THE EFFECT OF AUGMENTED REALITY IN LEARNING ARTS ON THE ABILITY TO APPRECIATE ARTS AS ACHIEVEMENT OF STUDENT LEARNING RESULTS

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Abstract: The purpose of this study is to investigate the effects of augmented reality applications on the ability to appreciate art as the achievement of student learning outcomes, and to analyze the opinions of students and their teachers on the use of augmented reality in art learning. The research design was quasi experimental with pre-test post-test that included a control group. The study was conducted with 66 primary school teacher education students in Universitas Sebelas Maret. To collect quantitative data, a quasi-experimental pretest-posttest with a control group design was employed, and to collect qualitative data, a case study design was used. The study was designed around the lesson topic "Montage, collage and mosaic objects and measure student participation when augmented reality is used in class. While the students in the experimental group studied the lesson topic using augmented reality and real objects, the students in the control group used only real objects. Data analysis used is t test, questionnaire analyzed qualitative. The results indicate that the use of Augmented reality had a positive effect on the ability to appreciate art and the achievement of students' learning outcomes. It was concluded that compared with the control group, the experimental group students more successful in appreciating art. These results indicate that the application of AR can be effective in improving the achievement of student learning outcomes.

Keywords: Augmented Reality, primary teacher education, art education course

1. Introduction

Appreciation activities in elementary school teacher education programs (PGSD) are part of the art education program. Fine arts courses are given for one semester. Through this course, students are expected to have the ability to appreciate artwork, which is the achievement of student learning outcomes for one semester. It is hoped that by often appreciating art, students' aesthetic experiences will be better and expected to appreciate, realize the uniqueness of a work of art so that later can be applied with respect for others, and training their sensitivity to themselves and others. The appreciation of students' art works at the end of the semester is done through an exhibition of artwork.

Fine arts learning in elementary school teacher education programs still uses media books and media images, so it still seems traditional. Art learning becomes less interactive because of monotonous activities. Students are less motivated to produce works of art and have an impact on the appreciation of artwork as the achievement of learning outcomes in art education programs. The achievement of student learning outcomes is less optimal so that the level of appreciation of students is low in art. Besides that the existence of Android Smart-phones that are still widely misused and has not been optimized properly as a learning medium. The development of Augmented Reality technology has not been widely used in the world of education.

Augmented reality in this study is used as an art learning media that is run using smart phones. The use of instructional media using augmented reality is expected to make the atmosphere of art learning more interactive and can encourage students to produce works of art such as mosaics, collages and montage. From the resulting artwork, it will encourage students to appreciate the work.

The formulation of this research problem is to know whether there is an effect of using augmented reality as a learning medium, on the ability to appreciate art as an achievement of students' learning. The purpose of this study is to investigate the augmented reality applications on the ability to appreciate art as the achievement of student learning outcomes, and to analyze the opinions of students and their teachers on the use of augmented reality in art learning. Augmented reality is one of the latest development technologies that can be applied to various existing technologies, such as computers, tablets, and smartphones.

2. Literature Review

a. Augmented Reality (AR)

AR technology is very potential to be used as a means of education. One of the benefits that can be obtained from the AR application to be applied in learning is to increase the understanding of objects being studied. AR is more effective as other learning media compared to other media such as books, videos, and ordinary computer use (Radu, 2012).

AR experts Chen and Tsai (2012) confirmed that AR stimulates the interaction with 2D or 3D virtual objects incorporated into a real-world environment. Based on the definitions mentioned above, one characteristic stands out as the ground support of AR descriptions which is the potential of superimposing virtual information to real objects (Chen & Tsai, 2012).

AR technology can be utilized through a variety of mediums including desktops, mobile devices, and smartphones. The technology is portable and adaptable to a variety of scenarios. AR can be used to enhance content and instruction within the traditional classroom, supplement instruction in the special education classroom, extend content into the world outside the classroom, and be combined with other technologies to enrich their individual applications. (Misty Antonioli, Corrine Blake, Kelly Spark, 2014). Currently there are many augmented reality applications that are used in learning, especially in learning art. The aim is to find out the effect of using augmented reality on the ability to appreciate art as an achievement of student learning outcomes.

