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Development of Android-Based Millealab Virtual Reality Media in Natural Science Learning

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Abstract. Basically, media is something that cannot be separated from the learning component. The use of unattractive and varied media can make students bored and bored when the learning process takes place. This research was conducted with the aim of developing or producing a learning media product based on the use of virtual reality technology. The method used in this research is the research and development (R&D) method. This media development focuses on learning Natural Sciences for grade V Elementary Schools. The initial stage of this research is by validating media experts and material experts. Then test the feasibility of media products to the teacher before testing the product to students. The results of the validation by media experts and material experts obtained criteria strongly agree with the results of validation by media experts by 85% and material experts by 92%. Then the media feasibility test conducted by the teacher obtained 89% results with the criteria strongly agree. The feasibility of media products for use by students was carried out through product trials at SDS Muhammadiyah 9 Jakarta with a total of 21 students. The results obtained show a percentage of 86% with very agree criteria.

Keywords: Learning Media, Virtual Reality, Research and Development (R&D)

Introduction

Education is a process of conscious and planned efforts to create an atmosphere of earning and the learning process to actively develop their potential to have religious, spiritual strength, self-control, personality, intelligence, morals, and skills needed by themselves and society. One of the main bases of education is to teach culture through the younger generations. The learning stage is one of the stages that determine the success of an educational process. Learning media plays an important role in the learning process (Sulistyowati & Rachman, 2017). Learning media is a tool or intermediary that is useful for facilitating the teaching and learning process to streamline communication between teachers and students . Learning media is a tool that can be used as a tool for delivering all learning materials (Wahyuni & Yokhebed, 2019). The use of instructional media can help teachers deliver learning material (Okediran, et al., 2014). Learning media is very necessary for increasing, arousing new desires and interests in the learning process.

In the digital era, various innovations will be aimed at services that are easy to obtain, easy to access, easy to provide intelligence and enlightenment, even very cheap (Terracina

& Mecella, 2015). Likewise, in education, innovators compete to find various learning models that are practical, cheap, and easy then democratic with digital and mobile characters(Rusnandi, et al., 2015). This media was developed through the Millealab application, which is used specifically for android development on computers (Herlandy, et al., 2019; Monita & Ikhsan, 2020). Virtuall reality (VR) is a technology that allows users to interact in an environment simulated by a computer (Prayudha, et al., 2017). Virtual reality is a technology used as if we can interact with an environment simulated by a computer. Virtual reality can be used in learning media during the times in the current era of globalization (Mandal, 2013). Technically, virtual reality is used to describe a three-dimensional environment generated by a computer and interact with someone (Sarosa, et al., 2019).

Virtual reality has the ability to attract a person to a new world and has the capacity to improve the quality of education by unlocking the potential to learn more than before. (Darabkh, et al., 2018). Remembering and reading books and listening to the subject matter delivered by the teacher becomes boring for students. The use of VR for education is very appropriate to make lessons memorable so that it becomes a priority in the world of education.Considering that generation Z (or commonly known as the millennial generation) is more interested in learning using technological media than just using traditional media (Bibic, et al., 2019; Bondarenko, et al., 2020; Karageorgakis & Nisiforou, 2018). VR enables learning to tap into students' emotional core in new and interesting ways (Tomchinskaya, et al., 2018). Based on the results of observations made at SDS Muhammadiyah 9 Jakarta, teachers are still less varied in instructional media in classroom learning activities. There is still limited development of technology-based learning media in the natural science learning process. Learning by utilizing technology in virtual reality-based learning media can provide a fairly good contribution. To achieve quality learning, of course, there must be an innovation in the use of technology in learning media (Esteves, et al., 2019). Science learning in elementary schools must be more focused so that students are able to apply it in real life (Fauza & Farida, 2020). From the results of this background explanation, the problem of this research can be formulated how applications that will be developed based on virtual reality on Human Anatomy material in class V can improve the quality of learners?

