

The Development of Virtual Laboratory-Based Learning Media of Biology on The Topic of Bacterial for High School Students

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Abstract- This study aims to find out the level of advisability of Virtual Laboratory based learning Media of biology on the topic bacterial and to determine the effectiveness of the media developed on the student learning outcomes. This research method is R & D (Research and Development) which uses the Borg and Gall model. The results of percentage score in average from the material experts, media experts and instraccional expert ware 89,66% and it was categorized as extremely good, 90,48 % it was categorized as extremely good, 90,91 % it also was categorized as extremely good. The result of response estimation from three biology teachers received an average score of 4,39 and it was categorized as extremaly. The results of individual trials on the learning media developed are in good categorized an average score of 4,19. The results of small group trials on the learning media developed it was categorized good with an average value of 4,22 and subsequently the result trials of limited group to the learning media developed it was categorized as good with average value of 4,26. The sample consists of two classes, class X MIPA 3 amounts 26 students treated as the control group and class X MIPA 2 amounts 25 students treated as the experimental group as well. The average value of control class learning outcomes is = 80,38 and the average learning outcames of the experimental class is = 90,80. The results of hypothesis trial showed that ware significant differences between the control class and the experimental class with sig. (2 tailed) of ,000 < 0,05, that means students learning outcomes with virtual laboratory media are greater than the learning outcames using the pawor point media.

Keyword: Media Development, Virtual Laboratory, Bacteria

I. INTRODUCTION

Biology is a branch of science that provides a variety of learning experiences such as understanding scientific concepts and processes. During science process activities, the existence of laboratories is very important, because through laboratory activities aspects of products, processes, and attitudes can be further developed (Gunawan, 2015). Practicum is one of the laboratory activities which is very

instrumental in supporting the success of the teaching and learning process of biology.

The importance of the science process in biology learning is also reflected in the demands of the curriculum. The latest curriculum that replaces the Education Unit Level Curriculum (KTSP) is the 2013 curriculum. The material to be studied must be in accordance with the Basic Competencies (KD) contained in the 2013 Curriculum (Permendikbud, 2014). The Basic Competence (KD) of knowledge for Archeobacteria and Eubacteria material is KD 3.4, which is to apply the classification principle to classify Archeobacteria and Eubacteria based on characteristics and forms through careful and systematic observation, and for skills is KD 4.4, which presents data on characteristics and the role of Archeobacteria and Eubacteria in life based on observations in the form of written reports.

However, there are several problems that often arise in carrying out practical activities, so teachers often do not carry out lab work. based on research Adi (2016), SMAN 2 Bondowoso was one of the schools that had difficulty doing biology practical activities because the subject of excretion systems was abstract so it was difficult to practice. The same thing was expressed by Cengiez (2010) that there were several problems faced in the implementation of practicum, among others: lack of equipment in the laboratory so that limiting teachers to do practicum, the materials used for practicum were relatively expensive and the number of students was too crowded making it difficult to check the overall performance of students.

The development of science and information technology has a considerable influence on various fields, including the learning process. Almost all learning activities and activities are now starting with sophisticated technology that has been computerized, even practice can be simulated with computer software (Virtual Laboratory). Virtual laboratory is a series of laboratory equipment in the form of interactive multimedia-based computer software, which is

operated with computer hardware and can be simulated in laboratory activities as if the user is in an actual laboratory (Santoso,2009).

From the analysis of the problems and needs of students in learning biology, especially in the material of sub bacterial material planting and staining of bacteria, as well as reviewing some previous studies, the solution found by the author was to develop learning media based on Virtual Laboratory that had never been done in the school. This is intended as a solution if actual lab work cannot be done.

II. RESEARCH METHOD

A. Time and Location of the Study

This study was conducted at MAN Insan Cendekia Aceh Timur locat, located in Jalan Medan Banda Aceh Desa Kuta Lawah Idi Rayeuk P.O. Box 24453. The research has been conducted in January to April 2019.

B. Reserch Desain

This study uses the R & D (Research and Development) method of adaptation from the Borg & Gall research model, consisting of 3 stages namely; 1) preparation stage, 2) development stage and 3) testing phase.

