
E-SENIARCA ON IOT PLATFORM IN EDUCATION OF SCULPTURE ARTS

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ABSTRACT

Purpose: In education, by using any media method is one of the most important elements of an educational institution, especially in order to make a consistent learning session. It also can give the two ways communication between teachers and students. Based on E-SeniArca learning tool, it will provide a new way to deliver the information with more effectively. By the lack of references material of sculpture arts topics, it was difficult for students to learn and perform their achievement. In fact, students can purpose to design, transfer, construct and test the effectiveness of the E-SeniArca learning tool in sculpture topics.

Design: The methods are used to the production of *E-SeniArca* learning tool on technology are the ADDIE Model.

Findings: The actual image depiction of the sculpture arts through the images is shown to clearly explain the shape of arc that have in sculpture concepts.

Research limitations: This study has developed an application of 12 flip cards for scanning by *E-SeniArca* learning tools to generate 3D images on each of the different picture cards.

Practical implications: Much of the software used to produce this learning tool has been able to attract students to learn the basics of sculpture arts.

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I. INTRODUCTION

The useful of technology involves several aspects of the real problem, including the source of information and simulations for a professional concept and communication at the time of delivery. In addition, learning session using this technology is also believed to complement the modern form of learning and teaching method more than traditional method (Yusoff, 2008). By adopting the technology for this concept based on AR technology, it is a good idea to be using, so that it can give attraction and interest for students to learn and gain the knowledge. It also can give students a new and advanced learning experiences. In addition, it can provide an approach a strategy based on experiences, problems and situations to replace the real world (Arensman, van Waegeningh and van Wessel, 2018) . Through this research study, researchers will use quantitative methods to identify the suitability of this AR technology to teachers and students as a suitable teaching medium during the learning session.

Each teaching medium has its own advantages in asserting an example based on objects, facts, ideas, processes, human activities, character models or in the development of motor skills (Zeng *et al.*, 2017). Therefore, the suitability of this technology in terms of consumer acceptance through various senses such as seeing, hearing and touching can be realized very well. It also responds positively if done concurrently. Through the application of multimedia software, it is the latest term for computer-based learning, which can demonstrate computer-based learning (technology) (Lee and Cherner, 2015). The importance of this AR technology can provide a new variety of learning and teaching sessions as well as achieve a goals and can have a positive impact on students by a relevant topic, such as Sculpture topics.

II. LITERATURE REVIEW

The advantage of this AR technology is that users can see the real world around it with the proper devices of virtual objects, that is generated by electronic devices such as smartphones, tablets or computers with AR software (Sheng Tung, 2009). Thus, the information conveyed through this concept is only through virtual objects that make the result seem real. Through this AR concept approach, it is highly applicable to current and future students during learning lessons (Weng and Wang, 2018).

A.21st Century Learning Skills

Through this 21st Century Learning Skills, it more focuses on four key principles to focus on. The four key principles are critical thinking and problem solving, communication, collaboration and creativity, KPM 2012. Therefore, the application of the skills that provided in 21st learning skills will indirectly enable and assist students in facing future challenges, such as in their careers. This has also been proven by several studies that suggest that this skill can influence and positively impact students' attitude, motivation and achievement in particular (Galvez, 2018).

B.Syllabus of Visual Art Education

The Visual Arts Education syllabus is to form 1, 2 and 3. The focus is for the Sculpture topics, which is in the topics in the syllabus have the topics about sculpture. So, it is for students to understand and can dominate the topics and in this subject. In fact, this topic is difficult for students to understand and differentiate the type of work that exists on each subtopic as students lack enough exposure (Galvez, 2018).

C.Augmented Reality (AR)

This Augmented Reality (AR) technology is intended to combine through real-time on objects or images such as digital materials that can be made by computers or smartphones that can be seen in the real world clearly. AR can also provide 2-dimensional and 3-dimensional effects that will be displayed on computer screens and smartphones. Consumers cannot see the effects of this AR technology through their naked eye and only through their own intermediary tools such as computers, smartphones (which have AR applications and sometimes use special glasses for use) (Nurcahyo, Sulistyono and Hantono, 2017). AR consist which is in the concept of education where it is used as Teaching Aids using a 2D or 3D concept.