Methods

In this study, researchers used the research and development method, which is a research method used to produce a particular product and to test the effectiveness and feasibility of virtual reality learning media products on Human Anatomy in class V. This study used the ADDIE research model (Khoerniawan, et al., 2018). Five phases were part of the ADDIE model: study, design, development, implementation and evaluation (Davis, 2013). The first stage of analysis by analyzing the needs of students as objects of VR media users. Next, determine the subject matter as the subject of learning in VR media and prepare the hardware and software requirements for VR operation. The second stage is designing the media by conceptualizing ideas for the appearance and format of the material and designing the lesson questions. The third stage is to validate and develop the media, this is done by testing with experts to validate the suitability of the VR media, then it is developed and updated. The fourth stage is implementation, namely testing the use of media by students. The selection of respondents was carried out purposively systematically, namely by selecting respondents who only used Android-based smartphones. The fifth stage by evaluating the results of student responses after using VR media.

The validation assessment questionnaire instrument sheet here is made to be given to media experts and material experts to conduct validation assessments of virtual reality learning media on Human Anatomy material in grade IV. The score of the questionnaire instrument criteria uses a Likert scale with a value of 1 to 4, where the score is 4 (strongly agree), 3 (agree), 2 (disagree), 1 (strongly disagree) (Wulandari, et al., 2020). The validation questionnaire instrument was also made for the teacher to validate the product feasibility test before testing the product to students. The score of the teacher questionnaire instrument criteria uses a likert scale with a value of 1 to 4, namely where the score is 4 (Strongly Agree), 3 (Agree), 2 (Disagree), 1 (Strongly Disagree). The questionnaire is calculated using the formula (Jannah & Julianto, 2018) as follows, Percentage is a way of expressing a number as part of a whole, where the whole is written as 100%. Obtained the equation, Percentage = (Number of Part/Total Amount) x 100%.

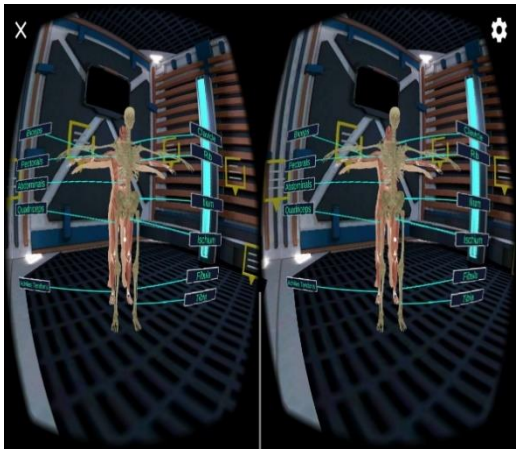
Table 1. Questionnaire Instrument Criteria

Percentage Range	Criteria
86 - 100	Strongly Agree
70 - 85	Agree
55 - 69	Disagree
<55	Strongly Disagree

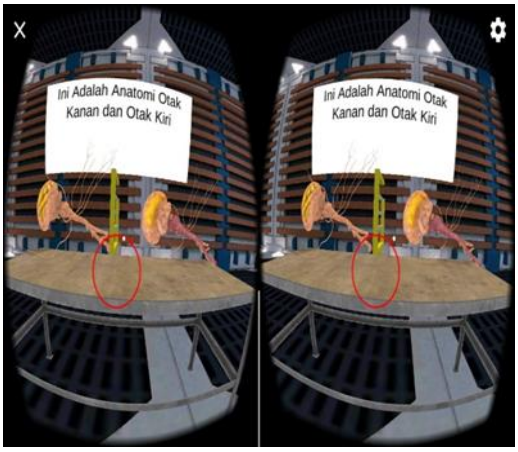
Results and Discussion

After the student needs analysis stage, then the virtual media product development stage and student trials, excellent results were obtained with the criteria that the VR media developed was feasible to be supporting teaching material for teachers. The teacher's need for learning media, namely media that can facilitate students' understanding, attract attention, and media that are easy to use for students to find information. The needs of students for media are media that are interesting and not monotonous in studying human anatomy, because many terms are not understood. Product design also pays attention to core competencies, basic competencies, indicators and learning objectives in the 2013 curriculum.

