

Developing Physical Learning Multimedia Based on Physics Edutainment

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ABSTRACT

The research is research and development, which aims to describe the process of developing multimedia learning based on physics edutainment that fulfills the valid and effective criteria. The research design used was the DDDE model. The research subjects consisted of 2 lecturers and one teacher as a validator, 20 students as the trial subject, and one teacher as a respondent. Moreover, the research instruments included media validation sheets, educator and student response questionnaires, learning outcomes tests, and learning observation sheets. The data analysis technique by using the Aiken V index, descriptive statistics, and t-test. The results showed that the developed media was categorized as high validity for each component of validation, namely the elements of media, material, and language, with a validity index of 0.88. The developed media provided a positive effect on students in the learning process. The percentage sees it of students who gave a very positive response to the media was 55% meanwhile 30% gave a positive response. Furthermore, the results of the t-test analysis showed that the value of $t \text{ count} = 2.729 > t \text{ table} = 2.093$. So, it can be concluded that the developed media were effective in the learning outcomes of students.

Keywords: *Research and development, learning multimedia, physics edutainment*

1. INTRODUCTION

The government of Indonesian, especially the Department of Education and Culture, is always trying to improve the education curriculum, both in the levels of primary, secondary, and tertiary education. It is expected that the national education goal, which is to form quality human resources and useful for present and future development, can be achieved [1].

According to Astra et al. [2], physics is the knowledge that contains natural phenomena and interactions in the universe. The physics learning process it requires educators to show phenomena that are real through direct observation or experimental activities. Therefore students can understand the whole concept comprehensively. Physics lessons cannot be simulated because of the limitations of the laboratory.

According to Morrison & Collins [3], Physics subjects have very complex characteristics. Learning Physics involves physical interpretation abilities and skills, magnitude and unit transformation, mathematical logic, and certain numerical skills. The attributes of

Physics lessons the relatively tricky, it needs to be reflected to package the problem in Physics subject. The teachers should provide learning procedures that can help students to reformulate new information or restructuring their previous knowledge. Students should deduce and elaborate on the new information and generating relationships between new information and learners' prior knowledge.

Learning media in physics practicum is very important to help students in simulating the material. According to Hardy & Mawer [4], learning media functions in delivering messages or information about the material. Media that is well designed will greatly assist students in achieving learning goals. Each type of learning media has character, strengths, and weaknesses. Astra et al. [2] added that educational media are all kinds of components in the student environment that can stimulate students' thoughts, feelings, interests, and concerns. Hence, the learning process occurs, and the learning message can be conveyed well.

Media is a supporting factor for learning success; however, the use of media in schools, especially senior

high schools (SMA), still uses conventional media. It is monotonous such as the use of blackboards. These media are certainly limited to material presentation because the concepts cannot be presented in dynamic forms of visualization, for example, moving images. Furthermore, the subject cannot present the material that must include music/audio in the presentation of the material. The use of computers can make abstract concepts become a real concept with immovable images and moving images. Moreover, It can also make the appearance of learning media, which is more interesting.

The benefits obtained from the use of educational media are: 1) clarifying the message so that it is not too verbalizes 2) overcoming the limitations of space, time of energy and sense power; 3) generating learning passion, more direct interaction between students with learning resources; 4) enabling children to learn independently based on their visual, auditory and kinesthetic talents and abilities; 5) giving the same stimulus, equating experience and giving rise to the same perception. Furthermore, learning media on Computer-based plays a huge role in helping students to understand and master their subject matter. However, to fulfill this role, computer-based learning media must first be developed as soon as possible. Therefore, it fits the characteristics of students [4].

Based on the results of observations made in MAN 1 Polewali Mandar, the learning media used are still conventional. The teacher only used conventional learning media, and their presentation was not using the animation, moving displays and music. This limitation makes the media seen less attractive hence, as an educator, it is required to be able to present material that makes students interested in learning participation. Then one way to overcome the limitations of the form of material presentation is by using media that can simulate all physical matter.

According to Frey & Sutton [5], the media that is most suitable for use in learning is multimedia. Learning multimedia is concerned with combining images and audio. The instructional videos include written and oral narrative based on practical knowledge of the learning material. Therefore the multimedia component must be able to prevent high-level simulations that hinder the learning process

The fact shows that Physics learning has developed rapidly in various forms. Some of them can be accessed on the internet. There is a number of multimedia developed in a variety of different physics materials. Even more, there are still certain materials that are not yet available or not being supported with appropriate multimedia. Therefore, the success of learning with multimedia depends on the multimedia design that is applied. Learning will provide better results if it is designed based on the way humans learn [5].