D. Internet of Things (IoT)

IoT technology is the concept of internet development. In education, this IoT technology is suitable for use in any learning material (Liana, Linuwih and Sulhadi, 2020). This is because it is an appropriate technology to be using the students with internet to be more productive. Also, students can easily use it to find the information they want. Else, the useful of IoT technology is often used through teaching materials is to facilitating students' access and get the information,

E. Education Theory

The application of the learning model in the development of the learning material is the first thing that needs to be listed in order to fit the existing model (G and Zulkifli, 2016). Among the elements of the learning model are the approaches, strategies, methods and techniques of learning. All of these elements need to be selected according to

the suitability of the learning material to be developed. However, each learning model has its own breakthrough through its own characteristics and description. The features of each model are able to make an impact on the development of the E-SeniArca as a learning kit. In addition, it also can help to see and assess student progress when using the learning kit in more detail.

F. Issues in the Basics of Sculpture Arts

Learning basic of sculpture arts is the main things to be focusing and just not by teacher-centered only. It will make the learning session in the classroom less effective for students. Students can't describe the concept of a sculpture arts such as the category of sculpture arts (Basiron, 2012). It is because they can't imagine how the shape of sculpture arts. This simulation technique and learning also can be used to learn the concepts of sculpture arts but the learning session will take a long time to teach and depend on the student activity. Existing learning forms such as slides, printed pictures and lectures are one of the most ineffective processes for information processing for students to remember and obtain information effectively (Salsidu, Azman and Abdullah, 2017). Through this study, the main focus and emphasis is on the learning and teaching method that is particularly in the subject of Visual Arts Education based on the topic of Sculpture Arts.

G. The Benefit of E-SeniArca based Augmented Reality (AR) Toolkit in the Sculpture Topic:

The concepts featured in this AR Technology by applied on E-SeniArca Toolkit is combines the elements of multimedia, such as text, graphics, audio, video and animation. This toolkit comes with a sculpture topic for lower form students, focusing on the basic topic of sculpture (Selian and Safuan, 2015). Through this method, students will be given as well as new experiences that is related to the concept of sculpture. Therefore, through the useful of this toolkit, it will indirectly overcome the problems faced by the students throughout the learning and teaching process (Che Zalina, 2014). Using the AR technology and multimedia concepts that is applied on E-SeniArca Toolkit, it can give users get their new experience and more interested by using it during learning session. Among other things, the benefits of using this concept are:

a. The Teaching Process of E-SeniArca apps - Problem Based Learning

Active learning is one of the learning approaches that encourage students to engage directly and actively in a problem-based basis. The problem-based learning is one of the methods that can give the education more in other ways to using the technology with their own information first to solve the problem given to the students (Amerah, 2016). Therefore, this study can give students a new concept and learning session also more exciting. Following the previous study, the teaching process only focused on the learning process and experience-based only. For example, using this toolkit, teachers will not be able to assess the level of student achievement through skills. While teaching based on experience, students can only learn within a limited scope (Selian and Safuan, 2015). Indirectly, it will inculcate the spirit of enthusiasm and the spirit of the student to be more interested in the subject of sculpture. Next, students will share information gathered from teachers and other friends to change ideas and create two-way communication between teachers and students.

b. Fun Learning Ambience

By using this toolkit E-SeniArca, learning session becomes different compared to what is often seen, that the teacher will read or give a description in front, while students will listen. Also, it will make students more fun to learn about the topic of the sculpture, as well as incorporating elements in the combination of multimedia concepts and AR technology (Abindinhazir and Zali, 2017). Otherwise, it is in line with the development of today's world technology. This kind of abnormality will produce students who are thoughtful, creative and critical in line with the progress in the current education system (Haryani and Triyono, 2017).