In the near future, eventually everyone has a smartphone or a tablet that is capable of displaying augmented information. This makes it possible for a teacher to develop educational activities that can take advantage of the augmented reality technologies for improving learning activities. According to Fernandes and Ferreira 2012, the use of information technology made many changes in the way of teaching and learning.

From the description above, this study wants to know the effect of the use of augmented reality on the ability of student appreciation as the achievement of art learning outcomes. The application of augmented reality can make learning activities more interactive. A study conducted by (Ezgi Tosik Gün and Bilal Atasoy 2017) stated that the AR application made the classes more enjoyable. The students who used the AR application in their lessons stated that it was enjoyable and that it helped them to visualize abstract concepts in their minds. Besides that the AR application helped the students to concretize abstract concepts.

b. Art Appreciation Education

The arts are organized expressions of ideas, feelings and experiences in images, in music, in language, in gesture and in movement. Arts education enables the child to explore alternative ways of communicating with others. It encourages ideas that are personal and inventive and makes a vital contribution to the development of a range of intelligences. Art is not meant to be looked at only for what it is. It is meant to stimulate thought because it allows viewers to draw their own emotions and pull from their personal experiences when viewed. It is very powerful in this way and it naturally develops critical and innovative thinking skills. Art also teaches many important qualities such as listening, observing and responding to multiple perspectives. This allows students an opportunity to develop an open mind and understand that there is more than just one solution to a problem. Having an appreciation for art also helps us to develop an appreciation for each other and how we are all unique in our own way.

Education in modern higher education pedagogy is based on developing students' productive artistic skills-creative skills-and their receptive abilities. (duh, Cagran, Huzjak, 2010). Art appreciation, thus, deals with emotions and feelings about art at the affective and cognitive levels, while including the knowledge and understanding of the latter (Seabolt, 2001). Appreciating artwork is actions taken by students towards artwork in order to appreciate the work. Thus the process appreciation of artwork needs to be done someone so he can capture the value contained in a work of art. A person's ability to enjoy a lot of artwork is determined by aspects of both knowledge, attitude and will one for a work art. Activities to appreciate the work

good art for friends' work itself or the work of artists professionals are very important in efforts to get an aesthetic experience and also to develop personality. Thus appreciation activities art is an important activity inside art education.

As part of education, Fine art appreciation is something which is very important to give to students in developing abilities / aesthetic sensitivity to artwork. Appreciation in the context of learning as well disclosed by (Sobandi 2008: 116), that as part of the territory art learning needs to be developed through appreciation learning.

Most curricular art aims at two equally important purposes: to engage students in the act of self-expression through art production, and to provide opportunities for students to gain artistic appreciation. However, most programs only achieve the first goal by placing emphasis on art production. The teaching of art production usually focuses entirely on composition, artistic procedures, and skills development. If the art class only teaches the knowledge and skills needed for self-expression and does not prepare students for reflection and discussion about art, then the student's level of appreciation will be low

Learning appreciation in elementary school teacher education (PGSD) is to foster appreciation of the results of art so that it can provide the basis for coaching artistic appreciation to children. The final activity of the art education course is to hold an art exhibition as a final project on and off campus

As an art teacher, there is a sense of concern about the low level of student appreciation of art and the low development of skills in art production. Many students who are skilled in using several art media can only make superficial responses to artwork. This shows that there needs to be more emphasis on developing perceptual skills, aesthetic criteria, and special vocabulary, all of which will help students make responses that are knowledgeable about art. An alternative strategy that will teach

students to describe, analyze, interpret, and assess art, namely by using augmented reality that is used as a learning medium.

3. Material & Methodology

The research was carried out at primary teacher education program in Surakarta, Central Java, Indonesia. In the current study, a quasi-experimental pretest-posttest with a control group design was used to collect quantitative data, and a case study design was used to gather qualitative data to support quantitative data. The art appreciation ability test was used to measure art appreciation ability as the achievement of fine arts learning outcomes. The opinions of teachers and students about learning based on augmented reality are collected with the form of teacher and student opinions developed by researchers

The teacher's and students' opinion forms were developed by the researchers to collect their opinions concerning the use of the AR application in art education. These forms consist of open-ended questions. The forms were examined by subject-area experts and language experts. Using their feedback, required corrections were made and final versions prepared.

