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DEVELOPMENT OF VIRTUAL REALITY-BASED LEARNING MEDIA TO IMPROVE STUDENT LEARNING OUTCOMES IN ELEMENTARY SCHOOL

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Abstract

Educators use various methods to explain the material so that learning objectives can be achieved., one of the methods is by utilizing learning media. The purpose of using learning media in learning activities is to facilitate communication and learning. The use of media in learning activities aims to attract the attention of students and strengthen their concentration when receiving material from educators. The development of virtual reality media is an effort to realize educational goals. One of the successes of learning lies in the ability of students' learning outcomes. Learning outcomes are essential for students as a benchmark of the extent to which students understand the material delivered by educators. Virtual reality media make learning outcomes the basis of development. The purpose of this study is to develop products in the form of virtual reality media to improve the learning outcomes of elementary school students. This research is development research with the 4D development model from Thiagarajan. The development model consists of the stages define (design), design (design), develop (development), and disseminate (deployment). The tests were done in a limited environment with a total of x students divided into two classes, namely experiment and control class. Data collection instruments, in the form of a questionnaire, were distributed to experts in the material, media, and field application. Student learning outcomes of the experimental class and the control class can be concluded that the virtual reality-based learning media used in the experimental class are stated to be more effective and can improve student learning outcomes by a percentage of 100% while the control class gets 77.3%.

Keywords: Learning Media, Virtual Reality, Learning Outcomes

INTRODUCTION

The development of science and technology has influenced the development of other fields such as education. Developments in education can be seen from the changes in the quality of educators, curriculum, learning processes, learning facilities and infrastructure, learning resources, etc. The portrait of education that occurs in the school environment is not only seen as an activity of teaching teachers and students learning, but is a process of teaching and learning activities in which an educator and students must cooperate in creating an atmosphere of learning that supports educational goals in accordance with curriculum demands. Akbar (2013) states that learning will run effectively if the teacher is able to utilize learning resources and media. Teachers are required to utulize the advantage of recent technological advancements to support learning, while students are expected to be actively involved in solving the problems they face.

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Technology plays an important role in learning activities, one of which is at the level of basic education. Technology is able to provide convenience in all aspects in education. However in reality, it is still not fully utilized in the elementary school environment in the province of Bali. There are three facts in the field related to learning activities at the elementary school level: (a) the delivery of challenging learning materials in the classroom is not optimal; (b) there is no learning media available that can facilitate the characteristics of students at present; (c) the utilization of technology that is more modern and in accordance with the learning styles of students today is not optimal.

These facts give an obligation to educators to be more careful and precise in using learning media so that they can help participants during learning activities. Therefore, the elementary school teachers are requred to learn about such a media that can help them to explain the learning material that is difficult to present in the conventional classroom. It is also importan for them to learn a new way to improve the expected learning outcomes. On the other side, the learning process can become interesting for students to participate. As we can see nowadays, children prefer to learn by utilizing technologies products such as using tabs or smartphones than other learning media. In addition, the development of learning media should contain not only visual but also audio elements.

Based on the problems that have been described above, we provided solutions by developing a learning media in the form of media with Virtual Reality (VR) format. VR can help educators to explain the material with the visualization and brief description of the solar system during learning activities.

METHODS

Virtual reality refers to the use of interactive simulations for users with the opportunity to engage in environments that may look and feel similar to real-world objects and events and that might give rise to feelings of being present in cyberspace (Ghali et al., 2012).

Virtual reality is also a powerful technology for solving real-world problems today. For educational purposes in general, virtual reality has been widely proposed as a significant technological breakthrough that has great potential to facilitate learning (Sun, Lin, & Wang, 2010). One of the benefits of using virtual reality is the potential to encourage student learning retention (Chou, 2017). Virtual reality media besides containing visual elements also contain audio elements.

The research model used in this study is the 4D model from Thiagarajan, Semmel and Semmel (1974). The 4D model consists of four stages, namely define, design, develop, and disseminate. This research was carried out until the disseminate stage with a limited field testing process.

The reason researchers used the 4D model for this study was that in terms of the stages the 4D model was classified as systematic and in accordance with the stages in developing learning media. The stages of the 4D model can provide clear direction in developing a learning medium. In the 4D model there are specific stages in developing learning media, systematic,

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and in more detail. Thus the development of instructional media get maximum results.

Research and development methods use the 4D development model (Thiagarajan, S., Semmel, D., Semmel, MI, 1974). This development model includes four stages and the four stages are explained below.

