JOURNAL LA EDUSCI

VOL. 03, ISSUE 06 (450-459), 2023
DOI: 10.37899/journallaedusci.v4i6.879

# The Effectiveness of Using Augmented Reality Learning Media in Improving the Ability to Draw Sketches

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Article Info

*Article history:*
Received 13 October 2023
Received in revised form 9 November 2023
Accepted 19 November 2023

*Keywords:*
Augmanted Reality
Learning Media
Students
Sketches
Effectiveness

**Abstract**

*Learning is the transformation of knowledge from teachers to students, the obstacles that occur are the non-achievement of information, these factors can occur due to not understanding the material, learning is less interesting, teachers are boring, there is no learning media, teachers cannot manage classes and different student characters, in practical learning sketching at the concentration of product design this becomes a competence that requires must be able to students, with casuus studies, students are generation Z who have more insight into the effectiveness of using technology while learning to draw sketches is less of an approach to technology so that competence is not achieved entirely. By creating learning media based on Augmantid Reality (AR) aims to carry out learning effectiveness to achieve competence in drawing sketches. This study uses qualitative methods with a descriptive approach, for data processing techniques using pretest and posttest control groups and Likert scales are able to analyze thoroughly. The population was 100 students and a random sampling technique was carried out into 20 respondents which were divided into 2 classes, namely the experimental class and the control class. There are results such as the following: the experimental class has a pretest value of 19 points with a description of Cannot and a posttest value of 34 points with a very clear can be after applying AR-based learning media, while the control class has a pretest value of 18.5 points with a description of Not being able and a posttest value of 24.5 points with a description of not being able to and a posttest value of 34 points with clarity can be applied after applying power point learning media. The difference after applying AR-based learning media is that it guarantees to increase the competence of sketching skills.*

## Introduction

Augmented Reality (AR) technology has become more popular in many fields in recent years. AR technology combines virtual components with the real world to create engaging and creative interactive experiences. In the gaming industry, AR allows players to integrate virtual characters and objects into real environments. Learners can view and interact with virtual objects with a real environment using devices such as smartphones, tablets, or special headsets. For example, the game Pokemon Go, which allows players to capture Pokemon in real life with their smartphone camera, has gained tremendous global popularity. AR is also used in other games, such as Minecraft Earth, where players can build structures in the game.

Learning is a planned activity, an educator will involve teaching materials, teaching resources, information, and the environment to create a learning process in students so that they can develop their potential, knowledge, skills, and positive values (Mustaqim, 2016)Applying AR as a learning medium so that practical learning becomes more fun and not bored quickly, learning process planning must prepare carefully from teaching files, learning methods, and learning evaluation. Today's learning media must adapt to technologies such as AR, which makes learning more interactive through animated visualizations that students love.



*ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)*

Product Sketch is a competence that needs to be possessed by prospective designers, the foundation of ability that must be able because it is the first stage to convey ideas into a visual form for product creation. In the industrial world, product sketches need to be owned by designers, be it manual or digital sketches. In general, students have difficulty in drawing product sketches because they must be precise and proportional and must be realistic, be it textures that show the material, or information from the type of product sketch. Product sketching is only done for one semester on first-level learners who do not have drawing competence at all.

Every semester has the same constraints on this competence, because sketching requires a long process with routine activities of sketching practice. Product sketches have 16 subjects with seven materials including introduction and introduction to media, alternative sketches, final sketches, orthogonal sketches, informative sketches, and detailed sketches and product sketch evaluations. In addition, product sketches include courses used in continuous courses so that students must be able to or exceed the ability to sketch products. Every year product sketching is a course that is considered difficult. Researchers try to analyze what kind of difficulties learners face. Every difficulty will make an improvement in the learning model, this is one solution to overcome difficulties in the process of learning activities.

In the teaching and learning process, many aspects can be an obstacle including teaching factors, such as: authoritarian types of teacher leadership, teaching and learning formats that do not vary (monotonous), poor teacher personality, lack of teacher knowledge, and teacher understanding of students that are lacking, student factors. The lack of awareness of students in fulfilling their duties and rights as members of a class or a school will be a problem in class management, family factors, student behavior in the classroom is a reflection of their family circumstances. The authoritarian attitude of parents will be reflected in the behavior of aggressive or apathetic students. In the classroom there are often found bully and noisy students, they are usually from broken-home families, Facility factors, These factors include: the number of students in the class is too much and not balanced with the class size, the size and size of the room is not adjusted to the number of students, the availability of tools that are not in accordance with the number of students who need them (Erwinsyah, 2017).