Based on the description above, it is necessary to conduct this research. The products produced from this study are expected to be used to improve the learning process of physics. Therefore, it becomes more effective and can improve students' understanding of physics concepts. The problems described in this study include; (1) how is the process of developing multimedia physics learning based on physics edutainment? (2) how is the multimedia profile of physics learning based on physics edutainment that fulfills valid and effective criteria?

2. METHOD

This research was conducted at MAN 1 Polewali Mandar, West Sulawesi Province. The subjects of this research were 23 people who are consisting of 3 validators and 20 students as the respondents. The type of research used is Research and Development, with a development model, namely DDDE. The multimedia development using the DDDE model consists of: Decide or defining objectives and material from the program, design namely making a program structure, Develop is the production of media parts and making multimedia displays Evaluate, checking all steps of developments[6]. The steps to develop using the DDDE model can be shown in figure 1.

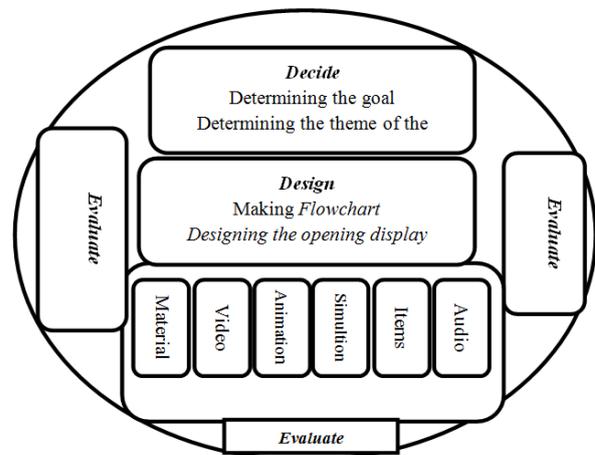


Figure 1 Development Model of DDDE

The research instruments used to consist of the validation sheet. The students' response questionnaire toward the developed product, the test learning outcomes. The data analysis technique used to consist of:

2.1. Aiken V Analysis [7]

$$V = \frac{\sum s}{n(c-1)} \tag{1}$$

Information:

V = Index of rater agreement regarding the item validity

- s = The score set for each rater is reduced by the lowest score in the category used ($s = r - lo$)
- r = The category score of rater choice
- lo = The lowest score in the scoring category
- n = The number of raters
- c = The number of categories that can be chosen by the rater

Table 1. The Category of Aiken V index

Index interval	The category
$V \leq 0,4$	Low Validity
$0.4 < V \leq 0.8$	Medium Validity
$V > 0.8$	High Validity

2.2. Proportion Analysis [8]

$$P = \frac{f}{n} \times 100\% \tag{2}$$

Information:

- P = The presentation of proportion
- f = Frequency
- n = The number of respondent

Table 2. The Criteria of Students' Responses toward the media

Percentage (%)	Information
$P \geq 90$	Very Positive
$80 \leq P < 90$	Positive
$70 \leq P < 80$	Sufficient Positive
$60 \leq P < 70$	Less Positive
$P < 60$	Negative

2.3. Test - t 1 sample [8]

This test is used to analyze the effectiveness of the media being developed. It is reviewed from the test of learning outcomes given to students. Testing is compared with the minimum graduation standard used in the research location, which is equal to 75.

$$t_h = \frac{x - \mu_0}{\frac{s}{\sqrt{n}}} \tag{3}$$

Information:

- t_h = t value calculated, hereinafter referred to as t count
- (\bar{x}) = Average
- μ = KKM determined by the researcher
- s = Standard deviation
- n = The number of students

The media was declared effective against student learning outcomes if the t count > t table at a significant level of 0.05.

3. RESULTS AND DISCUSSION

The procedure of the development goes through several stages based on the stages of the DDDE development model. The initial stage is "Decide," which discusses the determination of objectives, determining the theme of the media, and determining the ability of prerequisites. The determination of goals needs to be analyzed carefully. Therefore, it can be ascertained that learning outcomes can be improved by the use of multimedia learning based on *physics edutainment*.

Conventional learning causes students less responsive to learning. The weaknesses of conventional media are monotonous so that students do not play an active role in the learning process. The development of learning media based on *physics edutainment* can be achieved by using the program of *Macromedia flash 8* for the process of making material components, simulations, and animations. Whereas to arrange practice questions used the *iSpring Suite 8* program. Furthermore, learning media made using the *video scribe* application, and to combine all the components of the media that have been made using the *Macromedia director (finishing)*.

It will produce in one package of learning compact disc. The theme of the multimedia that will be created, namely Straight Motion, which focuses on Regular Straight Motion (GLB), Regular Changed Straight Motion (GLBB), Vertical Upward Motion (GVA) and Vertical Downward Motion (GVB). In addition to students who need to have the ability to use information technology, furthermore educators, in this case, as facilitators during the learning process. They are required to be more proficient in the use of IT. Then there must be facilities and infrastructure that will support the effectiveness of the learning process. The main tool for using this media are LCD and computers or a notebook.

