



DEVELOPMENT OF COMPUTER-AIDED LEARNING MEDIA ON VIBRATION AND WAVE MATERIAL, IMPROVE STUDENTS' CONCEPT UNDERSTANDING GRADE 8

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ABSTRACT

This research aims to develop computer-assisted learning media that is feasible and valid so that it can visualize abstract concepts in vibration and wave material for junior high school / MTs class VIII students. The development method used in this research and development is the Four-D Model by taking three steps, namely defining, designing, and developing. The feasibility of the developed media can be known from the validation test and the readability test. The results of the development in the form of computer-aided learning media on vibration and wave material for students in grade VIII SMP / MTs. The results of the feasibility test by media experts obtained an average score of 93.25% which means very feasible. The test results by material experts obtained 20 correct concepts, all of which are very feasible, and the results of the readability test obtained an average score of 93.75%, all respondents can accept this media well, which means it is very feasible. Based on the results of the assessment, in general, the learning media developed has met the criteria very feasible so that it can be said that learning media can help improve concept understanding for students.

I. INTRODUCTION

Learning Natural Sciences (IPA) is related to how to find out about nature systematically, so that science is not only mastery of a collection of knowledge in the form of facts, concepts, or principles, but also a process of discovery. [4] A collection of knowledge can be mastered by students by mastering concepts thoroughly and being able to relate to everyday phenomena, [9] using science learning which has three abilities, namely (1) the ability to know what is observed, (2) the ability to predict what has not been observed and the ability to test follow-up experiments, and (3) the ability to develop scientific attitudes. [9]

Data in the field shows that the majority of students have difficulty in understanding science concepts thoroughly. Based on a questionnaire that has been given by researchers to ninth grade students at Tulungagung and Batu State Junior High Schools, it shows that 56.2% of students have difficulty learning science. This happens because the characteristics of thinking students can easily learn something through concrete things because of the way of thinking that is inseparable from concrete facts. [2];[5];[7] At this stage, the way students think is still concrete requires a stimulus to be able to think invisibly. [11] Science learning applied by teachers is less precise, less varied, and the teacher's teaching style is less fun for students[8] because the use of learning media in schools has not been maximized, [9][13] causing students to have difficulty in understanding science concepts. The results of interviews with science teachers at Tulungagung and Batu State Junior High Schools, the limited use of teaching aids makes it difficult for students to relate the material to phenomena in everyday life. In addition, the questionnaire results show that 84.62% of students need other learning resources to help understand the material of vibration, waves and sound. One alternative is to utilize technological developments in the form of learning media.

According to [5] lately, the use of computers for learning programs continues to increase. The utilization of animation is one of the solutions to improve students' understanding of vibration and wave materials. Computer-assisted learning in science learning is used to illustrate invisible science phenomena.[3] Computer-assisted learning media is expected to further improve concept understanding and make it easier for students to interpret the wave propagation process. Computer-assisted learning media on the theme of sound and hearing has been developed previously, but has not supported the contextual approach. Learning media on vibration and wave material develop also still has shortcomings.[6] The learning media developed is still pixel-based, so if enlarged

the resolution will break. Based on this description, it is necessary to conduct research entitled "Development of Computer-Aided Learning Media on Vibration and Wave Materials to Help Improve Concept Understanding of Students in Grade 8 SMP / MTs".

The purpose of this development research is to develop a feasible learning media on vibration and wave material for grade 8 junior high school / MTs students.

II. METHODS

This learning media development model adapts the development model namely the Four-D model or 4D model. [11] This model has four stages, which include define, design, develop, and disseminate. However, in this media development research, the fourth stage, namely disseminate, was not carried out due to limited time, cost and research labor. [11]

The trial design used in this study was a feasibility test of the product. The test subjects were one physics lecturer and one junior high school science teacher and tested on ten 8th grade students of SMPN 3 Batu who had taken vibration and wave material.

The type of data obtained from validation can be grouped into two, namely qualitative data and quantitative data. Qualitative data is obtained from responses and suggestions for improvement to the development results from both expert validators and teachers which are also listed in the questionnaire. Quantitative data is obtained based on the questionnaire scores of responses from expert validators and teachers made in the form of a Likert scale.

The data analysis technique used in processing quantitative data uses average analysis techniques. The rating scale used is 1,2,3 and 4. The range value is calculated by reducing the highest scale with the lowest scale. Determination of the length of the interval class of the rating scale is calculated using the following rules.

