



Virtual Reality as a Media for Learn Animal Diversity for Students

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ABSTRAK

Dalam proses pendidikan, peserta didik menghadapi berbagai masalah salah satunya sulitnya memahami materi karena kompleksitas materi. Saat ini mulai dikenalkan media berbasis teknologi baru yang membantu peserta didik dalam proses belajar, seperti virtual reality (VR). Penelitian ini bertujuan untuk menghasilkan produk berupa media pengembangan virtual reality sebagai media pembelajaran keanekaragaman satwa. Jenis penelitian ini yaitu pengembangan dengan menggunakan desain model 4D. Metode pengumpulan datanya menggunakan non tes dengan instrument penelitian yakni angket validasi ahli, dan angket validasi pengguna serta Teknik analisis datanya menggunakan analisis deskriptif untuk menggambarkan hasil angket yang didistribusikan kepada ahli, praktisi maupun siswa sebagai subjek penelitian yang terdiri atas ahli media, ahli materi, praktisi dan siswa. Hasil dari uji kelayakan produk yang telah dilaksanakan pada ahli media, ahli materi, dan siswa mendapatkan banyak tanggapan positif, sehingga dapat disimpulkan bahwa media virtual reality keanekaragaman hewan ini layak digunakan dalam pembelajaran. Media ini memberikan kemudahan pada siswa dalam memahami keanekaragaman satwa dan memberikan daya tarik untuk siswa sehingga timbul rasa ingin belajar yang meningkat.

ABSTRAK

In the educational process, students face various problems, one of which is the difficulty in understanding the material due to its complexity of the material. New technology-based media are being introduced that help students in the learning process, such as virtual reality (VR). This research aims to produce a product in the form of virtual reality development media as a learning medium for animal diversity. This type of research is developed using a 4D model design. The data collection method uses non-test with research instruments, namely expert validation questionnaires and user validation questionnaires. As well as data analysis techniques using descriptive analysis to describe the results of questionnaires distributed to experts, practitioners, and students as research subjects consisting of media experts, material experts, practitioners, and students. The results of the product feasibility tests carried out on media experts, material experts, and students get many positive responses. So it can be concluded that the virtual reality media of animal diversity is suitable for learning. This media makes it easy for students to understand the variety of animals and provides an attraction for students so that an increased desire to learn arises.

1. INTRODUCTION

Technology and information is currently developing rapidly. The use of technology and information is not only limited to means of communication or entertainment, but can be used in various fields, one of which is in the field of education (Prihantoro, 2018; Shoraevna et al., 2021). Education is one aspect that can provide changes in life, apart from being a very important aspect for every country to be able to develop rapidly, education must also be adapted to the times because keeping up with the times

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can make students more motivated in learning (Batsila, 2020; Ilic, 2021). Along with emerging technological developments such as the internet, the current learning process has maximized existing information technology both from elementary school to university (Camilleri & Camilleri, 2017; Shatri, 2020). One of the uses of information technology in education is as a learning media to support the learning process in schools (Astriyani & Zahra, 2021; Raji, 2019; Shoraevna et al., 2021). The use of learning media in the learning process can have the effect of increasing the desire to learn and can have a psychological impact on students (Kareem, 2018; Kuswanto et al., 2021; Ziadat, 2019).

Learning media always follow technological developments, ranging from print technology, audio-visual, computers to the combined technology of print and computer technology. However, in reality, there are still many media animations in the technological era that have not been able to bring users to as if entering the animation given because users cannot directly feel the environment in the animation if only by using the sense of sight (Amelia et al., 2021; Serin, 2020). So with an incident like that it would be more interesting if the animation was collaborated with virtual reality (VR) technology. In the 21st century Virtual Reality is one of the latest technological trends that have been used in every field of human needs, including education (Elmqaddem, 2019; Rashid et al., 2021).