The second stage is the design. In this stage, the researchers think about the characteristic of the product. It will test in schools taking into account the media, the scope of material to be published in the media, and the use of language in learning media. The researchers make outlines of multimedia content. Following this, a flowchart, display design, and storyboard are created. The display of diagrams is made to provide an overview of the flow of interactive learning media from one scene to another. A storyboard was created to describe each scene. The results that have been made at this stage are called prototypes 1. The following are the initial designs of the media developed.



Figure 2 The initial Design of multimedia physics-based physics edutainment learning, (a) start page, (b) destination page, (c) concept map, (d) material list, (e) video page, and (f) test form

The third stage is to Develop. In this stage, the researchers develop the elements in the interactive learning media needed, such as text, illustrations, material, video, animation, simulation, and audio. Following this, the researchers make interactive learning media by using software that has been determined at the *Decide* stage. The prototype of learning media was validated by three validators. Two of them are lecturers, and one is educators. Having validated the researcher corrected and added suggestions for media improvements made on the prototype 1. Finally, after the repair process, the media created will be prototype 2, which is ready to

be tested. The results of the product validation analysis developed can be described as follows:

Table 3. The Result of Validation Analysis

No.	Components	V	Information
1	Media	0.89	High Validity
2	Material	0.86	High Validity
3	Language	0.89	High Validity
Range		0.88	High Validity

The results of the analysis in table 3 show that the value of the Aiken V index for the three components that are validated is $V > 0.8$. Based on these results, overall,

the products developed are categorized as having high validity. Therefore, they are feasible to be tested.

The last stage is the evaluation stage. At this stage, the media that has been developed and declared valid, then used in the learning process as a trial material. The aim is to find out the response of media users and user learning outcomes after using the media. Based on the results, the data obtained from students' responses to the media developed, as follows:

Table 4. The Analysis Result of Student's Responses toward the Media

Interval	f	%	Category
$P \geq 90$	11	55%	Very Positive
$80 \leq P < 90$	6	30%	Positive
$70 \leq P < 80$	3	15%	Quite Positive
$60 \leq P < 70$	0	0%	Less Positive
$60 < P$	0	0%	Negative
Total	20	100%	

Based on table 4, it can be shown that the total number of students who were respondents, there were 11 people who gave a very positive response or with a percentage of 55%, six students gave a positive response with a percentage of 30%, and three students who give a positive response with a percentage of 15%. These results indicate that the developed media have a positive effect on the students when using physics learning media. Three students who gave quite positive responses gave reasons that they were disturbed by the back sound on the media. This is because the three students predominantly have a visual learning style.

Furthermore, to collecting student response data, the researchers also gave tests to the students after using the media. This aims to find out how much completeness of the students' learning outcomes, especially in the material presented in the media. The results obtained after giving the test can be shown in table 5.

Table 5. The Completeness Category of the Students' Learning Outcomes after using the media

The interval of Learning Completeness (P)	f	%	Information
$P \geq 75$	18	90%	Complete
$P < 75$	2	10%	Incomplete
Total	20	100%	

Based on table 5, it can be concluded that the developed learning media has been effective. This is indicated by the percentage of learning completeness obtained by students after learning by using media, especially in the material of Straight Motion that is equal to 90% with complete categories.

In addition, the effectiveness of learning media was also tested statistically by using effectiveness tests

(sample t-test 1). The test results can be seen in the table as follows:

Table 6. The result of the Significance Test of the effectiveness of the Media toward the Students' Learning Outcomes

Test Value = 75			
Learning Outcomes	T	df	Sig. (2-tailed)
	2.729	19	.013

Based on table 6, the value of t-count = 2.729 is obtained, and the value of t-table = 2.093. If the t-count > t-table, then the data analysis results at a significant level. As a result, effective learning media can be expressed. Hardy & Mawer [4] results show that the use of interactive learning media has an impact on students' physics learning outcomes, namely an increase in learning outcomes.

4. CONCLUSIONS

The multimedia development of physics learning based on edutainment physics in class X MIA MAN 1 Polman was carried out using the Research and Development (R & D) method, using the DDD-E model: Deciding (decision making regarding products to be developed), design (making the initial design of the product will be developed, Developed (product development through validation activities), and Evaluate (product testing).

The results of the validation sheet analysis for three validators in the very valid category, the material component in the category of moderate validity, and for language components, the category is very valid. As a result, the average media is categorized very validly and feasible to be applied in the learning process. For the questionnaire responses of students, the educator's response questionnaire, and the students' learning outcomes overall show that the media is very effective to be used in the learning process.

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