Define

This stage functions to define and determine the importance of learning by examining the objectives and limits of the concepts in primary school learning that is in accordance with the basic competencies listed on the theme. Define phase also has several stages namely: (a) Front-end Analysis (initial and final analysis), (b) Learner Analysis (student analysis), (c) Concept Analysis (concept analysis), (d) Task Analysis (task analysis), and (e) Specifying Instructional Objectives (learning objectives).

Design

This stage aims to design prototypes of virtual reality media. At this stage, there are four steps, as follows: (a) Constructing Criterion-Referenced Test, (b) Media Selection, (c) Format Selection, and (d) Initial Design (initial design).

Develop

This stage aims to produce a product that will be developed. The following stages of development were carried out: first the expert appraisal (expert assessment) with the revision process; and the second stage of developmental testing. This stage aims to produce a final draft. The following stages are in the product development process.

Expert Appraisal

This stage aims to test the validity of the product being developed. The expert validation phase will produce data in the form of assessment, input and criticism from the validators. The steps taken are discussing and submitting products that are developed in accordance with media design references, materials and field application to the experts (validator).

Developmental Testing

This stage aims to get direct input in the form of assessments and comments of students towards the product being developed. Stages that will be passed include testing the product afterwards revising based on input responses, criticisms and suggestions. Product trials have stages namely individual trials, small groups, large groups and the field.

Disseminate

This stage in development research is carried out through the dissemination of products that are developed by being distributed in a small scope namely at the location of the research at the time of field trials.

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RESULTS AND DISCUSSION

Development was carried out to produce products in the form of virtual reality-based learning media. This learning media was presented in the form of an android application that can be installed and opened on an Android-based smartphone. This media presents the material of the solar system learning Natural Sciences focusing on the sun and planets subjects. The material was packaged in the form of virtual reality that can give the realistic impression to the users as if they can see directly the sun and planets in the outer space. These objects can seen through the VR Box device.

This application contains several menus that can be selected by users, i.e., ...

The validation of media experts on learning media based on virtual reality consists of 21 aspects. The result of validation by media experts is 82% or Very Valid. Material expert validation on virtual reality-based learning media consisted of 5 aspects. The results of validation by material experts are 80.5% or Very Valid. Expert validation of the application of the field to learning media based on virtual reality consists of 3 aspects. The result of validation by the field implementation experts is 88.8% or Very Valid.

The first stage in testing developed media products is the individual trial phase. Implementation of individual trials conducted on two students. Two students represent gender in that class, namely one male student and one female student. The purpose of this trial is to see the level of attractiveness and practicality of the developed media. The following percentage of individual trial results that have been analyzed, can be seen in table 1.

Table 1: Student Response Results in Individual Trials

No.	Aspects That Assessed	Average (%)	Information
1	Media attractiveness	90.6%	Very Valid
2	Practicality of Media	87.5%	Very Valid

The second step in testing the developed media product is the small group testing phase. The small group trial was carried out on six students. Six students represent the gender in the class and represent the cognitive abilities of the students, namely three male students and three female students. Three male students represent their cognitive levels namely high, middle and low levels. Likewise, with three female students who also represented high, medium and low cognitive abilities. The purpose of this trial is to see the level of attractiveness and practicality of the media. Following the percentage of small group trial results that have been analyzed, can be seen in table 1.2.

Table 2: Student Response Results in Small Group Trials

No.	Aspects That Assessed	Average (%)	Information
1	Media attractiveness	83.3%	Very Valid
2	Practicality of Media	80.5%	Very Valid

The third stage in testing developed media products is the large group trial phase. Implementation of large group trials carried out on all students. The purpose of this trial is to see the level of attractiveness and practicality of the media. Following the percentage of

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the results of the large group trials that have been analyzed, can be seen in table 1.3.

Table 3: Results of Student Responses in Large Group Trials

No.	Aspects That Assessed	Average (%)	Information
1	Media attractiveness	84.2%	Very Valid
2	Practicality of Media	80.6%	Very Valid

Student learning outcomes of the experimental class and the control class can be seen in table 1.4 which is presented as follows below.

Table 4: Percentage of Experimental and Control Class Learning Outcomes

No	Class	Average	Information
1	Experimentation Class	100%	Very good
2	Control class	77.3%	Well

Student learning outcomes of the experimental class and the control class can be concluded that the virtual reality-based learning media used in the experimental class are stated to be more effective and can improve student learning outcomes by a percentage of 100% while the control class gets 77.3%.

CONCLUSION

This virtual reality based learning media can improve student learning outcomes because the developed media has visual elements for vision and audio for hearing.

