Augmented Reality with National Insight Media in Social Studies

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Abstract. The purpose of this research is to determine the effectiveness of augmented reality technology-based media with a national insight for increasing the learning outcomes of fifth grade students of SDN Kanggraksan Cirebon in terms of Indonesian Heroes material. The research method used the quasi-experimental model with nonequivalent control group design. The subjects of the study were the fifth grade students of SDN Kanggraksan Cirebon. Collecting the data used the multiple choice question-based test. The average difference and gain test was used to analyze the data. The results showed that learning outcomes of the group experimented were significantly different. Therefore, it can be concluded that the augmented reality media based on national insight is effective for increasing the student learning outcomes.

Keywords: Augmented reality, Student Learning Outcome, National Insight, Social Studies

1 Introduction

Social Studies (IPS) in Elementary Schools have an important role in shaping knowledge especially about heroism in Indonesia. Social studies aims to enrich and develop knowledge and train students to be able to socialize and place themselves in society in particular and the State of Indonesia in general. Through social studies learning, students learn about the historical-philosophical about Indonesia based on local wisdom, national spirit, and global insight, the spirit of nationalism can grow to strengthen the character of Indonesia [1].

Classical problems obtained by the teacher in teaching social studies is the fluctuative students learning outcomes depending on the depth of the material, learning media and method used by the teacher. Students tend to be bored beacuse of identifying and memorizing activities on this subjetcs. Moreover, teachers usually use textbook-based or Student Worksheets as a media in teaching, whereas the textbooks or worksheets usually only provide text and rarely use picture illustrations. Teachers often use the classical teaching method by explaining part by part of the material called “ceramah” in front of the class. This obviously makes the students bored and impact on their reading interest.

The problems above were also experienced by students at SDN Kanggraksan Cirebon. Based on the observations, about 78% of students obtained under the minimum criteria. This is caused by inappropriate media used in teaching national insights. Textbooks media and worksheets often only display text information without illustrations. Some books include illustrations, however, the images often cannot be identified clearly because of the blurry image or black and white. It affected the student learning outcomes got low. However, the low value of these students can be

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improved and avoided by the way the teacher in teaching and develops his creativity in using supportive learning media for the material.

The use of media aims to facilitate the learning process of social studies in class. As stated by C. Rusman, Kurniawan, D., Riyana, the function of learning media is a tool that can clarify, facilitate, accelerate the delivery of messages or subject matter to students, so the main point of the subject can be conveyed to the students [2]. The statement means that the media can assist the teacher in delivering the material so that the material can be well absorbed by students.

The implementation of technology in elementary schools can help students to understand deeply about the material. In addition, learning media equipped images can stimulate student's imagination and creativity. One of the media that can be used by teachers in social studies is augmented reality (AR). AR is an emerging technology with high relevance for teaching, virtual learning, and creative inquiry, thus it is expected to find broad adoption in education in the near future [3][4]. Some abroad researchers concluded that AR can create an interesting and interactive learning environment [5]. In this case AR aims to create an environment of teaching and learning to be more interactive, interesting, fun and the process of delivering material clearly. This media contains 2D images related to the material, narrative sound to clarify the presented material, and videos that explain clearly from a process that emerged from the material and can be seen directly through augmented reality technology.

AR simulations allow students to learn content while collaborating face to face and interacting with a multimedia-enhanced version of the world around them [6]. Although in its application the teacher requires skill in using qualified technology but the results are commensurate to improve student learning outcomes. This is proven by research conducted by Mardikaningsih regarding the development of AR media for physics subjects. The results showed that the media succeeded in providing a positive effect on student learning outcomes [7]. Another study conducted by Abdullah obtained results that the use of AR media can increase student cognitive learning outcomes on the concept of static fluid [8].

Based on the discussion above, the researcher is interested in conducting research using media based on augmented reality technology with a national insight to improve student learning outcomes in fifth grade SDN Kanggraksan Cirebon.

2 Material and Method

Based on the problem and research objectives, the method used in this study is a quasi-experimental method with a nonequivalent control group design model. In this method, the experimental and control groups were not randomly chosen [9]. This method was used to determine the effectiveness of improving learning outcomes in the heroism material among students who were treated using AR technology-based media containing national insight with students which is not given treatment by using the media. The following is the research design used.

Table 1. *Nonequivalent Control Group Design*

Kelas	*Pre test*	Perlakuan	*Post test*
Eksperimen	O_1	X	O_2

Kontrol	O_3	O_4

Based on the Table 1, O1, O2, O3, and O4 are pre test and post test in the experimental class and the control class. Whereas X is the treatment of the use of AR technology-based media with national insight in the experimental class.

The population in this study is SDN Kanggraksan Cirebon. Samples are not taken randomly but based on the results of the average value of low social studies subjects compared to other classes. The sample in this study were students of class VA and class VB, each of which numbered 30 people. The VA class is set as the experimental class, while the VB class is set as the control class. The selection of the subject of fifth grade students is based on the consideration that the material of heroism is contained in the syllabus of the Education Unit Level Curriculum (KTSP) fifth grade.