Of the problems that become obstacles to classroom management during the learning process, the most possible is to improve teaching methods with learning media, namely entering the facility factor, namely by improving visual learning media with AR-based so that it is more interactive during the learning process The most important characteristic of interactive learning media is that students do not only pay attention to presentation or objects, but also forced to interact during lessons (Harsiwi &; Arini, 2020).

When learners feel engaged and interested in a lesson, they tend to be more focused and more eager to learn. Interactive learning methods such as group discussions, collaborative projects, and the use of technology can also help learners become more engaged. By considering the different learning styles of learners, lecturers can choose the most suitable method to increase student participation and interest. The apprehension of a learning material will be understood by students in different ways, with AR-based interactive learning media will make it easier for teachers so that the process of achievement indicators on sketch material will be achieved faster.

## Methods

The method used is a descriptive research method with a qualitative approach to analyze a phenomenon with the support of literature studies so as to support research conclusions, this



*ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)*

method is a method used to make observations about situations or events that occur and aims to make systematic, factual, and accurate senses about the facts and characteristics of certain populations or regions (Sri Mulyani et al., 2018). Meanwhile, to test the effectiveness of learning media using the Pretest-Postest Control Group Design data collection technique, which is a form of experiment carried out by randomizing two groups (control group and experimental group). This experimental design was carried out by making initial measurements or observations before and after the treatment was given to experimental groups and groups (Asdiansyah et al., 2020). The statistical elaboration and description of the data are based on the learners' responses on the questionnaire. According to Salim &; Haidir (2019), descriptive research methods are as follows; (1) Formulation of problems, (2) determine the type of information needed, (3) determine data collection procedures, (4) determine information in data management procedures, and (5) draw research conclusions.

There is a population of 100 respondents in a Sketch course to have effective results, the population is sampled ramdom into 20 respondents divided into 2 classes, the class includes experimental classes given AR-based learning media actions and conventional classes given PowerPoint learning media as usual. The Pretest-Postest Control Group will show the effectiveness of a learning medium will be assisted by a Likert scale aimed at measuring individual cooperation behavior by measuring ideological variables, perspectives, personal training, and training of others. (Budiaji et al., 2013). Looking at this goal to see the development of competence / training of people / individuals is still continuous with the effectiveness of learning media, if the value of students develops, the effectiveness of learning media is quite helpful in increasing learning competence.

Table 1. Pretest and Post test Contol Group Design

| Class | Pre-Test | Treatment | Post Test |
|---|---|---|---|
| Experiment (E) | $T_1$(E) | X (E) | $T_2$ (E) |
| Control (K) | $T_1$ (K) | X (K) | $T_2$ (K) |

Note

T1(E) : Initial test in experimental class
T1(K) : Initial test in the control class
T2(E) : Treatment in class applying AR learning media
T2 (K) : Treatment in class using Power point media
X (E) : Final test in experimental class
X (K) : Final test on Control class

## Results and Discussion

### Search and Data Collection

The significant change in implementing AR learning media is proof that AR technology, which contains interesting audiovisuals and is in line with students' characteristic approaches, makes learning more enjoyable than just implementing power points. Provide a pleasant, non-stressful, relaxed and interesting learning atmosphere so that learning goals can be achieved. (Mustaqim, 2016) enjoyable learning is a solution so that learning achievement indicators can be achieved more quickly. This is also based on learning media as an intermediary for material so that it is easy to understand and measure quickly.



*ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)*

Table 2. Score questionnaire on research data search

| Factor | Question | Score | Solution |
|---|---|---|---|
| Teacher factors | • authoritarian teachers,<br>• unvaried (monotonous) format of teaching and learning,<br>• bad personality of the teacher,<br>• lack of teacher knowledge,<br>• teacher understanding of students is lacking, | 25 | Teachers already understand their duties and obligations |
| Learner Factors | • Lack of awareness of students in fulfilling tasks | 45 | Need motivation to learn |
| Family Factors | • The authoritarian attitude of parents will be reflected in the behavior of aggressive or apathetic students.<br>• In the classroom, there are often students who bully and usurper. | 10 | Parents already support learners to learn |
| Facility Factors | • The number of students in the class is too large.<br>• The room is not adjusted to the number of students.<br>• Availability of inappropriate learning media. | 60 | Need to improve learning media and learning facilities |

Remarks : SS:Very Compliant 76-100
S : Compliant 51-75
TS : Non-Compatible26-50
STS : Highly Incompatible 0-25

After getting a questionnaire distributed to 100 respondents, the biggest result that needs to be improved is the facility factor where this factor will have an impact on teacher readiness, teaching competence, and how to teach. To prepare teaching methods if learning media takes up all parts of the teaching factor are ready and of course, the process of teaching and learning will run smoothly. Students can use smartphones to make the learning process easier. For example, they can be used to create learning media with lesson content that they want to share in the form of visually appealing applications, possibly in the form of Android media.