III. CONCEPTUAL FRAMEWORK

To produce a more effectiveness by the learning process for students and the contribution by using technology concept, the conceptual framework (Figure 1) below will explain how the information is delivered from teacher to a student. Traditional teaching methods such as using slides and lectures only allow limited information for teachers to convey to students depending on the amount of knowledge that students need (G and Zulkifli, 2016). In addition to the use of this AR technology, students have been able to master and quickly recall and obtain information without a doubt. Therefore, this study is particularly relevant so that it can be seen that the level of student mastery in individual sessions occurs as:

- a. Students are able to understand how to make sculptures.
- b. The level of thinking students can think beyond their comprehension.
- c. Student learning will be more efficient.

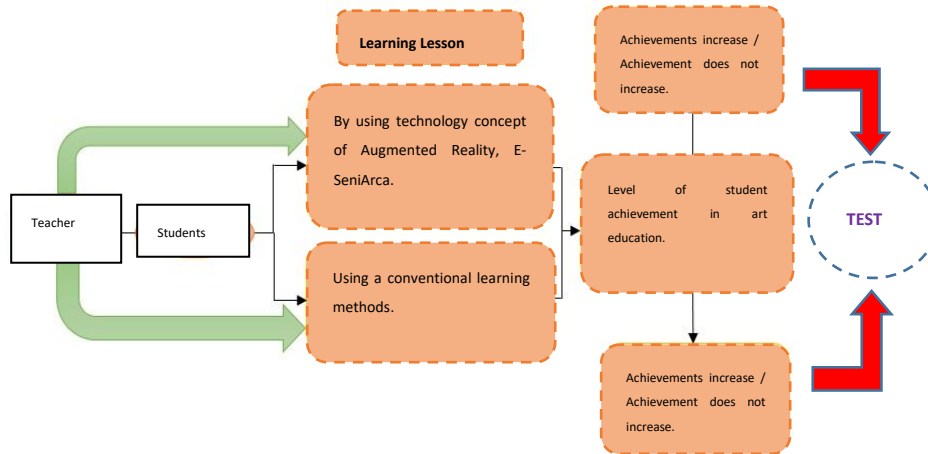


Figure 1. Conceptual Framework Model

In addition, the model of this study is to assist the researcher in seeing and demonstrating the relationship between teachers, students, teaching and learning and improving the level of student achievement through the test. Through the framework of this study, it also indirectly provides a clear picture of the movement of the E-SeniArca Kit and can provide the researcher an understanding of choosing the appropriate concept. The concepts used should meet the specifications and requirements of the kit to ensure that the kit developed can have a positive impact on the user over the long term.

IV. RESEARCH METHODOLOGY

Based on this study, a total of 50 students (form two students) which is study the subject of Visual Arts Education were involved and its running for approximately 4 to 5 weeks. Also, this study conducted based on the useful and the benefit of the E-SeniArca Toolkit in the teaching and learning session, as a Teaching Instrument to replace the traditional way of learning encouraging (G and Zulkifli, 2016). All of the students that involved had been separate into two group which is to get the results through pre-test and post-test by using fully quantitative (quasi-experimental).

A. Observations

Observations were made by involved students who learn the subject of Visual Arts Education. The observation also focused on one group, that is the treatment group that used this E-SeniArca Toolkit and the second group, that is the control group that did not use this E-SeniArca Toolkit during the teaching and learning session. The position of the researcher in the classroom is at the back, where the researcher has carefully and explicitly observed the student's behavior while the teacher has been briefing on the sculpture arts topic, which is a statue during the teaching and learning session. Indirectly, it can see that the level of acceptance the information conveyed to students is achieved or not through the traditional teaching method. Lastly, the studies in this observation will be performed before and after the use of AR technology used in the description of sculpture topics. All student's behavior was recorded through a video camera to see the changes.

B. Interviews

Interview sessions were conducted for teachers, that was teach the subject of Visual Arts Education and form one students who was study Visual Arts Education subjects. It was individually conducted for students to get the student achievement before using this toolkit and after using E-SeniArca Toolkits with Augmented Reality (AR) technology was introduced in this subjects for the topic of sculpture. In addition, the teachers will also provide to comments before and after using this E-SeniArca Toolkits. The questions given are divided into 2 sections, which are general questions and questions about the useful of the E-SeniArca Toolkit.