The research design used was non equivalent control group design. The population is all elementary school students of teacher education in semester 4. The sample used is 4th semester students of class A and B. Determination of the sample using purposive sampling. Before the treatment activities were carried out, each experimental and control group was given a pre-test. The pre-test was conducted to assess the background knowledge of the students learn art. After the pretest was carried out, the control group students learn art through the conventional learning method by using image on the textbook. Meanwhile, the experimental group students learn art using interactive media based on augmented reality.

4. Results and Discussion

To assess the learning performance of both groups, paired-sample and independent sample t-tests were applied. Tables 1 and 2 show the learning art of the control and experimental groups based on paired-sample t-test results. Pre-test scores of both groups represent students' prior knowledge in art learning. The post-test scores of the control group represent the students' achievement on art learning through the use of the conventional art textbook. While for the experimental group, the post-test scores represent the students' achievement on art learning through the intervention of the Augmented reality (AR) art.

Tabel 1. The result of art learning for the control group

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-test	69.5455	33	9.30084	1.61907
	Post-test	78.0303	33	8.56404	1.49081

Tabel 2 . The result of art learning for the experimental group

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-test	76.2121	33	9.35667	1.62879
	Post-test	82.8788	33	9.18816	1.59945

Table 3 presents the results of the paired-sample t-test for pre-test and post-test of the control group. The mean scores of the control group's pre-test and post-test increased from

69.5455 to 78.0303 and the significance value is 0.00, which is significant at 0.05 and 0.01. This indicates that the students in the control group were interested in art learning.

Tabel 3. Paired- sampel of t- test control group

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		Mean	Std. Deviation	Std. Error Mean
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Pair 1	Pre-test - Post-test	-8.48485	2.33347	.40620	-9.31226	-7.65744	-20.888	32	.000

Table 4 presents the results of the paired-sample t-test for pre-test and post-test of the experimental group. The mean scores of the experimental group's pre-test and post-test increased from 76.2121 to 82.8788 and the significance value is 0.00, which is significant at 0.05 and 0.01.

The paired-sample t-test confirms that there is a significant difference in the result of art learning mean scores for the experimental group. In other words, art learning through the use of the Augmented reality application resulted in better learning

Table 4. Paired-sample t-test of experimental group

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		Mean	Std. Deviation	Std. Error Mean
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Pair 1	Pre-test - Post-test	-6.66667	3.67990	.64059	-7.97150	-5.36183	-10.407	32	.000

Additionally, this study also examines whether the art learning of the experimental group is superior to that of the control group based on independent-sample t-test results. Table 5 compares the art learning of the control group and the experimental group based on the independent-sample t-test results. Results show that pre-test mean scores for both groups differ significantly. Next, this study assesses whether the difference in post-test scores for both groups is significant based on independent-sample t-test results. Results reveal that post-test scores for both groups differ significantly in achieving students to achieve good art leaning outcomes after both methods of intervention in art learning. Tabel 5 presents the results of the independent t-test for post-test of the control group and experimental group. The mean scores of the control group's posttest 78.03, and experimental group's pos-test 82.88 and the significance value is 0.00, which is significant at 0.05 and 0.01. The independent sample t-test confirms that there is a significant difference in the result of art learning mean scores for the control group and t.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference		95% Confidence Interval of the Difference
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Skor	Equal variances assumed	.939	.336	-2.217	64	.030	-4.848	2.186	-9.217	-.480
	Equal variances not assumed			-2.217	63.686	.030	-4.848	2.186	-9.217	-.480

Tabel 5. Independent t-test hypothesis testing

	Group	N	Mean	Std. Deviation	Std. Error Mean
Score	1.00	33	78.03	8.564	1.491
	2.00	33	82.88	9.188	1.599

Testing hypothesis 1.

There is no significant difference in the students' learning art between the pre-test and post-test mean scores of the control group.

Table 1 presents the result of the paired-sample t-test for pre-test and post-test of the control group in which the significance value is 0.00.Thus, the null hypothesis is rejected, therefore, there is a significant difference in the students' learning art between the pre-test and post-test mean scores of the control group.

