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Motivation

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The Use of Mobile-Based Augmented Reality In Science Learning To Improve Learning Motivation

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Article Info	Abstract
	This study aimed to examine the effect of the use of mobile-based Augmented Reality media to improve student learning motivation in SMP Muhammadiyah Surakarta on the science subject. The study used a quasi-experimental method with pretest-posttest control design. The tests of mobile-based augmented reality media in learning and learning motivation were conducted on the research subjects, seventh-grade students of Muhammadiyah 1 Junior High School Surakarta, with cluster random sampling. It was found that, based on the scores obtained from the statistical test with SPSS 20 program, the sig. level was 0.002, smaller than 0.025 (0.000<0.025). This shows that there is a different significant mean score between the control class and the experimental class. Therefore, the mobile-based augmented reality media influences the classroom learning process, which is shown by the increase in student learning motivation in the learning process. **Keywords**: Augmented Reality, Android, Learning Motivation

1. INTRODUCTION

In the 21st century, many fields are centered on technology due to its rapid development. Education is one field that is affected by the rapid development of technology. As a result, many new learning approaches are discovered. One significant adaptation of technology-based education is the use of mobile-based augmented reality (AR) to deliver learning content. AR is a new technology that has emerged with the potential to be applied in education (Saidin, Halim, & Yahaya, 2015). It has become an alternative that promises anytime-anywhere learning. Mobile devices are designed to accommodate a variety of features to support the learning

process. (Bozkurt, 2016) AR not only complements dynamic learning but also involves many senses, such as touch, sight, and hearing (Saltan & Arslan, 2017).

The learning process will be useful if students can understand the knowledge delivered by the teacher. Science is not only a set of knowledge about living things or creatures but is a science that requires work, ways of thinking, and ways to solve problems. In science learning, understanding ideas and procedures is one of the determinants of learning success for students because the process of understanding ideas underlies the main knowledge for further learning. Besides, science learning aims to help students understand the science concept and its relevance to everyday life (Rediarta, 2014). Science learning can be a means for students to learn about themselves and the natural environment, as well as the prospects for further development in applying it to everyday life.

The 2013 curriculum in Indonesia is designed to strengthen student competence in terms of knowledge, skills, and attitudes. In learning, however, it is sometimes found that students have difficulties in understanding material, especially the complex material that cannot be directly observed or visualized (Mukti & Nurcahyo, 2017). This eventually influences student learning outcomes. The science learning process is often confronted with the materials that cannot be visualized directly so that they are difficult for students to understand. One of the materials difficult to visualize directly is about the respiratory and excretory systems in humans because the process occurs in the human body that requires the students to understand the concept.

Based on the results of the interviews conducted with the science teacher at Muhammadiyah 1 Junior High School in Surakarta, Central Java, Indonesia, the science learning class still uses classical learning methods in general, discussion, and lecture methods. The learning process is still teacher-centered, which makes learning seems monotonous and less interactive because there is only one-way interaction. Also, the use of media in the classroom is not yet optimal. The teacher uses media in the form of a blackboard, student books. and, sometimes, an LCD projector in learning. They seldom use media because it requires a lot of time for the teacher to prepare, especially electronics and digital media, and there is a lack of training for teachers to create interactive media and knowledge of the latest technological developments that can be utilized as interactive media

This makes students feel less motivated in learning science, especially in the topic of respiratory and excretion systems in humans and other concepts. The relation between motivation and learning is that motivation drives learning activities to achieve maximum learning outcomes.

Motivation determines the level of success and failure of student learning because someone who has no motivation will not do learning activities (Hamalik, 2011). Also, the success of learning activities is inseparable from the use of interactive media in the learning process. The use of interactive media is considered very important because as a teaching aid, the media also influences learning atmosphere and conditions (Suryani & Agung, 2012).

This study emphasizes the use of AR as a mobile-based media in science learning given the low motivation of students to learn in class; this is a serious problem faced during the science learning process because motivation determines the success of student learning activities. Without motivation, it is difficult to achieve the optimal success of the learning process (Hamdu & Agustina, 2011). Many studies revealed the potential benefits of using AR in learning, such as increasing student learning motivation.