III. RESULT AND DISCUSSION

A. Results

1. The Results of Virtual Laboratory Learning Media Validation by Material Experts

The results of the percentage of material feasibility assessment by two material experts on the appropriateness of content, material presentation, accuracy and up-to-date of material obtained by the average is 90.25% as in Fig1

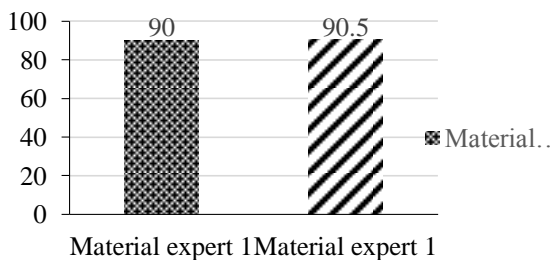


Fig 1. Percentage of expert validation of learning material on Virtual Laboratory-Based Learning Media on Topik Bacterial

B. The Results of Validation of Virtual Laboratory Learning Media by Media Experts

The results of the percentage of media feasibility assessment by two media design experts on the aspects of programming, learning design, and visual communication obtained an average of 89.66% as shown in Fig 2.

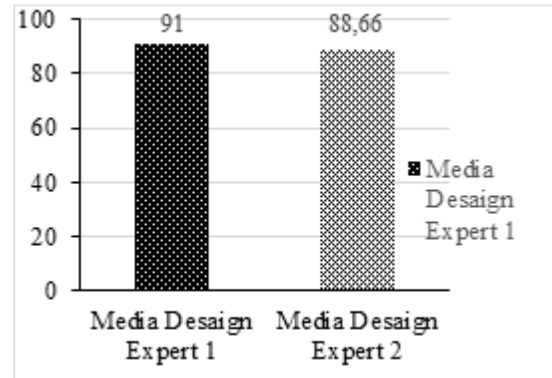


Fig 2 . Percentage of Validation of Design Expert Learning Media Against Learning Media Based on Virtual Laboratory on Topik Bacterial

C. The Results of Validation of Virtual Laboratories Learning Media by Instructional Experts

The results of the percentage of media feasibility assessment by instructional experts on the aspects of identification of learning objectives, instructional analysis and identification of learning and context with the acquisition of an average value of 91% as shown in Fig 3

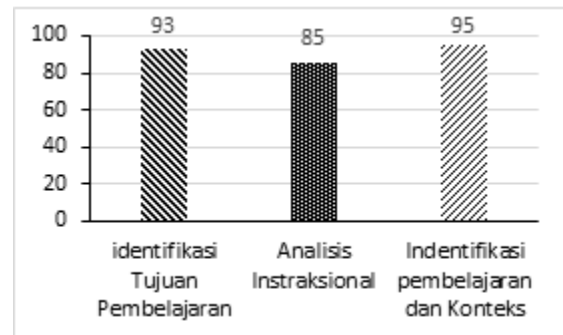


Fig 3 . Percentage of Validation of Instructional Experts in Learning About Learning Media Based on Virtual Laboratory on Topik Bacterial

D. The Results of Biological Teacher Responses to Virtual Laboratory Learning Media

The results of the assessment of instructional media by biology teachers in the form of converted values on the topic of bacteria obtained an average teacher score of 4.46 with very helpful criteria, teacher B by 4.37 with criteria very helpful and teacher C at 4.44 with criteria very helpful. as shown in Fig 4

average score was higher than PowerPoint-based learning media ($x A = 90.8 > x B = 80.38$) as shown in Fig 6

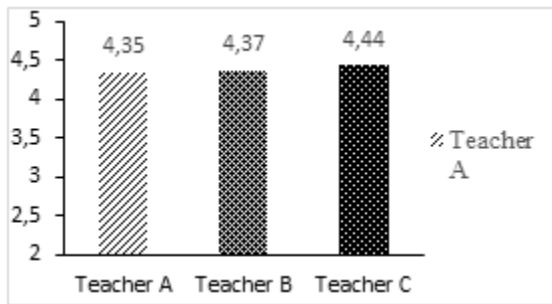


Fig 4. Graph of Biological Teacher Responses to Learning Media Based on Virtual Laboratory

E. The Result of Students' Responses on Virtual Learning Media

The testing of learning media based on Virtual Laboratory on students in individual groups has an average score of 4.19 with good categories, small group trials on average, the results of the assessment are 4.22 with good categories, and limited group trials on average the assessment results are 4.26 in the good category. This means that the learning media based on Virtual Laboratory on the bacterial material developed has been used properly in learning as shown in Fig 5.