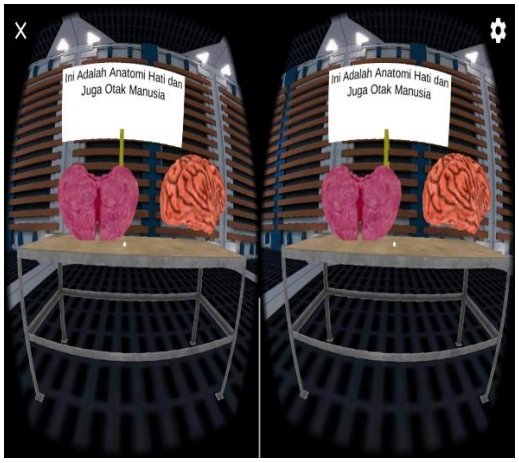
In Figure 4 bellowed, for part (a), this is a visualization of the anatomy of the human body using virtual reality media. In the learning process it is very helpful for teachers in explaining material to students. With VR media, students can easily visualize the anatomy of the human body, so that they can receive the learning process better. In the picture part (b) this is a visualization of the human heart and brain, this is a medium that supports explaining the anatomy learning of the organs in the human body. In the picture part (c) is a visualization of the human right and left brain, this is also the hardest part to explain directly, but with VR media this will help teachers and students in the learning process. In the picture part (d) is a visualization of the palcenta which is part of the metabolic process in the human body and includes an important part of the body in the human body.



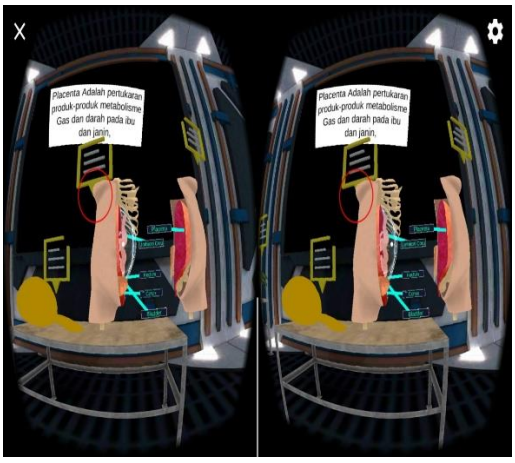
a. Anatomy of the human body



c. Right and left brain anatomy



b. Anatomy of the human heart and brain.



d. Parts of the placental system

Figure 1. Virtual Reality Anatomy Lab

In figure2 showed, Media experts validate the development of virtual reality-based learning media, material experts (Muruganantham, 2015). For the feasibility of media products, the teacher assessed being tested on students. The following shows the average percentage assessment of media experts, material experts, teachers, and students.

The researcher validated the material expert using a questionnaire instrument. The following is the percentage of results from material experts that can be seen in Figure 2. Based on the results of the data percentage of media experts above, it can be assessed from several aspects. In the Interface aspect, a percentage of the assessment was obtained by 100% with the criteria "Strongly Agree" for the Visualization aspect, a percentage of 91% was obtained with the criteria "Strongly Agree," then the Audio aspect obtained a percentage of 75% with the criteria "Agree," and for the Animation aspect it was obtained a percentage of 75% with the criteria "Agree". Of the four aspects of media that have been tested by experts and the test results are also very good, so we found that this VR has met the criteria for learning support media needs for elementary school students. Although there are some areas that still need to be improved after the assessment of media experts.