Based on the results of the validator's assessment, it was analyzed descriptively using a percentage. The formula used is: [3]

$$P = (\Sigma x) / n \times 100\%$$

Description:

P = percentage

Σx = number of assessment scores

n = ideal score (highest score per aspect x number of validators)

Learning media is feasible to use if the information is $\geq 50\%$. The criteria for interpreting the learning media assessment score are listed in Table 1 below

TABLE I.
 CRITERIA FOR ANALYZING THE LEVEL OF ATTRACTIVENESS OF DEVELOPMENT PRODUCTS FOR USERS[11]

Average	Description
0% – 25%	Very Unfit
26% – 50%	Not Feasible
51% – 75%	Feasible
76% – 100%	Very Feasible

III. RESULTS AND DISCUSSION

The product resulting from this development is learning media in the form of interactive learning media based on Swishmax 4 with vibration and wave material consisting of the initial part, main menu, and learning material. The initial part consists of a home page and media identity. The main menu section contains 5 buttons that will go to a specific page when pressed on Figure 1.1. Menu 1 regarding instructions for use and the function of the buttons on the media, menu 2 regarding basic competencies and objectives, menu 3 regarding material, menu 4 regarding evaluation containing practice questions, menu 5 regarding glossary and menu 6 regarding a brief description of the developer profile application. Figure 1 Application Menu



Figure 1. Application Menu

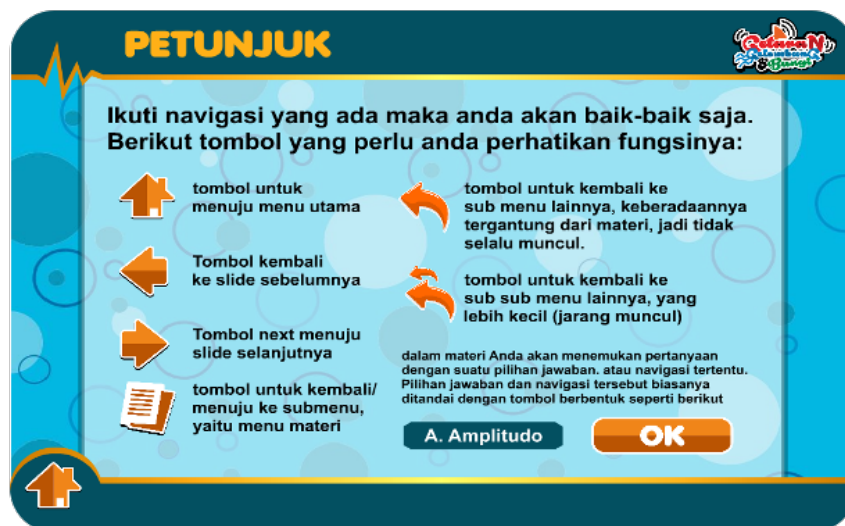


Figure 2 Instructions



Figure 3. Material



Figure 4. Vibration Material

Learning media can be used by teachers in class learning and independent learning by students. Based on the results of quantitative media expert validation, a value of 93.25% was obtained, material expert validation obtained a value of 100% and the results of the readability test by junior high school students in grade VIII amounted to 93.75% which indicates that this learning media is very feasible to use. Comments and suggestions obtained from field practitioners can be seen in Table 1. Meanwhile, comments and suggestions obtained from the readability test by junior high school students in grade VIII can be seen in Table 2.

TABLE II.
 DATA ON COMMENTS AND SUGGESTIONS BY MEDIA EXPERTS

No	Comments and Suggestions
1	The video is given a duration and given a button to play and stop
2	It is necessary to add a link to the material on the concept map as a non-linear interaction pattern
3	In the corner of the slide is given a media title
4	Answers to exercise questions in the material are given a sound when correct or when wrong
5	When displaying two videos to see the difference, the video is displayed in one slide

TABLE III
 DATA ON STUDENTS' COMMENTS AND SUGGESTIONS FROM THE READABILITY TEST

	Comments and Suggestions
1	Media is interesting and easy to understand
2	Media helps in learning
3	This media is very easy to understand.

IV. CONCLUSIONS AND SUGGESTION

Based on the results of validation and readability tests, it can be concluded that the learning media developed is feasible and can help to improve students' concept understanding. Computer-aided learning media with vibration and wave material through the development and validation stages. This learning media also needs to be applied in the learning process. Suggestions for further development are trials in a classroom lesson with the aim of testing effectiveness in helping the learning process.

The improvements made are as follows.

1. Adding different voice variations in each sub-material.
2. Provide additional animations that are more interactive in learning materials.
3. Adding games to the media to make it more attractive to users.
4. Increase the level of evaluation questions to C2-C6.

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