The use of mobile-based AR in science learning can increase student motivation in learning, as in the study conducted by Di Serio, Ibáñez & Kloos (2013) which found that student motivation in learning environments using AR was higher than that using slide-based presentation media. Another study on the use of the AR-based magic book application displays 3D images of cartoon characters in a book and is shown to children through mobile devices showed that children were motivated and like the cartoon characters from the AR-based magic book application (Billinghurst, 2002).

This study shows that the use of AR in learning is recognized in education. It can be said that in the near future, the application of AR in education will gradually increase. (SÜNGER & ÇANKAYA, 2019).

2. METHODOLOGY

This study belongs to a quasi-experimental study with pretest-posttest control design. This quasi-experiment was carried out by giving treatment to a class, hereinafter referred to as the experimental class. This experimental class was compared with the control class, untreated class (Sugiyono, 2016). The independent variable in this study is the mobile-based AR media while the dependent variable is student learning motivation.

The population in this study included all seventh-grade students at Muhammadiyah 1 Junior High School Surakarta. The sample in this study consisted of two classes, namely class VIII A and class VIII B. The data were collected using a questionnaire. The questionnaire technique

was used to determine the effect of AR media on student motivation. The questionnaires were distributed to students before (pretest) and after learning (posttest).

The data analyses included prerequisite and effectiveness tests. The data processed in these prerequisite tests were the mean scores of students' pretest and posttest results. The parametric statistical test can be performed if the data meet the analysis test prerequisites, namely data normality and variance homogeneity tests. Shapiro-Wilk test was used for the normality test with SPSS 20 program. The data description can be seen in Table 1.

Table 1

Data Normality Test Result

Item	Grup	Shapiro-Wilk			Analysis
		Statistic	df	Sig	
Pretest	Experiment	,927	22	,109	Sig (2-Tailed) > 0,05 Normal
	Control	,936	22	,163	
Posttest	EXperiment	,949	22	,308	
	Control	,935	22	,158	

Based on the table above, it is known that, based on the Shapiro-Wilk test, the sig. value of the motivation pretest in the experimental class is 0.109>0.05 and in the control class 0.163> 0.05. For the posttest sig. value, the experimental class obtains 0.308>0.05 and the control class 0.158>0.05. It concludes that the data in this study are normally distributed.

For the homogeneity test, the Lavene test was used with SPSS 20 program. The data description can be seen in Table 2.

Table 2

Data Homogenity Test Result

Item	Kelas	Sig	Analysis
Pretest	Experiment	0,834	Sig (2-Tailed) > 0,05 Homogen
	Control		
Posttest	Experiment	0,011	
	Control		

Based on the table on the results of the statistical test with SPSS 20 program, it was found that the sig. value of the pretest was 0.834>0.05 and the posttest 0.011>0.05. It can be concluded that the student motivation and learning outcomes of the control and experimental classes come from the same or homogeneous variance.

If the analysis prerequisites have been met, the effectiveness test can be performed using the parametric test in the form of an independent t-test.

3. FINDINGS AND DISCUSSIONS

The data collected in this study were the data on the effect of using AR media on student motivation. The data were obtained from the pretest and posttest from 22 students of class VIII A as an experimental class subjected to learning with AR media and 22 students of class VIII B as a control class subjected to learning with PowerPoint media, which is commonly used by the teacher. The description of student learning motivation data can be seen in Table 3.