Virtual reality (VR) is the use of computer technology to create a simulated environment that can be explored in a 360-degree angle, the real environment in the real world will be copied into a virtual environment. The reason for choosing Virtual reality is due to its very high ability to visualize objects close to their original form. VR will place users in a virtual environment resulting from a computer simulation (computer-simulated environment) to provide the experience of interacting with virtual objects. VR elements consist of virtual world (virtual world), immersion (real sensation), sensory feedback (sight, hearing, touch) and interactivity (interaction) (Çoban & Göksu, 2022; Mariscal et al., 2020; Serin, 2020). By using Virtual Reality, it can make students remember, understand and focus more quickly on the material (Çoban & Göksu, 2022; Kamińska et al., 2019; Molina-Carmona et al., 2018). Virtual Reality has the advantage of attracting students to a new world and being able to increase the effectiveness of the learning process in the classroom (Sattar et al., 2019; Vergara et al., 2019). So far, what has happened is that the activities carried out by students are limited to remembering and reading books and listening to the subject matter delivered by the teacher. Passive activities become boring for students. The use of VR in the learning process makes it very appropriate to use because it makes learning more meaningful (Raja & Priya, 2021; Shin, 2017). Given that students are now a digital native generation, they are more interested in learning to use technology media than only using traditional media. Virtual Reality can also improve student learning outcomes and skills, this is because students find it easier to learn the material provided and the learning process in class is not boring (Molina-Carmona et al., 2018; Paszkiewicz et al., 2021).

In elementary school learning there are science subjects that are integrated with thematic lessons. Natural Science is the ability to interpret the universe systematically and develop a scientific interpretation of the phenomena of the universe in the form of facts that are proven to be valid. Broadly speaking, science has three elements, namely: the first is the scientific process, such as identifying, classifying, guessing, designing, and scheduling experiments; the second is a scientific product, such as principles, suggestions, laws, and theories, and the third is a scientific attitude, and the third is an act of finding out, carefully, optimally, and honestly. The three elements are interrelated with each other. Thus, science is not just a collection of skills or materials. Science learning aims to warm the curiosity of students, expand scientific thinking capabilities. Science learning is not based on drafts, but presents real expertise in the expansion of products, processes, scientific actions, which are increasingly widening to create scientific literacy (Dwi Apriliani et al., 2019; Imanuel, 2015).

In science subjects that are integrated with thematics, there is the theme of living things. Materials that are associated with the diversity of animals and plants around and examine the relationships that occur between living things (Molina-Carmona et al., 2018; Pertiwi et al., 2018). It aims to make students. In this material, students are expected to be able to classify and understand various types of animals that exist around the environment and be wiser towards the environment. Based on the learning that has been done, the media used by students is in the form of textbooks that contain pictures that do not provide a detailed description of the material, so students have difficulty classifying and understanding the themes of living things and also not being able to pump up the enthusiasm for learning from students who are very bored with the package book media (Fitria et al., 2017; Nur Jannah, 2020). Thus, learning objectives are difficult to achieve. In addition, in the elementary school environment, technology is still not fully utilized. The following are facts in the field related to learning activities at the elementary school level: (a) less than optimal in delivering material that is very difficult to present in class; (b) there is no available learning media that can facilitate the characteristics of students at this time; (c) less than optimal in utilizing technology that is more modern and in accordance with the current learning styles of students.

To achieve quality learning, of course, there must be innovation in the use of technology in learning media. Thematically integrated science learning in elementary schools must be more focused so that students are able to apply it in real life. The problems described above can conclude that primary school educators need learning media that can assist educators in explaining material that is difficult to present in the classroom (Cvetković & Stanojević, 2017; Ören, 2019). Educators also need learning media that can improve learning outcomes and are attractive to students and in accordance with the learning desires of students who currently prefer to study by using tabs or smartphones than other learning media (Pinto da Mota Matos et al., 2016; Qodr et al., 2021; Roemintoyo & Budiarto, 2021). It can be seen from the various relevant studies that have been carried out related to learning media innovation, especially an ICT-based learning media in the Virtual Reality (VR) format which also has a positive impact on student learning achievement, moreover VR is very flexible and can be operated via smartphones (Budi et al., 2021; Çoban & Göksu, 2022; Jang et al., 2021; Villena-Taranilla et al., 2022). Referring to the development of technology leading to digitalization, learning should now be integrated with ICT starting from the time students sit in elementary school (Har et al., 2019; Machmud et al., 2021). This research will focus on material that is prepared and accompanied by research subjects who are still in elementary school, given the importance of digital literacy, ICT literacy in order to introduce ICT to students since they were in school.

