilities.

Discussion

Learning media can be classified into several classifications, namely: 1. Judging from their nature, media can be divided into: 1) Auditive media, namely media that can only be

heard, or media that only contains sound elements, such as radio and voice recording. 2) Visual media, namely media that can only be seen, does not contain sound elements. Included in this media are slide films, photos, transparencies, paintings, drawings and various forms of printed materials such as graphic media, and so on (Ramadhan et al., 2023). 3) Audiovisual media, namely a type of media that apart from containing sound elements also contains image elements that can be seen, for example video recordings, various sizes of film, sound slides and so on. (Mahendra et al., 2023; Supriadi et al., 2023; Supriadi & Dewi, 2022) Judging from its reach capacity, media can be divided into: 1) Media that have wide and simultaneous reach such as radio and television. 2) Media that has a limited reach by space and time, such as slide films, films, videos, and so on. 3. Judging from the technique or method of use, media can be divided into: 1) Projected media such as slide film, film strip, transparency and so on. 2) Non- projected media such as images, photos, paintings, radio, and so on. Based on the description above, it can be concluded that the types of media are very diverse, so a teacher must be skilled in choosing media. Choosing the right and correct media in the learning process will make students motivated to participate in learning, but if the media used is not interesting then the material taught by the teacher will not be paid attention to by students. Several studies related to the use of learning media to increase understanding of basic movements (Humairah & Safutri, 2023; Khasanah & Hariyoko, 2023). Effective learning media can improve the quality of learning, make it more interesting, and provide a better learning experience. Other researches mentioned that, the data was analyzed using quantitative statistical tests. Based on this data, researchers know that teachers play an important role in developing student learning media through ICT-based e-learning learning designs. Apart from that, the research results based on the Mann-Whitney N-gain score of students' comprehension ability obtained a significance value of $0.00 < α = 0.05$ so that H0 was rejected. These results indicate that students' understanding of learning using e-learning media is significantly better than students who receive book-based learning (Freddy & Olifia, 2019; Toma et al., 2023). The results of the research show that the average value obtained from football learning expert validation was 89%, learning media expert validation was 96.2%, PJOK expert validation was 89.4% and product trials were 87.7%.

From this research it can be concluded that the learning media for basic football technical material based on the Articulate Storyline application for class XI students at SMA Negeri 2 Batu is suitable to be implemented without revision. Conclusions can be drawn based on the results of the one way anova test in Table 3, stating that the significance figure of 0.065 is more than 0.05 which means interpreted. In this research, there was no difference in students' mathematical understanding abilities that differentiated between those who had kinesthetic, visual and auditory learning styles through Augmented Reality media. Thus, it can be concluded that through AR media, it is a media that can be applied to all learning styles. This is because AR-based learning media is an interactive technology that contains activities that will improve the ability to understand basic movements. As students are trained to explore for themselves the properties and networks of spatial structures. This statement is in line with other researches arguing that increasing the level of student participation in learning activities is one of the functions of using learning media, so learning media can increase student activity (Arifianto & Izzudin, 2021; Hardiansyah & Mulyadi, 2022; Sholihin et al., 2020). When someone has a visual learning style, they can increase their activities by seeing it directly, so that visual students understand a concept better, unlike the pictures in textbooks which are in two-dimensional form. Furthermore, if you have a kinesthetic learning style, you can increase your mathematical understanding through activities using AR media. This is because kinesthetic students can move-movement of the media directly by enlarging, reducing, and manipulating basic movements. Furthermore, students' auditory learning style

can improve their understanding abilities through activities using learning media supported by explanations from the teacher. This research has several advantages that support its validity and relevance. The AR media used allows the integration of multisensory activities to meet the needs of all student learning styles, both visual, auditory, and kinesthetic. In addition, the research design using pre-test and post-test tests provides strong empirical evidence of the effectiveness of AR media in improving students' mathematical understanding. This research also provides new insights into the application of AR technology in primary education, especially in supporting interactive and innovative mathematics learning. This study's results significantly contribute to the world of education. One of the main contributions is using AR technology as an innovative learning media relevant to the needs of students with various learning styles.

In addition, this research provides practical guidance for teachers in selecting and using technology-based learning media to improve student understanding. This interactive learning approach can also increase students' learning motivation, thus creating a more exciting and meaningful learning experience. This research has significant positive implications for educational development. The research findings encourage the development of other technology-based learning media that can be applied to various student learning styles. In addition, the results of this study provide a basis for schools to integrate AR technology into the curriculum to improve the quality of learning. Thus, this research also facilitates more inclusive education, where every student can access learning that suits their needs. However, this study also has some limitations. The study was only conducted in one class with limited samples, so the results cannot be generalized to a broader population. In addition, this study only focused on mathematical understanding without exploring the long-term impact of AR media on other aspects, such as creativity or problem-solving skills. Therefore, future research should involve a more extensive and diverse sample to increase external validity. Further research is also expected to examine the impact of AR media on other skills, such as collaboration or problem-solving. In addition, the development of AR media with additional features, such as tracking student progress, can support more personalized learning. To enrich the data, future research can integrate qualitative evaluation to understand students' learning experiences deeply.

4. CONCLUSION

The conclusion of this study shows that Augmented Reality (AR)-based learning media can be effectively applied to all student learning styles, whether visual, kinesthetic, or auditory, with no significant difference in mathematical understanding ability between learning style groups. AR media facilitates learning through multisensory integration, allowing students to interact actively with the content, thus supporting a more inclusive and interactive learning process. These results underscore the potential of AR as an innovative learning technology that is relevant for various learning styles and can increase students' engagement and motivation in understanding mathematical concepts.

5. ACKNOWLEDGE

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