**Testing the Effectiveness of Learning**

***Media Augmented Reality-based Learning Media***

After searching for data that has hypotheses, what must be improved is learning facilities and media, the right learning media will produce the achievement of appropriate indicators. The function of learning media is to create direct and indirect interactions between message sources, teachers, media and students to help overcome various obstacles in the teaching and learning process, so that the communication process will be successful. The media has an important position in achieving goals (Nurmadiah, 2016).


*Figure 1. Flash Card Marker*



*ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)*

This Flash Card aims as an AR recorder, the smartphone camera is aimed at the flash card so that it will release characters that explain the ways and characteristics of the sketch on each card. These flashcards consist of alternate sketches, final sketches, informative sketches, orthogonal sketches and detail sketches. These five types aim to inform the designer team or design head to discuss and adjust according to the target user persona.


*Figure 2. Character flash card*

This character or animation adjusts the user persona, namely Telkom University students, who are casual and minimalist in style, this animation will appear when explaining the type of sketch type with audio that is easy to hear and friendly to their daily lives. The use of animation is an approach with the interest and motivation of students towards the learning media used by teachers, will affect student learning outcomes (Panjaitan et al., 2020) AR-based learning media adapts to an entirely technology-based era, this adjustment is adjusted to generation Z students who can and know technology that makes their activities more practical. The characteristics of generation Z born in the era of technological development, educators should provide teaching media that can improve a conducive learning atmosphere (Nawawi, 2020)

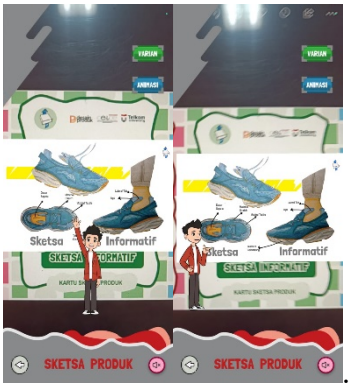



*Figure 3. AR learning media display*

The success of a learning is an important thing that must be achieved in a learning process. Indicators of success in learning include increasing the cognitive abilities of students and learning more memorable for students (Pangestu et al., 2019). AR learning will bring the imagination of students into interactive learning that can see visually, and audio simultaneously so that it will be easier to understand and understand what is meant in the topic of sketching.

**Implementation**

Implementing data retrieval techniques with the Pretest-Postest Control Group method, divided into 2 classes, namely classes that are given experimental actions and classes that are not given actions (power point teaching materials). The population of 100 was carried out random sampling so that there were 20 respondents, including 10 respondents in the Action class and 10 respondents in the No Action class (power point teaching materials). Pretest-Postest is



*ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)*

assisted in finding the development of self-competence through a likert scale of 4 options including STB: Very Can't (1), TB; Cannot(2), B; Can (3), SB: Very Can(4).

Table 3. Data processing using pre-test and post-test control group design

| **Experiment Class** | | | | **Conventional Class** | | | |
|---|---|---|---|---|---|---|---|
| Respondent | Pretest ($T_1$ E) 0-40 | | Post-test $T_2$ E 0-40 | Respondent | Pretest ($T_1$ K) 0-40 | | Post-test $T_2$ K 0-40 |
| A | 15 | Action X (E)' AR learning media | 35 | A’ | 10 | Action X (K) Learning media Power point | 25 |
| B | 10 | | 30 | B’ | 20 | | 30 |
| C | 20 | | 30 | C’ | 20 | | 25 |
| D | 20 | | 35 | D’ | 25 | | 30 |
| E | 30 | | 40 | E’ | 25 | | 25 |
| F | 20 | | 30 | F’ | 30 | | 35 |
| G | 25 | | 35 | G’ | 20 | | 25 |
| H | 30 | | 40 | H’ | 15 | | 20 |
| I | 10 | | 35 | I’ | 10 | | 20 |
| J | 10 | | 30 | J’ | 10 | | 20 |
| Total | 190 | | 340 | | 185 | | 255 |
| Mean | 19 | | 34 | | 18,5 | | 25,5 |
| Information | TB | | SB | | TB | | B |

Information : STB 0-10
TB 11-20
B 21-30
SB 31-40

The significant change by implementing AR learning media is proof that AR technology, which contains interesting audio visuals and is in line with students' characteristic approaches, makes learning more enjoyable than just implementing power points. Providing a learning atmosphere that is fun, not pressured, relaxed and interesting so that learning goals can be achieved. (Mustaqim, 2016) Fun learning is a solution so that learning achievement indicators can be achieved more quickly. This is also based on learning media as an intermediary for material so that it is easy and fast. understood and comprehended.