From some of these research results, it is important to integrate ICT into learning activities, especially in the form of optimizing learning media. It can be seen that there are many benefits that arise as a result of the use of virtual reality for students, however, it seems that there are still very few researches on virtual reality for basic education that raise themes or materials regarding animal diversity. In fact, the introduction of animals to students will be able to bring up an attitude of love for the environment so that students can later gain initial knowledge about various kinds of animals that are obligatory to be preserved and animals that can be consumed. Therefore, this material becomes very important so that it can then be packaged with the integration of ICT in it. Thus, this research becomes very useful and has the latest innovations related to packaging digital subject matter regarding animal diversity for students in elementary schools. So with this educational phenomenon, the design of VR-based media to study animal diversity was held. The purpose of VR itself is to provide a real experience for users and summarize an object that is too large and dangerous so that it can be displayed directly in learning. It is hoped that with this research in the world of education, it can be more developed with the times and can make more use of technology in education.

2. METHOD

This research belongs to the type of research and development (Research and Development or R&D) that uses a 4-D development model (Define, Design, Develop, Disseminate) (Ristante et al., 2020). This model was adopted with the aim of developing a Virtual Reality product for Animal Diversity for Elementary School students that is suitable for use in the learning process. The research procedures that will be carried out through the adoption of this 4-D model are; 1) Define, which is to define the identification of various needs both in terms of students, assignments or learning curricula, material analysis, and analysis of learning objectives. 2) Design, the activities that will be produced are choosing the format and type of media, designing product drafts and designing initial products. 3) Develop, in this section the initial product that has been designed is then validated by media experts, material experts, teachers, students and product revisions to determine the level of feasibility. 4) Disseminate, after the product is revised and the feasibility results are known based on an assessment by media experts, material experts, and teachers, the developed Virtual Reality product can be disseminated to teachers in schools.

In this study, the dissemination stage was not carried out so that the distribution stage was only limited to the distribution of Virtual Reality to teachers who teach animal diversity. The subjects of this study were taken from elementary school students in the city of Solo, with a total of 15 students. In addition, 5 classroom teachers became the subject of research because they played a role in providing an assessment of the developed Virtual Reality product.

The research instrument used in this research is a needs analysis questionnaire and observation sheet for the define stage as the first step, namely needs analysis, the next instrument is a validation sheet in the form of a response questionnaire for media experts, material experts, teachers and students. The research instrument in the form of a validation sheet for material experts and media experts was adopted and modified from research instruments that have been carried out by (Ramadhani & Muhtadi, 2018), the media expert assessment sheet consists of two aspects of assessment, namely: the display aspect which is composed of an opening component, a component display design, audio component, video component.

The next aspect is the program aspect which is composed of operating components and navigation components, which can be seen in Table 1.

Table 1. Media Expert and Teacher Assessment Instruments

No	Aspect	Component
1	Display	Opening Component Component Display Design Audio Component Video Component
2	Program	Operating Component Navigation Componen

Meanwhile, the validation sheet for material experts consists of two assessment aspects, namely: learning aspects and material or content aspects. Each of these aspects contains components which are composed of several points of assessment indicators. Validation sheets were distributed to two materials experts and two media experts. The following is a material expert validation instrument contained in Table 2.

Table 2. Material Expert and Teacher Assessment Instruments

No	Aspect	Component
1	Learning	Learning objectives Usage Example Material Depth
2	Content Apect	Media Functionality Material Mastery

Analysis of the data used for processing the data from the needs analysis using descriptive analysis, by explaining the results of the identification of the distribution of the needs analysis questionnaire and the elaboration of observations in the learning process (Gunawan, 2013; Widoyoko, 2012). Meanwhile, in order to develop appropriate Virtual Reality for the learning process, assessment or validation process as an effort to determine the level of product feasibility using descriptive statistical analysis techniques, this analytical technique aims to process data obtained through the instrument into a description of the average score. The results of the assessment related to validation are calculated as the average number and interpreted into the eligibility criteria (Rejekiningsih et al., 2021), which are shown in Table 3.

Table 3. Validation Score Conversion

Average Score	Category	Conversion
$X > 4,2$	Fine	Feasible
$3,4 < X \leq 4,2$	Good	
$2,6 < X \leq 3,4$	Enough	
$1,8 < X \leq 2,6$	Less	Not Feasilbe
$X \leq 1,8$	Very Less	

3. RESULT AND DISCUSSION

Result

Define Stage. At this stage, the results of the analysis of the learning needs of animal diversity are obtained, through observation and questionnaires. The results of the observations show that the teacher carries out learning activities with the stages of opening, content, and closing. Based on these observations, information was obtained that the use of learning media was still limited to print modules provided by the government, even though students felt they were already familiar with the use of computer and smartphone technology. However, teachers are still unable to optimize the utilization of this potential to provide innovation to the learning process.