C. Research Design

This study is aimed by the effectiveness of the concept of multimedia element and utilization through an Augmented Reality (AR) technology in Visual Arts Education for lower secondary subjects through the sculpture topics. Among the data collection that has been done is to combine qualitative and quantitative approaches. The selected method is the appropriate method and the right way for collecting and analyzing the information contained in the research conducted by the researcher.

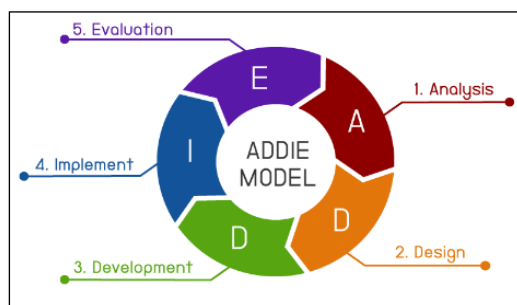


Figure 2. Framework by ADDIE process

The analysis phase is the first phase of developing a product. Through this phase of analysis, it will discuss about several aspects, such as the needed for titles by identified for Form One students for sculpture topics. These include the information for students needed and how to achieve a successful for teaching objectives. This concept was introduced and used in the development of the E-SeniArca Toolkit as it provides an innovation, also a positive impact on the new way of learning compared to the old learning method, that is called conventional learning. By innovating the learning session as well, researchers have done preliminary analyzes to identify the needed for students to learn more systematically organized.

The second phase is the design phase which is to focuses on some of the software that used during develop this E-SeniArca Toolkit. By choosing the software, some of the main thing must be think whether it is suitable to be used or not. So, after decided of the software that want to be used, it will be noted and prepared the things. By develop this toolkit, it was more on draw the image, shape the image, move it and lay it out. For example, in layouts for toolkit was using existing multimedia elements. The multimedia elements include animation, text, graphics, audio and video.

The third phase of this ADDIE model is development. The focus of this design phase is to planning and design requirements, and then to create the appropriate design for this E-SeniArca Toolkit. This design phase also used the data analysis of the questionnaire obtained through the analysis phase and solved it to obtain a solution. In addition, the main focus of this phase is to focus on the main goals in the development of the E-SeniArca Toolkit. Among the goals of this development in this E-SeniArca Toolkit, there was an innovation of the Teaching and Learning process to simplify and provide the current technologies. Indirectly, it can provide the way with easy in learning and the objectives in each session can be achieved easily.

The fourth phase is the implementation phase, which is focused on the target user. Through the development of this E-SeniArca Toolkit, it has involved approximately 50 form one students who are taking the subject of Visual Arts Education from Secondary School in Kedah. Then, the students were divided into two different groups of 25 students for the control group and another 25 for the treatment group. Each group was separated by the same total of students. The first review and process took about 3 weeks. Subsequently, pre- and post-test were distributed and

distributed to both groups to find out about the effectiveness of using the E-SeniArca Toolkit, for students during the learning sessions. Through this test, it indirectly provides researchers with changes and improvements in terms of the development of the E-SeniArca Toolkit.

Lastly is fifth phase that is evaluation phase. During the evaluation phase, the evaluation of the product will be going by the developed before and after the implementation process. This is because the data has been collected and recorded for analysis according to the specifications that needed to be evaluated. Based on this study, there are two perceptions of the evaluation in terms of toolkit design and the needed for the innovation. Specifications for this assessment have been selected and done as they will be able to clearly show the extent to which the useful of this E-SeniArca Toolkit is applicable to target students in recognizing and understanding the basics of sculpture correctly. Therefore, a detailed description of student achievement scores has been provided through the third study objective using SPSS software.