The instrument used by researchers to obtain data in this study was a multiple choice test. This instrument is used to determine the student's initial ability (pre-test) and the student's final ability after the application of AR technology-based media containing national insights (post test).

Data analysis used is the t test to test the difference in the average value of learning outcomes and the national insight of the experimental and control groups. While the normalized gain test is used to test the improvement in learning outcomes and national insights between the experimental and control groups.

3 Results and Disscussion

Preliminary data shows that teachers at SDN Kanggraksan Cirebon have several obstacles that occur in the classroom including the use of media. It affects on the student learning outcomes. The low score of these students can be improved and avoided by the way the teacher has and develops his creativity in using learning media that supports the material. AR technology is appropriate learning media in this case.

AR technology has long been used both in the general and educational fields. AR technology enables students to clearly see images of hero figures on a laptop screen. AR technology-based media design with national insight developed through the stages of potential and problems, data collection, product design, design validation, design revision, trial use, product revision, wide-scale trial, product revision and final product. The media design method in this study uses the Markerless AR method which allows users no longer need to use markers to display digital elements [10]. One of the Markerless Tracking techniques developed by the worlds largest AR Company Total Immersion and Qualcomm is Face Tracking.

Face tracking is a computer algorithm that able to recognize human faces in general by recognizing the position of the eyes, nose and mouth of humans, then it will ignore other objects around it such as trees, houses, and others. This technique was once used in Indonesia at the 2010 Jakarta Fair and the Toy Story 3 Event [11].

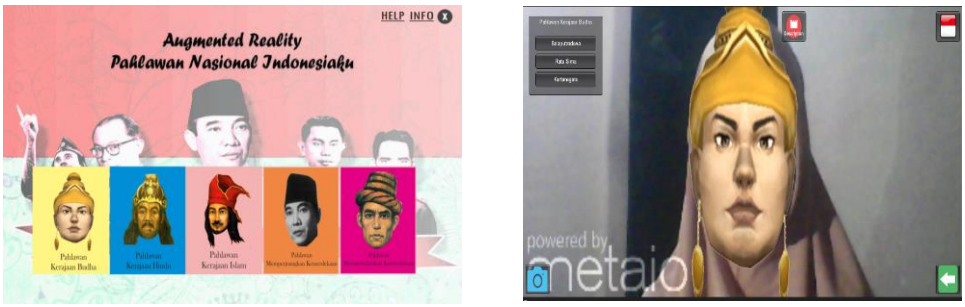

Fig.1. User Interface and display of media

On the homepage, it features an attractive display by showing the faces of Indonesian national heroes including heroes from the Buddhist, Hindu, Islamic kingdoms, and heroes who fight for and maintain independence made as buttons that can be clicked on by students so that the media is more interactive. On the content page, the media presents the appearance of the user's face in this case are students who change as if they were the face of a hero. In the display the picture above shows that the user's face changed into one of the hero figures during the Buddhist kingdom, Balaputradewa.

After designing the media, the next step is to test the questions. Trial questions were given to fifth grade students outside the research sample of 30 students. The purpose of the test problem is to calculate the validity, reliability, difficulty index, and distinguishing problems of 15 questions. The results of the calculation of the validity of the questions obtained that as many as 15 items were declared valid. The reliability results showed that the instrument was classified as very strong with a coefficient of 0.842. The difficulty level calculation results obtained that 13.3% easy questions, 53.5% medium questions, and 33.3% difficult questions. While the results of the calculation of distinguishing power obtained 13.3% are sufficient, 66.7% are good, and 20% are very good.

The next step is conducting a trial on the VA and VB classes, each with 30 students. The trial is used to find out how effective the media and changes in student learning outcomes by using AR technology-based media containing national insights. Trials conducted in the VA class were given treatment with learning using only LKS without using AR media. While the VB class was given treatment using AR media. The trial run was conducted five times with details of four meetings for pre-test and action and one meeting for evaluation or post-test. Learning procedures refer to the competency standards and basic competencies that exist in the learning tools that have been made previously, namely the syllabus and learning implementation plan.

Fig. 2. The class situation when using AR Media

After treating the control and experimental classes, then the data were analyzed. Based on the analysis of learning outcomes data obtained that the normality and homogeneity of the results of the pre-test and post-test control group and experimental data were normally distributed and classified as homogeneous with sig> 0.05.

After analyzing the results of normality and homogenity of the two groups then a hypothesis test was conducted. The hypothesis proposed in the study is as follows.

Ho : There is a difference in effectiveness before and after using AR technology-based media with national insights on the subject matter of heroism.

Ha : There is no difference in effectiveness before and after using AR technology-based media with nationalistic insights on the material of heroic figures.

Based on the hypothesis test, the pre-test average difference in the results of the control group and experimental learning, t arithmetic with a degree of freedom 58 and a significance level of 5% was -0,448. Based on the criteria of acceptance and rejection of Ho that if -t count ≥ -t table then Ho is accepted [9]. Price of t table with a degree of freedom 58 is -1.9811. These results mean -t count> -t table (-0.448> -1.9811) then it means that Ho is accepted, so the conclusion is that there is no difference in effectiveness in the control and experimental classes before being treated.