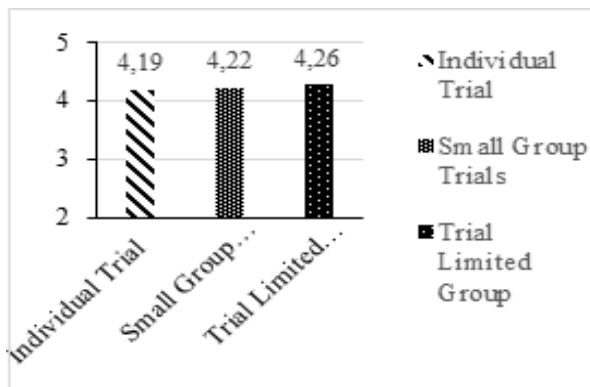


Fig 5. .Response to Aspects of Learning Media

F. Effectiveness of Using Virtual Laboratory Learning Media

The results of hypothesis trial known that $P = 0,000 < 0,05$ or H_0 is rejected and H_a is accepted, so it can be explained that virtual laboratory-based learning media on the topic of bacteria is effective to be used and applied to tenth grade students. Student learning outcomes taught by Virtual laboratory-based learning media showed that the

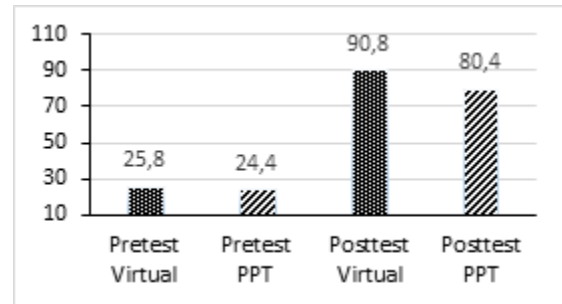


Figure 6. The result of effectiveness of Virtual learning media usage

The result was in line with the study of Nobina (2012) concluded that the effect of using synchronized multimedia could motivate student's interest to learn and had a positive effect on their academic achievement, between Biology taught by using multimedia and without using multimedia showed the extremely significant difference. Students who were taught by using multimedia showed the average score of 0,51, higher than students taught by not using multimedia with the average score of 0,23.

G. Discussion

Interesting learning media can provide an understanding of the material being taught and also very effective as a learning resource (Fadhillah, 2018). However, the problems that often arise with regard to the use of learning media, namely the availability and use of media that are still very rarely used by teachers (Daryanto, 2010). Media that is often used by teachers in learning in the form of textbooks, modules and worksheets, while visual and audio media and electronic media are still not used intensively.

This is due to the developed media has a fascinating appearance so that it can give a deep comprehension on the materials and it is very effective to become the learning sources on the topic of auditory system in living things. Learning media also presents the evaluation/exercises, feedback on students' learning performances and find out that students will be encouraged to understand the learning materials. Djamarah and Zain (2013) stated that by figuring out the result, students were encouraged to learn more actively, and if that result raised up their learning intensity would be much better.

This was also supported by other previous studies conducted by Mustikasari and Supriyanto (2012) concluded that by using Macromedia Flash Profesional 8-based

learning media, students would be more active in learning activity and their learning outcomes would achieve the 75%. Furthermore, the less of learning media usage will cause students hard to comprehend the learning materials, hence the more students use the learning media the more their self thought and idea will be built instinctively (Arsyad, 2008).

IV. CONCLUSION

The development of Virtual laboratory-based learning media on the material developed using the Borg & Gall model, through validation of material experts, media design experts and approved instructional experts is appropriate for use in the learning process. Teacher responses and student responses, both individual trials, small groups and limited groups), appropriate and effective to be used for dual class students. The virtual laboratory-based biology learning media developed showed that student learning outcomes driven by Virtual-based learning media showed an average score of $x = 90.8$ and developed by PowerPoint-based learning media showing an average score of $x = 80.4$.

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