D.Test

In order to analyze the data in this section of the Pre and Post-Test, it involved 2 groups that were distributed throughout the research study. The two groups in question are as stated at the beginning of this chapter 4, which is in the background of the respondents. It consists of the Control Group and the Treatment Group. As a result, both groups have carried out the same test both through the Pre and Post Test. As stated at the beginning of this chapter, both groups need to answer a few questions about the Sculpture foundation. The questions given are divided into 2 sections. The first part is an objective part, consisting of 5 questions while the second part is structured, students need to match the correct answer and have 5 questions related to the sculpture.

Table 1.Pre-Post Tests Design

Group	Total of Students	Pre-Test	Treatment	Post-Test
Control	25	T1	-	T2
Treatment	25	T1	X1	T2

Guidance:

T1- Pre-Test

X1- Treatment

T2- Post-Test

All data collected were analyzed using Statistical Package for Social Science (SPSS) version 18.0 software as it was more efficient and faster for statistical analysis work. There was two type of process analyzing data which is the descriptive statistics and the inference statistics. To answer the research question, inference statistics were used to derive results from the pre and post-tests while descriptive statistics were used on the distributed questionnaires.

E. Questionnaires

The survey conducted on the development of the E-SeniArca Toolkit, that is related to the Visual Arts Education students through the subject of the sculpture. Also, this questionnaire is given to the student who was involved in this study for each respondent (individual) to get feedback on the E-SeniArca Toolkit that have been used. Through this survey, it is easy to see and analyze the response of users to using this toolkit (Piaw, 2011). Lastly, respondents were asked to provide their opinion and fill out the questionnaire form after using this AR toolkit as their instrument to be used during learning session. This questionnaire has 4 sections, namely section A (User friendly). This section deals with multimedia elements and the application of AR technology in the E-SeniArca Toolkit. Also, students' level of understanding and care will be gathered and assessed through the questions in this section. The second part is part B (Interactivity). This section contains questions about the emphasis on creativity concepts based on the useful of this E-SeniArca Toolkit in learning session. The level of student effectiveness in emphasizing the concept of creativity will be measured through each of the criteria provided in the questionnaire. The third is section C (Design). This section will address issues related to students' understanding and interactions with the concepts presented in the E-SeniArca Toolkit, which is based on AR technology and the multimedia elements used. The level of understanding and interaction of students will be measured by each criterion through the questions provided. The last one is part D (Suggestions and improvements). This section will provide users with suggestions on how to improve the AR applications that users have used. This is because it ensures that

the researcher makes improvements to the problematic structure. Also, this section of the user can provide appropriate improvement suggestions.

V. RESULT

The testing of the E-SeniArca Toolkit by applied AR technology, has been tested on 50 respondents in a school to see how effective it is. This test also aims to ensure that this application has functionality and effectiveness as well as find faults in this toolkit. This toolkit will test comprises the testing process by installing this toolkit into a smartphone by the HP Reveal software and then testing it to visual arts students in basic topic of sculpture arts.

A.Experimental Design

50 students participated in this experimental test. The age of all the students are the same and they take the visual arts education as their subject for form one students in school. All of the students are not have any experience in using toolkit by applied AR concept during their learning session. Otherwise, they also did not know about what is AR means. So, on the experimental tests, it performed on students consist of four main steps:

1. Pre-test (T1): The first step of the experimental test is to do a pre-test. It because want to know whether they have the knowledge of basics sculpture arts or not before using the E-SeniArca Toolkit. This pre-test consists of 10 questions on basics sculpture arts topics, that is about type of sculpture, what is sculpture, how the design of sculpture and so on for visual arts education students. This test was given to both groups.

2. For the Control Group, the interaction with teacher is shown. Teachers will teach as usual in the classroom without using any of the teaching materials other than the existing textbooks. It is because to shows the two-way interaction occurs between the teacher and students only.

Interaction on the E-SeniArca Toolkit for the Treatment Group (X1): The teacher must be assistant the students to describe while the oral theory on the basics of sculpture arts. Then, students take a smart card that was include in the E-SeniArca Toolkit packages. Students are formed into two groups to facilitate teachers to explain what they have learned. The hardware used to drive this toolkit is the Oppo F1s and iPhone 8 plus smartphone. Students have a maximum of 10 minutes to interact with the toolkit along be given on smart cards in sculpture arts.