Based on Table 3,

Table3

Results of Tests of Media Effectiveness Against Motivation

Grup	N	Mean Pretest	Mean Posttest	SD Pretest	SD Posttest	Sig (2-Tailed)
Control	22	76,50	83,14	4,351	2,817	0,002
Experiment	22	76,32	87,18	4,433	4,992	

The pretest mean score of the control class is 76.50 with a standard deviation of 4.351, and the experimental class 76.32 with a standard deviation of 4.433. the posttest mean score of the control class is 83.14 with a standard deviation of 2.817 and the experimental class 87.18 with a standard deviation of 4.992. In addition, the sig. level of the effect of AR media on student learning motivation is 0.002, smaller than the predetermined sig. value ($\alpha=0.025$). Thus, there is a mean difference between the control class and the experimental class, which indicates that the use of AR media influences student learning motivation

Mobile-based AR media has proven to be effective in increasing student motivation at Muhammadiyah 1 Junior High School in Surakarta Based on the scores obtained from the statistical test with SPSS 20 program, it was found that the sig. value of 0.002 was less than 0.025. Thus, there is a mean difference between the control class and the experimental class showing that the use of AR media influences student learning motivation.

This is following the previous results showing that AR has good potential in education. AR provides students with a media that is easy to operate, has an interactive and diverse interface, and is interesting to stimulate intrinsic motivation and learning outcomes (D. R. Chen, Chen,

Huang, & Hsu, 2013) In line with that, the study conducted by Susanto, Basuki, & Hakim, (2016) found that 70% of the respondents stated that AR mobile application can help the seventh-grade students in understanding the science material, and 72% of them stated that this application can help them increase their interest in learning.

Qumillaila, Susanti, & Zulfiani, (2017) in their study revealed that on average students agreed that Android-based AR media for the excretion system topic increases their interest in learning, makes them more eager to learn, makes learning more fun or interesting, makes them not sleepy when learning biology, and makes the material about the human excretion system more interesting to study. This is consistent with the analysis of the benefits of AR in learning, one of which is to increase motivation. AR users become more passionate, interested, and involved in dealing with the new technology and learning content compared to those using non-AR (NAR) methods (Diegmann, Schmidt-Kraepelin, Van den Eynden, & Basten, 2015).

Therefore, from the results of the study and some opinions previously explained, the mobile-based AR media has an influence on the learning process in the classroom with increased student motivation in science learning.

4. CONCLUSION AND SUGGESTION

Based on the results of the data analysis and discussion, mobile-based AR media has proven to be effective in increasing student learning motivation and learning outcomes at Muhammadiyah 1 Junior High School in Surakarta. It was found that, based on the scores obtained from the statistical test with SPSS 20 program, the sig. level was 0.002, smaller than 0.025 (0.000<0.025). Thus, it can be concluded that there is a different significant mean score between the control class and the experimental class.

Through the results of this study, the teacher can consider starting to use digital learning media in the form of AR for the learning process given that the findings of some previous studies show a positive effect on improving the quality of learning, such as making students more motivated to learn, increasing their active participation in learning, and making learning more effective. Therefore, educational institutions, in this case, the schools, are expected to provide facilities for teachers to continue to innovate in the process of developing learning media in accordance with the times, characteristics of students, and appropriateness of the learning material delivered in the learning process. With the flexibility of mobile learning, teachers are expected to develop augmented reality learning media with other materials or subjects.

Öğrenme Motivasyonunu Geliştirmek İçin Fen Öğreniminde Mobil Tabanlı Artırılmış Gerçeklik Kullanımı

Özet

Bu çalışma, öğrencilerin öğrenme motivasyonunu artırmada mobil tabanlı artırılmış gerçeklik ortamının kullanımının fen dersine etkisini incelemeyi amaçlamıştır. Çalışmada ön test- son test kontrol gruplu yarı deneysel araştırma yöntemi kullanılmıştır. Mobil tabanlı artırılmış gerçeklik ortamının öğretim ve öğrenme motivasyonuna ilişkin veriler, yedinci sınıf öğrencileriyle rastgele küme örnekleme yöntemi kullanılarak toplanmıştır. Bulgular, kontrol ile deney grupları arasında anlamlı düzeyde bir farklılık olduğunu göstermektedir. Bu bağlamda, mobil tabanlı artırılmış gerçeklik uygulamasının öğrenme sürecini olumlu yönde etkilediği ve öğrenme motivasyonunu artırdığı söylenebilir.

Anahtar kelimeler: Artırılmış gerçeklik, Android, öğrenme motivasyonu

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