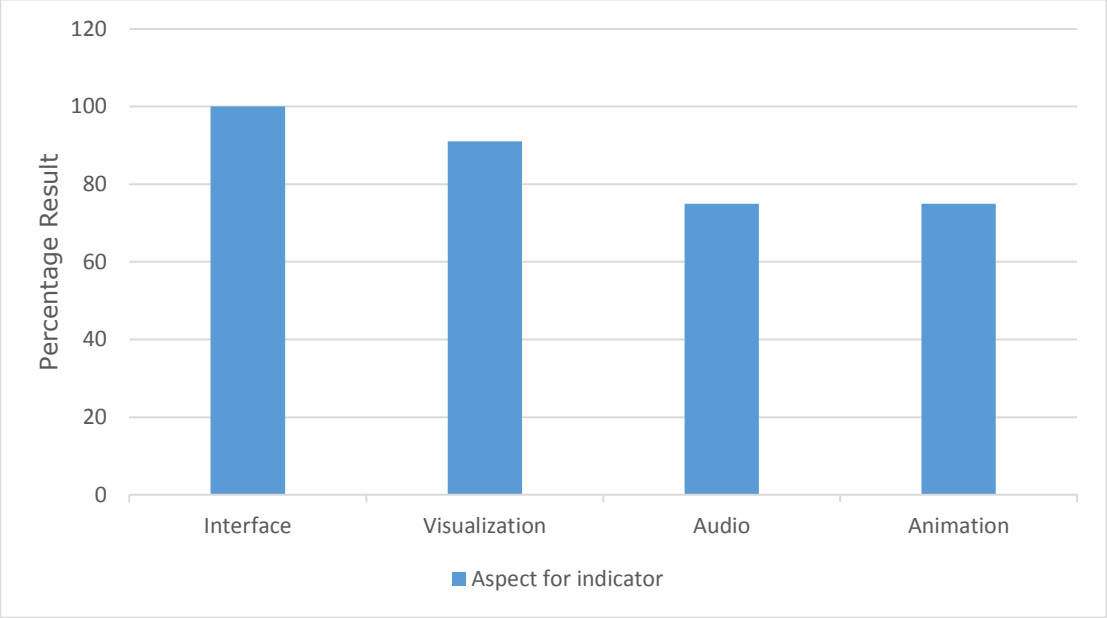


Figure 2. The percentage diagram of the assessment by media experts

Obtained the average percentage of perspective is 85% with the criteria "Strongly Agree". In accordance with the findings of research by (Jasuli & Fitriani, 2018) that the media created meets the standards as teaching material for students. In previous research by (Wulandari, et al., 2020), VR media which was validated by experts showed a value of 89.8% with very suitable criteria to be used as teaching materials for students.

The next step after validating media experts and material is to test the feasibility of learning media products based on virtual reality to teachers. The following is the result of the teacher's product feasibility test percentage, which can be seen in Figure 3. From the results of the percentage of material expert data above, it can be seen from several aspects. In the material aspect, the percentage of the assessment was 83% with the criteria "Agree", for the visualization aspect, a percentage of 94% was obtained with the criteria "Strongly Agree," then the evaluation aspect obtained a percentage of 100% with the criteria "Strongly Agree". Obtained an average percentage of the perspective of 92% with the criteria "Strongly Agree". With the results of the material expert validation test, from three content aspects such as material, display and evaluation, it shows that the results are good and meet the standards of learning materials for elementary school students.