Through the distribution of a needs analysis questionnaire consisting of several questions related to the use of instructional media, obtained information that a number of 15 students responded 'agree' if the learning process had been using the print module. Meanwhile, the needs analysis questionnaire also identified the competence of students in operating computers, a total of 12 students had 'very good' abilities, 2 students had 'good' abilities and 1 student had 'enough' abilities in using smartphones.

Meanwhile, as many as 5 classroom teachers gave a very good response in operating the computer. Based on the questionnaire distributed to students regarding the need for an innovation to the learning media used, namely virtual reality showed good results, this was based on the responses of 15 students who stated 'agree', 5 students responded 'strongly agree' and 5 The class teacher gave a very agreeable response if the learning of the theme of animal diversity was supported by virtual reality that can simulate animals that are difficult to find. Based on the results of the needs analysis that has been carried out, virtual reality is important to be developed as a learning medium. This can be seen through the results of the identification of needs that have been carried out both in terms of student characteristics, student acceptance, and the use of learning media by teachers.

Design Stage. Based on the results of the needs analysis carried out at the define stage, at this stage the researcher formulates and produces several outputs, namely, 1) flowchart development, 2) storyboarding, and 3) the type and format of the application that will be used to make the initial virtual reality product before being tested to experts and teachers at a later stage. Flowchart virtual reality animal diversity is show in Figure 1.



Figure 1. Flowchart Virtual Reality Animal Diversity

The Develop stage is the development of virtual reality products which contains several activities, including being tested for feasibility by media experts, material experts, educators on animal diversity subjects. The following describes the results of the assessment by each validator and educator. The assessment carried out by media experts consists of two people, namely media validator I, and media expert validator II with validator criteria, namely, 1) Educators have at least a Masters degree in Educational Technology/Multimedia, 2) have experience as a media expert validator at least four years, 3) have teaching and research experience in the fields of learning media, interactive multimedia, audio-visual media, educational technology for a minimum of four years. The results of the assessment of the Animal Diversity Virtual Reality product by validator I and validator II will be presented in Table 4.

Table 4. Media Expert Validation Results

No	Indicator	Experts	
		1	2
1	Selection and combination of cover displays	5	4
	Materials used	5	5
	Selection of text type and size	5	5
	Selection of supporting images	5	5
	Background selection	5	5
	Button icons	5	5
	Selection of the type of audio / music	5	5
	Video type selection	5	5
	Student control	5	5
2	Ease of exiting the program	5	5
	Ease and control of the program	5	5
	Interactivity	5	5
	Feedback	5	5
	According to the flowchart	5	5
Total Score		70	69
Average Score		5	4,9

Base on [Table 4](#), overall validation from the first media expert that the media was included in the "Very Good" category with an average score of 5 While from the second media expert that the media was included in the "Very Good" category with an average score of 4.9. Information that the animal diversity virtual reality product developed has the quality of display design, use of audio, and video quality which are included in the 'excellent' qualification. As the results of the assessment on the aspect of the display and aspects of the program get an average score of 5 and 4.9 by each validator. So that the total score for all aspects and media experts is 4.95 which is included in the 'very good' qualification. In addition, qualitatively the validators of media I and II provide input in an effort to improve the quality of the display and navigation of virtual reality products.

Furthermore, material expert validation is carried out by the validator with the criteria; 1) Educators have at least a master's degree, in the field of elementary school education/biology education. 2) have experience teaching in the field of education in the field of elementary school education/biology education for a minimum of four years. The results of the validation of material experts I and material experts II will be presented in [Table 5](#).

Table 5. Material Expert Validation Results

No	Indicator	Experts	
		1	2
1	Contents	5	5
	Conformity of content with KD	5	5
	The truth of the concept of Animal Diversity is easy to understand	5	4
	The suitability and accuracy of the image illustration with the material	5	5
	Material The characteristics of living things are explained clearly	4	5
	<i>Virtual Reality according to Animal Classification material</i>	5	5
	<i>Virtual Reality according to Animal Growth material</i>	5	5
	<i>Virtual Reality according to Animal Needs</i>	5	5
2	Benefit	5	5
	The use of Virtual Reality media can be used as a learning supplement	5	5
	The use of Virtual Reality media can minimize misperceptions about the concept of Animal Diversity in students	4	5
	The use of Virtual Reality media can make it easier for teachers to deliver material	5	5
Total Score		58	59
Average Score		4,8	4,9