Next average difference test is to calculate the difference in the average post-test results of the control group and experimental learning. Based on calculations, the results of t arithmetic with a degree of freedom 58 and a significance level of 5% is -15,317. Based on the criteria of acceptance and rejection of Ho that if -t arithmetic ≥ t table then Ho is accepted. Price of t table with a degree of freedom 58 is -1.9811. These results mean -t count <-t table (-15.317 <-1.9811) then Ho is rejected and Ha is accepted, so the conclusion is that there are differences in effectiveness in the control and experimental classes after being treated.

Looking at the results of the analysis of the pre-test and post-test data of the control and experimental groups, it was found that there was a difference in effectiveness between the control class and the experimental class before and after using AR technology-based media with national insight on the heroic material. This is evidenced by the average learning outcomes obtained in the experimental class higher than the control class.

The results obtained are in line with several studies conducted by other researchers namely 1) Yuen, Steve Chi-Yin; Yaoyuneyong, Gallayanee; and Johnson, Erik explained that AR can

increase the effectiveness of students' independent learning [12]; 2) The results of Rochmah, E., Labudasari, E., & Amalia, N research found that the use of AR media can increase student motivation on social studies so that the learning outcomes obtained also increased [13]; 3) Student who have used AR showed better memory for the observed spaces. AR experiences can also encourage understanding of invisible phenomena by converting abstract information into concrete objects, or visualizing phenomena that are otherwise infeasible for students to access [14]; and 4) AR can also increase motivation, high-level thinking, creativity and critical analysis in learning process [15][16].

The difference in learning outcomes is an indicator of the effectiveness of the media used in increasing students' national knowledge or insight on heroism. The VA class of 30 students felt helped by the media used by the teacher in the class compared to students in the VB class who only used the media book during the learning process. Students also more easily understand the social science material provided and are more enthusiastic in participating in learning. This is also in line with the results of research from M. Ozdemir, C. Sahin, S. Arcagok et al discovered that AR applications can increase students' academic achievement in the learning process compared to traditional methods [17].

Furthermore, a gain test has been done that aims to determine the increase in learning outcomes between the results of pre-test and post-test. The data obtained that the average value of the pre-test learning outcomes of the control group was 36 and the experimental group was 37. While the average value of the post-test learning outcomes of the control group was 43 and the experimental group was 83. Based on these data, the calculation of the gain gain results was obtained. Study pre test and post test between the control group and the experimental treatment. The following are the results of the calculation of N Gain learning outcomes.

Tabel 2. The result of N gain score

	Rata-rata			
Class	*Pre test*	*Post test*	N-Gain	Category
Control	36	43	0.45	Medium
Experiment	37	83	0.73	High

Based on the calculation results of the N-gain learning outcomes of the control and experimental class groups it is found that the average N-gain group is 0.45 in the medium category and the experimental class is 0.73 in the high category. From the results of these calculations it can be concluded that the social studies learning outcomes of fifth grade students with the hero group experimental material using AR technology based media have a higher national insight than the control class that does not use the media.

The use of technology-based media can be used as a solution when the learning process that requires students to read a lot of text without the help of picture illustrations begins to feel boring, especially in material about heroic figures. This is in line with the opinion of [18] that combining social studies learning with technology that is with the development of AR technology-based media can be used as a solution to instill a national spirit. Moreover, Johnson, et al. stated, “AR has strong potential to provide both powerful contextual, on-site learning experiences and serendipitous exploration and discovery of the connected nature of information in the real world”

[19]. The statement is in line with the results of the study that by using augmented reality, students become easier to imagine the faces of characters and stories that occurred in the past history.

AR technology based learning media is an effective media in improving student learning outcomes. This technology has long been used both in the general and educational fields. The use of AR in the classroom makes the learning process more active, effective and meaningful [20]. This is can make the teacher's task easier in teaching material that contains more text that must be memorized.

AR technology enables students to clearly see images of hero figures on a laptop screen. The function of learning media is to facilitate and improve the delivery of information and subject matter to students. This is in line with the opinion of Esmaelzadeh et al in Sakat et al which states that the expanded use of computer facilities and other mass media will lead to the rapid transfer of information which means that the use of media aided in computer facilities can increase speed in channeling information [21]. This is true because the facts on the ground indicate that students understand faster and are easier to identify and remember hero figures.

4 Conclusions

Based on the results of the research and calculations, it can be concluded that students are more excited when the learning process about heroic material using AR technology-based media, because it is interesting and easy to use. Social studies learning outcomes of grade V students with the heroism of the experimental group using AR technology based media with a higher national insight than the control class that did not use the media. In its application, classes using AR technology-based media have significant differences in learning outcomes compared to classes that do not use media. Thus it can be said that AR media based national insights are effective in improving student learning outcomes on heroic material.

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