The total has a total of 40 points from 10 respondents, if the respondents have a total of 40 points then it can be said to be very possible, 30 points are said to be can, 20 points are said to be cannot, 10 points are said to be very cannot. This assessment is taken from the work of students with criteria such as informative work, proportion, composition of the work, material texture, and others. Judging from the table above, it can be seen that pretest and postest in experimental classes and conventional classes have differences, experimental classes are classes that apply AR learning media while control classes are classes that apply power point learning media as usual. There are results on the competence effectiveness test obtained by the $T_1$ E and $T_1$ K pretest classes have the same initial competence as points 19 and 18.5 have information that they cannot start competence, sketch drawing is carried out Action with AR-based teaching media and power point control media. Then you will see the results of the $T_2$ E and $T_2$ K post tests that have different results, $T_2$ E has 34 points with very possible ketaranga and $T_2$ K with 25.5 points with information can.

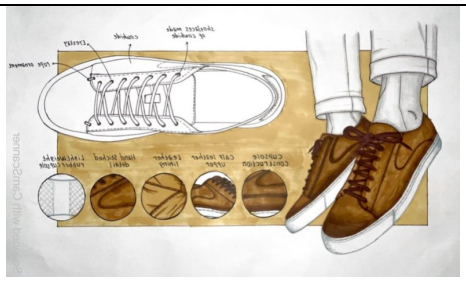
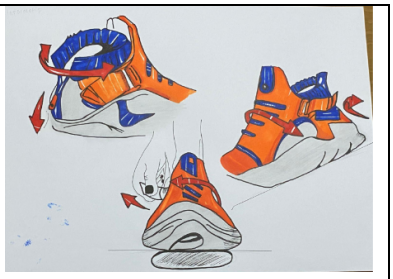
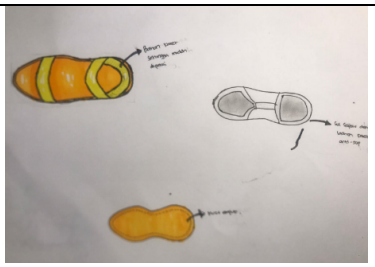
The impact after applying the pretest and posttest in the experimental class and control class can be seen that the effectiveness of the learning process, in one semester consisting of 14 meetings with the control class to achieve learning achievement indicators, results were not significant, there were still students who did not have good sketching skills. . However, in the



*ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)*

experimental class to achieve learning outcomes by implementing AR media in only 10 meetings, students already understand and have the ability to draw sketches, including being able to create proportional product images, having good visual references regarding product design insights. creating material textures in a product image, and interpreting an explanation into a visual form. AR media is currently being applied to students very effectively, this is because the students' characters are more visual and audio-visual, making learning fun.

Table 4. Sketches from respondents of 2 classes carried out the implementation of AR-based learning media and power poiint media

| | | |
|---|---|---|
| Experiment Class |  |  |
| Conventional Class |   |  |

**The effectiveness of AR-based learning media**

The learning process will be more effective and successful if educators are able to create learning media that are in accordance with the material and age level of students. (Hasan et al., 2021). Using interactive and fun learning media, students will be able to learn. Increasing learner motivation to achieve the goals of a learning process is the main task of a teacher (Kholiq et al., 2021) Taken from this opinion, learning media is a stimulus to motivate learning to achieve the goals of the learning process so that students can understand the topic of discussion faster. Learning media helps students to understand faster and easier to understand and can be implemented, learning indicators that should be 14 subjects of discussion of students already have competence in drawing sketches with learning media, especially based on AR 10 subjects of students have reached course competence. To show the effectiveness of AR-based learning media.