Through [Table 5](#). Information is obtained that the VR product developed has a learning quality which includes components of competence, introduction, learning process and evaluation which are included in the 'very good' qualification. This is shown through the results of the assessment which got a score from the first material expert that the material on the media was included in the "Very Good" category with an average score of 4.8. Meanwhile, from the second media expert, the material in the media was included in the "Very Good" category with an average score of 4.9. The total average score of the two experts is 4.85 which indicates the "Very Good" category. Assessments and inputs from media experts and material experts become the basis for developers to make improvements both in terms of appearance, navigation and material strengthening. VR display that has been revised based on input and judgment from each expert is show in [Figure 2](#). The result of the next assessment is an assessment by two learning practitioners, namely the elementary school class teacher. Data on the results of the assessment by educators is presented in [Table 6](#).

Table 6. Practitioner (Teacher) Validation Results

No.	Indicator	Expert 1	Expert 2
1.	Thumbnail display selection and combination	3	4
	Selection of text type and size	5	5
	Selection of supporting images	5	5
	Selection of audio/music type	5	5
	Ease and control of the program	5	5
2.	Interactivity	5	5
	Student control	5	5
3.	Clarity of learning objectives	5	5
	Ease of choosing a menu or study material	5	5

No.	Indicator	Expert 1	Expert 2
	Oral evaluation questions	4	4
	Material quality	5	5
4.	Illustration used	5	5
	Language use	5	5
Total Score		62	63
Average Score		4,7	4,8

Base on Table 6 show overall validation from the first expert practitioner that the media & materials are included in the "Very Good" category with a score of 4.7. Meanwhile, the second practitioner expert stated that the media and materials were included in the "Very Good" category with a score of 4.8. The next stage is a trial by students as media users. Student assessments were included in a large-scale trial conducted on 15 elementary school students. A total of 15 students have given an assessment on each aspect, this aims to determine the level of feasibility of the VR products that have been developed. So that the overall results of student assessments in field trials which were attended by 15 students on the feasibility level of VR products were 4.5 out of 5.0 included in the 'Very good' category and declared 'feasible' to be used as learning media in the learning process of animal diversity. As mentioned in the method section, this research only focuses on assessing product feasibility by material experts, media experts, practitioners, and students. So that the final result of this research is a virtual reality (VR) media that is feasible to be used as a learning medium.

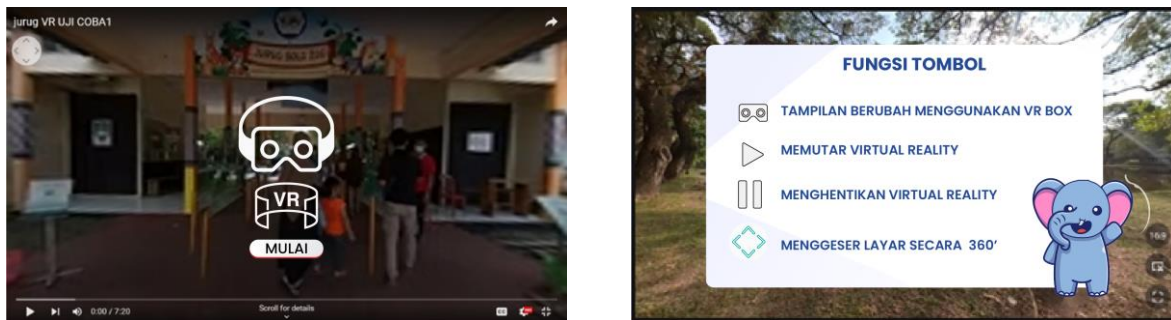


Figure 2. Main Menu Display and Button Functions Revised Version

Discussion

The developed virtual reality media has gone through several feasibility tests so that it can be said that the developed media is feasible. The presentation of the material needs to be adjusted to the conditions of the students so that the material that is considered by the students can be absorbed properly. Apart from that, the use of the term language also needs to be adapted to the characteristics of students (Marini et al., 2019; Syawaludin, A. et al., n.d.). Science has four elements, the first is attitude, the second is process, the third is product, and the fourth is application. Of all these elements can not be separated because it has become a feature of science. In the learning process at school, these elements are expected to appear so that no features of science are lost so that students can feel a comprehensive learning such as analyzing the symptoms that occur and being able to find current facts (Margunayasa et al., 2019; Membiela et al., 2022).