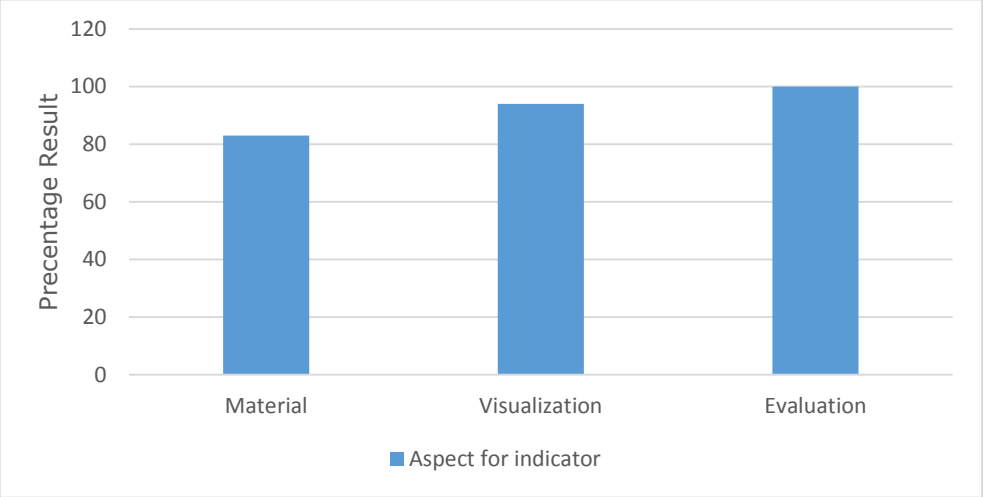


Figure 3. The percentage diagram of the assessment by material experts

There are things that need to be fixed before they are tested on students and further complement the existing deficiencies. Previous research by (Supriadi & Hignasari, 2019a) also showed that the expert test results were 80.5% with the material criteria in VR media very suitable for use as teaching materials for elementary school students. Another finding by (Pradnyana, et al., 2017), found that the material in VR was good for use in the learning process.

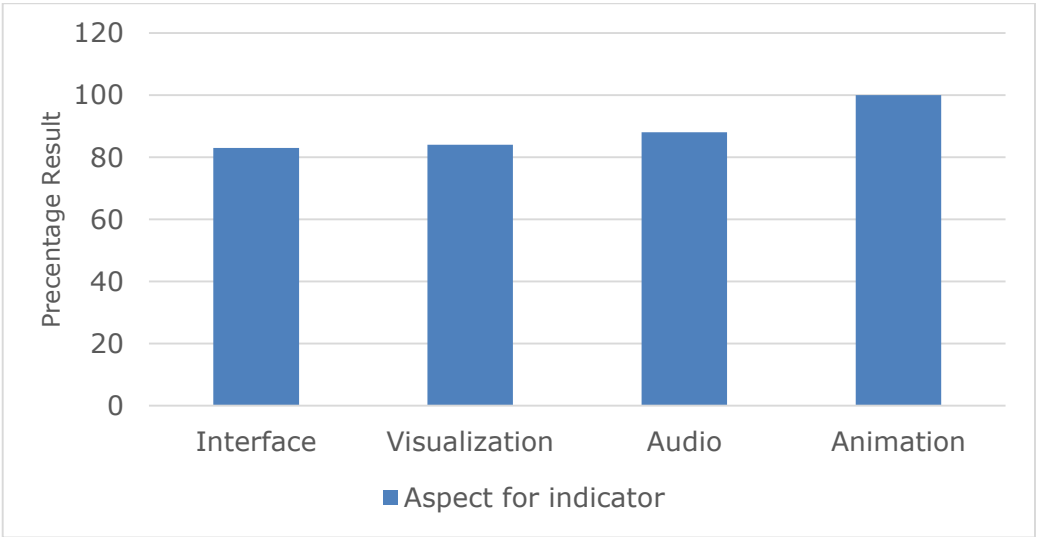


Figure 4. Diagram of the results of the feasibility test for media products by the teacher

In Figure 4, based on the data, the percentage of teachers can be assessed from several aspects. In the Interface aspect, the percentage of assessment is 83% with the criteria "Agree" for the Visualization aspect, the percentage of 84% is obtained by the criteria "Agree". Audio aspect obtained 88% with the criteria "Strongly Agree", and for the animation aspect obtained a percentage of 100% with the criteria "Strongly Agree". Obtained an average percentage from the perspective of 89% with the criteria "Strongly Agree". The class teacher provides that the VR media is in accordance with the student's

character and will be very helpful in explaining abstract teaching material and makes it easier for students to imagine and visualize directly. In previous research, the results of the feasibility test by field teachers conducted by (Purwati, et al., 2020) found the feasibility of VR as a medium for teaching materials in elementary schools in science learning. The findings of previous research are that VR media can help teachers in teaching especially for abstract teaching materials, this was said by (Supriadi & Hignasari, 2019b) who are teachers who also use and validate VR media.