3. Post-test (T2): Process on this steps is to create a post-test to determine the level of understanding and achievement of the student by using toolkit. Same with the pre-test, the post-test also contains 10 questions to investigate whether the toolkit helps them to understand the basic concepts of sculpture arts or not.

4. Investigations: Finally, the experimental test can be concluded after the students give a respond and answer based on the likert by the questionnaires on learning session and interaction process with this E-SeniArca Toolkit.

B. Results and Discussion

Results obtained from the experimental tests performed by students in the level of learning achieved by the students. Paired T-Test was used to measure students' performance in groups that did not used the E-SeniArca Toolkit, which is the control group. Tables 2 shows the differences mean on pre- and post-test of students in the group using the E-SeniArca Toolkit during the learning session, which is the control group. The mean score through this group for the pre-test was 33.20 (12.29) while for the post-test it was 37.12 (10.78). Therefore, this increase was significant with p value >0.095.

Table 2. Differences Analysis of Mean Test Pre and Post-Test Scores for Control Groups.

Group	N	Mean		Significant (p)
		Pre-Test	Post-Test	
Conventional teaching	25	33.20 (12.29)	37.12 (10.78)	> 0.095

This section is an analysis of paired T tests used to measure student achievement in groups using the E-SeniArca Toolkit of treatment groups. Table 3 shows the results of this group analysis:

Table 3. Differences Analysis of Mean Test Pre and Post-Test scores for the Treatment Group

Group	N	Mean		Significant (p)
		Pre-Test	Post-Test	
Learning session using E-SeniArca Toolkit	25	32.56 (11.29)	78.16 (8.87)	< 0.000

The differences for student achievement in the group using the E-SeniArca Toolkit during the learning session, which is the treatment group. The mean score through this group for the pre-test was 32.56 (11.29) while for the post-test it was 78.16 (8.87). Therefore, this increase was significant with p value <0.000.

Table 4. shows the mean of comparison between pre-test and post-test scores for both study groups, the control group and the treatment group. Overall, the mean difference between the control group and the treatment group was 0.64 while the mean difference between the control group and the treatment group was 41.04. Therefore, SPSS analysis based on the T test has shown that it is significant for KPre and RPre is $p > 0.095$ which means that both groups have achieved markedly different scoring results.

Through the comparisons outlined in the table above, it is clear that the use of the E-SeniArca toolkit in the Teaching and Learning session greatly helps teachers to teach and inform and students to facilitate the acquisition of information.

Table 4. Comparison of Mean Scores and Significance of Pre and Post-Test for Both Study Groups.

Group	N	Mean	
		Pre-Test	Post-Test
Conventional teaching	25	33.20 (12.29)	37.12(10.78)
Learning session using E-SeniArca Toolkit	25	32.56 (11.29)	78.16 (8.87)
Perbandingan		0.64	-41.04
Signifikan (p)	50	>0.095	< 0.000

- $KPre / RPre = p > 0.05$

$$KPost / RPost = p < 0.05$$

Therefore, through the development of the E-SeniArca toolkit, students can easily reach the maximum level of understanding the basics of sculpture arts. Therefore, the initiative taken to realize the effectiveness of students' level of understanding of the Sculpture topic is to develop an E-SeniArca toolkit to give students an interest in learning, as well as modernizing technology-based learning, along with 21st century learning.

VI. CONCLUSION

Through the development of this E-SeniArca kits, there is formulated that it will helps students in their learning to know about the sculpture which is a difficult topic to be understand through lectures-based learning. With the availability of the technology by this AR concept and based on Sculpture arts topic, it is indirectly able to create a difference way of teaching and learning session and also to provide drastic changes in the field of education (Yusoff, 2008). Otherwise, the E-SeniArca are also flexible with IoT platform that can give exciting for students when using it. Finally, it can provide a more convergence student during the learning session. Along with the learning in the 21st century, this AR technology is best suited to teachers and students so that it can produce students who are active in the classroom during the learning sessions and make students to think more critical and out of box.

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