The advantages of virtual reality-based learning media developed include the following.

A. Media learning -based *virtual reality* it has a look that is very attractive and is an application that is the latest in the field of IT.

B. Media learning -based *virtual reality* is presented in the form of virtual reality so that the material system solar the sun and planets can be viewed directly by the user so that the participant students at the time of activity of learning does not envisage the shape of the sun and planets will but participants learners can immediately see its shape.

C. Media learning -based *virtual reality* it has a degree of validity are very high and meets the requirements to be used at the time of activity learning on the concept of sun and plant. The level of validity is derived from the results of the test vailiditas some experts ie expert media learning , expert matter of earning and expert application of the field and continued with the test try the product on a test try individuals, test try to group small , and test try to group large .

D. Media learning -based *virtual reality* it can improve the results of study participants learners against the material or concept that is learned when the activity of learning by trial trying to pitch that do research.

The Seybold Report
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References

1) Akbar, S. 2013. Learning Instrument Instruments. Bandung: PT Remaja Rosdakarya.

2) Alghamdi, A. & Kingdom, U. 2015. An Investigation of Saudi Teachers' Attitudes Towards IWBS and Their Use for Teaching and Learning in Yanbu. , 8 (6), 539–554.

3) Anderson, LR & Kratwohl, DR 2001. A Taxonomy for Learning, Teaching, and Assessment: A Revision of Bloom's Taxonomy of Eductional Objectives. A Bridged Edition. New York: Addision Wesley Longman, Inc.

4) Chou, CC 2017. An Analysis of The 3D Video and Interactive Response Approach Effects on The Science Remedial Teaching for Fourth Grade Underachieving Students. Eurasia Journal of Mathematics, Science and Technology Education, 13 (4), 1059-1073. https://doi.org/10.12973/eurasia.2017.00658a .

5) Ghali, NI, Soluiman, O., El-Bendary, N., Nassef, TM, Ahmed, SA, Elbarawy, YM & Hassanien, AE 2012. Virtual Reality Technology for Blind and Visual Impaired People: Reviews and Recent Advances . Intelligent Systems Reference Library, 26, 363–385. https://doi.org/10.1007/978-3-642-23363-0_15 .

6) González, MMA, Santos, BSN, Vargas, AR, Martín-Gutiérrez, J. & Orihuela, AR 2013. Virtual Worlds. Opportunities and Challenges in the 21st Century. Procedia Computer Science, 25, 330–337. https://doi.org/10.1016/j.procs.2013.11.039 .

7) Lv, Z., Li, X. & Li, W. 2017. Virtual Reality Geographical Interactive Scene Semantics Research for Immersive Geography Learning. Neurocomputing, 254, 1339–1351. https://doi.org/10.1016/j.neucom.2016.07.078 .

8) Makransky, G., Lilleholt, L. & Aaby, A. 2017. Development and Validation of the Multimodal Presence Scale for Virtual Reality Environments: A Confirmatory Factor Analysis and Item Response Theory Approach. Computers in Human Behavior, 72, 276-285. https://doi.org/10.1016/j.chb.2017.02.066 .

9) Motamedi, A., Wang, Z., Yabuki, N., Fukuda, T. & Michikawa, T. 2017. Signage Visibility Analysis and Optimization Systems Using BIM-Enabled Virtual Reality (VR) Environments. Advanced Engineering Informatics, 32, 248–262. https://doi.org/10.1016/j.aei.2017.03.005 .

10) Rohani, A. 2014. Instructional Media. Jakarta: PT. Rineka Cipta.

11) Rutten, N., Van Joolingen, WR & Van Der Veen, JT 2012. The Learning Effects of Computer Simulations in Science Education. Computers and Education, 58 (1), 136–53. https://doi.org/10.1016/j.compedu.2011.07.017 .

12) Sadiman, AS 2014. Media of Education, Understanding, Development and Utilization. Jakarta. PT. RajaGranfindo Persada.

13) Smaldino, SE, Deborah, L. & James, D. 2014. Instructional Technology and Media for Learning. Jakarta: Kencana Prenadamedia Group.

14) Sun, KT, Lin, CL & Wang, SM 2010. A 3-D Virtual Reality Model of The Sun and the Moon For E-Learning At Elementary Schools. International Journal of Science and Mathematics Education, 8 (4), 689-710. https://doi.org/10.1007/s10763-009-9181-z .

15) Thiagarajan, S., Semmel, D. & Semmel, MI 1974. Instructional Development for Training Teachers of Exceptional Children. Indiana: Indiana University