Testing hypothesis 2.

There is no significance difference in the students' learning art between the pre-test and post-test mean scores of the experimental group. Table 2 presents the result of the paired-sample t-test for pre-test and post-test of the experimental group in which the significance value is 0.000. Thus, the null hypothesis is rejected. Therefore, there is a significance difference in the students' learning art between the pre-test and post-test mean scores of the experimental group.

Testing hypothesis 3.

There is no significance difference in the students' learning art between the post-test mean scores of the control group and the experimental group. Table 5 presents the result of the independent sample t-test for the post-test of the experimental group and the control group in which the significance value is 0.000. Thus, the null hypothesis is rejected. Therefore, there is a significance difference in the students' learning art between the post-test mean scores of the control group and experimental group. It means that the achievement of students' art learning outcomes is better in the

experimental class than the control class. It can be concluded that there is an augmented reality effect on the results of learning art when used as an art learning medium

From the opinions of teachers and students who participated about art learning based on augmented reality, showed that augmented reality application made lessons more interaction and fun to the learning process, especially those who study Art. 90% students and teacher are interested in applying augmented reality. 97 % of students stated learning more interactive. The students who used the AR application in the art lessons stated that it was enjoyable and that it helped them to visualize abstract concepts in their minds. The AR helped them to learn and increased their interest in learning 95 % students stated art learning is easier by using augmented reality.

5. Discussion

This experimental study used a control class to overcome external interventions, and before the treatment of each class, both the control class and the experimental class were given a pretest to determine the students' initial abilities in art learning. The students in the experimental group use augmented reality media while students in the group use the media images contained in the textbook. Furthermore, the Paired Samples t-Tests depicted the significant level for all the collected data. Besides that, the results show that there is an increase in the achievement of art learning outcomes and have significant difference after the intervention of the AR art and also the conventional art textbook.

Based on the analyses conducted in the frame word of this study, it is concluded that compared to control group students, experimental group students were more successful in using augmented reality based media. This result shows that AR application can be effective in increasing achievement. It has also been concluded in many studies that AR use in educational environments increases learner achievement (Shelton & Hedley, 2002; Sin & Zaman, 2010; Yen et al., 2013; Zhang et al., 2014). When contributions provided by AR technology in educational environments are taken into consideration, it can be argued that this result is expected. It is known that AR technology draws student interest and attention into courses and increases student motivation (Delello, 2014; Perez-Lopez & Contero, 2013;). With these aspects, AR may have contributed to student achievement in the experimental group. Also, Yingprayoon (2015) did a study to explore the using of augmented reality on training workshops programmes for teachers. The results showed strong influence of Augmented Reality on teachers' training to create a positive learning environment.

Al-Hussaini (2014) aimed to see the effects of using Augmented Reality on academic achievement cognitive levels in the computer course in Mecca AlMukarama-Saudi Arabia and found that this technology was effective. Considering these results, it can be argued that, AR offers an important alternative for topics that need learner application and practice.

From teachers' opinions can benefit from the study by implementing AR in their lesson plans to promote motivation among their students. Students also stated that art learning is more interactive, easy and fun. In the literature, these findings are echoed in several other studies (Liu et al., 2007; Klopfer & Squire, 2008; Lin et al., 2015). The teacher's opinions were similar to the students' opinions.

6. Conclusion

This study presented the effects of AR use in art learning and training on achieving student art learning outcomes. The results indicate that the use of Augmented reality had a positive effect on the ability to appreciate art and the achievement of students' learning outcomes. It can be stated that the applications developed with AR technology can be used as effective media in applied courses. It was concluded that compared with the control group, the experimental group students more successful in appreciating art. These results indicate that the application of AR can be effective in improving the achievement of student learning outcomes.

Considering the results obtained in this study, following suggestions are offered to guide researchers and application developers in future AR studies. It was concluded in the study that AR use increased student achievement. Based on this point, new studies can be planned in different fields and by using different sample levels. Student' smart phones were used in this study. Although no problems

were experienced in the use of these devices, due to their nature, they have limitations based on small screen sizes. Conduct workshops and training sessions for teachers to train them on how to use Augmented Reality in designing and presenting their lessons.

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