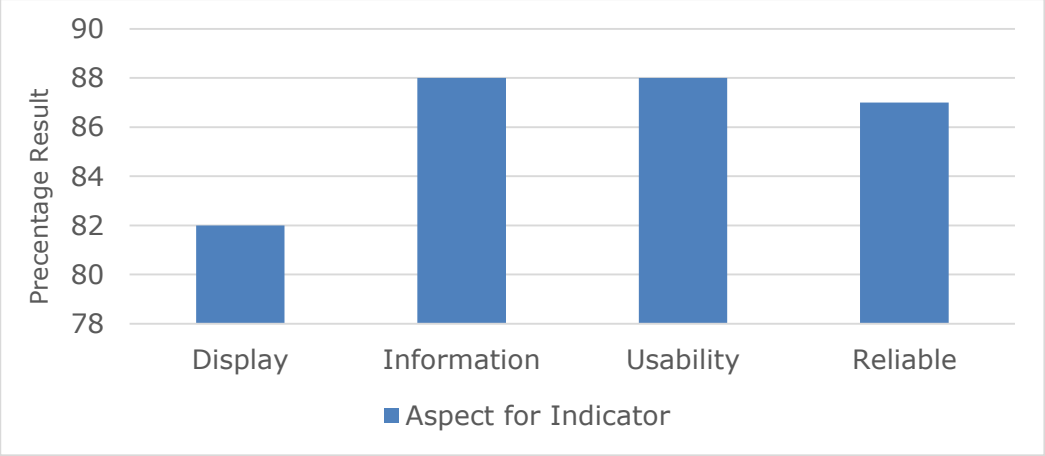


Figure 5. Diagram of the results of product trials by students.

Based on figure 5, after testing media products by students, the percentage of results were obtained from several aspects. In the Display aspect, the percentage of the assessment was 82% with the criteria "Agree," for the Information aspect, a percentage of 88% was obtained with the criteria "Strongly Agree," then in the Usability aspect, a percentage of 88% was obtained with the criteria "Strongly Agree," and for the Reliable aspect obtained a percentage of 87% with the criteria "Strongly Agree." Obtained an average percentage of the perspective of 86% with the criteria "Strongly Agree". Of the four aspects that have been assessed and the results are very good so that the VR media is able to get a good response after students use it in the learning process. This proves the feasibility of meeting the needs of students to learn.From the percentage results obtained from several assessments on these aspects, it can prove that virtual reality-based learning media on Human Anatomy material in grade V Elementary Schools are feasible and can be used as an alternative to improve understanding of the material in Natural Science learning in Elementary Schools, able to attract interest and motivate students in learning (Nadiyah & Faaizah, 2015) by the findings by (Arkün & Akkoyunlu, 2008), aspects of the results of the 21 students' assessment obtained a percentage in each aspect with the criteria Strongly Agree.

Conclusion

Based on data from the research and discussion results described, it can be concluded that the development of virtual reality-based learning media on Human Anatomy material for grade V Elementary School uses the ADDIE development model. Moreover, the final product is learning media based on virtual reality, which contains material about Human Anatomy. The application of stages in the development of virtual reality-based

learning media on Human Anatomy material for grade V Elementary Schools is feasible to use after a product trial was carried out on 21 students at SDS Muhammadiyah 9 Jakarta with the criteria being strongly agreed. For further research, it may be tried out for other subject matter.

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