The results of the study successfully showed that the media developed in the Virtual Reality (VR) format was considered feasible to be used as a learning medium, this of course cannot be separated from the needs analysis activities carried out and planning according to field needs where this step is important as a start in development of learning products (Budiarto et al., 2021; Doğru, 2020). The average score of the assessment results of media experts, material experts, students and practitioners who successfully demonstrate the level of feasibility of the developed media cannot be separated from the identification of the feasibility theory from the research results of several studies such as those conducted by (Al-Gindy et al., 2020; Huang et al., 2020; Mulders et al., 2020).

In learning, media is needed that can support science learning, learning media is a useful tool to channel the mandate or mandate from students to students so that students' willingness to learn increases and is fascinated by the lesson. Increasing the willingness to learn is one of the goals of this development research, because encouraging students' willingness to learn is a factor that can affect the learning outcomes to be achieved from the learning objectives (Malik, 2018; Riyanto et al., 2020; Styowati & Utami, 2022). This feasibility assessment also certainly cannot be separated from the contribution of the

implementation of research at the analysis and design stages, where at the analysis stage there is an adjustment process between the characteristics of the material and the characteristics of students. So that the product developed is in accordance with field conditions and is indeed needed by students (Budiarto et al., 2021; Osadebe & Osadebe, 2020).

Learning science with the help of virtual reality can impress students, make it easier for students in the learning process, and increase students' willingness to learn. Learning media that attract students' views can increase students' curiosity about the material to be studied (Puspitasari, 2019; Kusuma et al., 2018). This attraction can be realized in the developed media, namely the development of virtual reality. Along with learning objectives that require students to be able to describe and understand the diversity of animals so that students can have a caring attitude towards the environment. Thus, virtual reality media can help students achieve learning goals (Kusuma et al., 2018; Zhang et al., 2020). Virtual reality displays the diversity of animal species in the zoo that can make the user feel like they are in a zoo environment. This virtual reality video uploaded to YouTube is of the type of virtual reality 360 which makes it easy for users to access this media, only having an internet connection (Mariscal et al., 2020; Martín-Gutiérrez et al., 2017). This virtual reality video containing the diversity of animals can be enjoyed by using virtual glasses so that users can feel the virtual reality atmosphere that has been created by the developer. Virtual reality glasses do have a function to help present the impression of virtual reality. How to use virtual reality glasses is quite easy just by attaching them to a cellphone then turning your head to the right, left, up, and down with this virtual reality sensation (Molina-Carmona et al., 2018; Muñoz-Saavedra et al., 2020).

The development of virtual reality, apart from requiring virtual reality glasses, also requires a mobile phone. By utilizing mobile phones, media can be used or accessed anywhere which makes students feel comfortable and easy in learning (Makarova & Makarova, 2018; Marta, 2019; Shatri, 2020). In some research, virtual development has the advantage that it can be used at home for independent study, in the current pandemic conditions the media being developed is compatible with the learning that is currently being implemented (Renganayagalu et al., 2021; Villena-Taranilla et al., 2022). In addition, virtual reality media can also increase the willingness of students to learn because by utilizing virtual reality videos students can feel the habitat environment of the animals that are in this development. This research will provide practical and theoretical benefits to readers, especially teachers, so that they are able to carry out research and development steps for the needs of an innovation in their learning activities, specifically in terms of ICT-based learning media innovation with virtual reality (VR) format.

Thus, the final product of this research is a program or application of learning media in virtual reality format that contains material on animal diversity. However, this research is only limited to assessing the feasibility of the final product, therefore further development is needed, especially to find out more about the proper utilization scheme for the application of this media in learning activities, especially for elementary school students as a form of empirical testing of the final product. which has been developed.

4. CONCLUSION

The challenges of teachers in providing innovation for the learning process can be overcome through the application and integration of ICT into the learning process, one of which is discussed in this study, namely the development of high-level learning media products, namely virtual reality. The results of this research are in accordance with the research objectives where the results of this research show that the Virtual Reality Biodiversity product is declared suitable to be used as a learning medium in thematic science subjects in elementary schools. In the future, this research can be used as a basis for teachers and other researchers to implement and test its effectiveness on student achievement.

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