Judging from the graph above regarding the results of the implementation of the effectiveness of learning media to improve the ability to draw sketches, it has been seen with the graph above point 30 is the limit of the standard ability value of students in sketching courses. T1 E and T2 E have changes in the value of students' abilities and exceed ability indicators while T1 K and T2 K are not so significant that they need time to practice in improving ability indicators. The selection of one particular teaching method will affect the appropriate type of learning media, although there are still various other aspects that must be considered in choosing media, including learning objectives, types of tasks and responses that students expect to master after learning takes place, and the learning context including the characteristics of students (Sapriyah, 2019). Learning media must follow learning methods, which will affect all aspects in it, especially the characteristics of students. Generation Z is a generation that is literate in



*ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)*

informatics and technology where a teacher needs to adapt and follow the way of learning students who are indeed generation Z students.

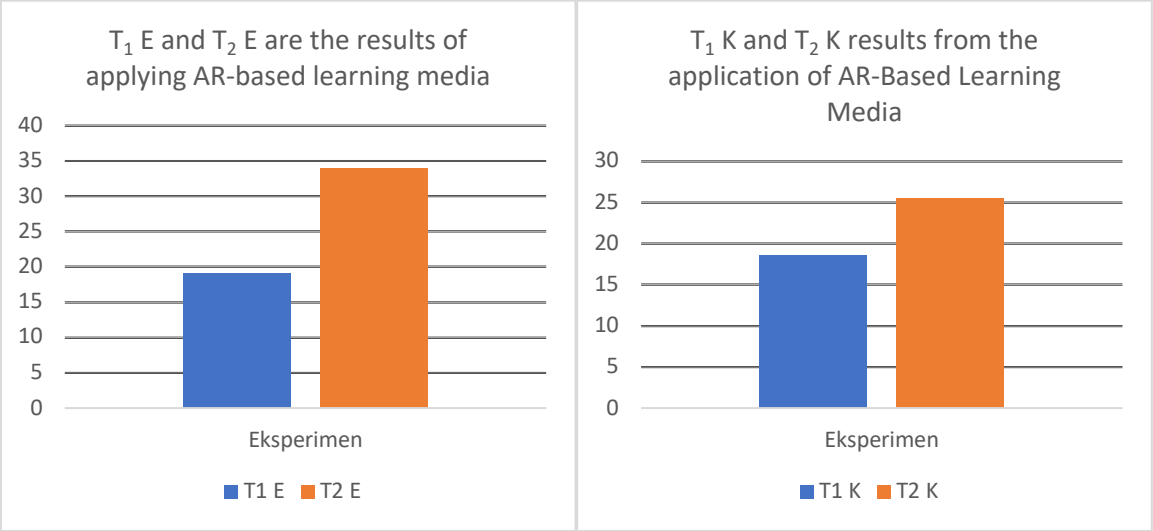



*Figure 4. diagram of analysis results using pretest and posttest control group techniques*

As technology continues to develop and the characteristics of students continue to keep up with the times, it is necessary to adjust teachers, teaching materials, teaching media and so on, accompanied by controlling class management and communication control in interactions so that the learning process will run smoothly. An interesting and enjoyable learning environment is very necessary to keep students' attention on what is happening in the classroom, providing them with interactive, interesting and unforgettable experiences and opportunities for active participation (Fauziah et al., 2019)

The use of AR in the scope of teaching is an innovation in the use of teaching media. In developed countries, the application of artificial intelligence has been implemented to make learning and teaching activities more interesting. the advent of artificial intelligence has brought a new development path for education, but at the same time, students are also required to strengthen the creative play of professional education (Xue & Wang, 2022). Therefore, the application of AR learning media is very important to increase competence effectively and more quickly in achieving the goals of learning achievement indicators.

## Conclusion

The incomprehension or difficulty of students in learning is an obstacle for teachers, it must be corrected through learning evaluation, the characteristics of students are the first identification that must be adjusted, generation Z is a generation that is able to see technology and informatics, so all aspects of learning such as learning methods, learning media, and assignments must be aligned. AR-based learning media is a solution to streamline learning so that the competence of students can surpass it. To test the effectiveness of AR-based learning media, pretest and *posttest control gruoup design* are made , two classes are made between experimental classes (implementation of AR learning media) and control classes (learning media using power points) with a likert scale of student abilities will be seen. The pretest experimental class has 19 points and post test 34 with very can information, while the pretest control class has 18.5 points with information cannot and the posttest has 25.5 points with information can. Looking at the Likert scale result point, AR-based teaching media is more effective in implementing the competence of sketching practice at Telkom university.



*ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)*

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*ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)*

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*ISSN 2721-0979 (Print), ISSN 2721-1258 (Online)*