

The Concept of Physics Learning Media Based Computer Animation

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Abstract-School Physics subject is one of required subject to study by students of FMIPA Universitas Negeri Medan Physics department. This study is learned about concept, misconception, remediation, mapping concept also mastering physics concept taught at school. Mastering a way to solve misconception, giving remediation in study physics and able to explain the implementation of physics concept in daily life. Therefore, it is needed to compiled a learning media in making Physics subject become understandable knowledge, that is by using the facility such as computer technology. The subject of this research were Physics material base computer based on Newton's law about movement on school Physics subject with using macromedia flash 8 software. The material is compiled which refers to the development model ADDIE that is Analysis, Design, Development, Implementation, and Evaluation. This program tested by Physics expert and media expert to know the worthiness level of media (program) in order to get good category based on the determined criteria/indicator, then the media effective results on students study results obtain good category, which means the use of media on students is having the significance effect.

Keywords: *concept, learning media, computer animation*

I. INTRODUCTION

The world of education today shows very rapid progress in line with advances in science and technology. These developments require the preparation of learners to participate in the development of science and technology. The ability to utilize technology in educational development efforts depends on the number and ability of experts in the field of education.

Meanwhile, modern communication technology has changed the face of the world, one of which is the innovation of educational communication technology in the form of media empowerment in the form of: presentation of lessons by using various media such as computers, radio, television, movies, and so on. Today, the use of computers is increasing in the field of education, but still few educators who use the computer facilities as a medium of education. This is reinforced by the findings in several places of learning or school, for example, the utilization of computer labs in schools is not optimally utilized, only limited to word processing. In this case, the teacher mastering the subject matter is largely unable to present the form of learning in the computer, while the computer expert who is able to realize

everything in the computer does not master the subject matter. Now that needs to be considered is how to make computers be beneficial for the advancement of education (Hanggoro, 2009: 2).

Physics as a science is considered enough to play an important role, both the mindset in shaping the students into quality and applied in everyday life, because physics is a means of thinking to examine something logically and systematically. Therefore, it is considered important that physics can be mastered as early as possible by the students. Based on its development, the problems faced in physics learning are getting more complicated and require a more perfect analysis structure. The vision of the Department of Physics, Faculty of Mathematics and Natural Sciences in State University of Medan, is to be an excellent major in physics education and applied physics nationally, to indicate the importance of the curriculum relevance of Physics Department with a job field and to improve the standard of graduates through curriculum improvement (Renstra Prodi Pendidikan Physics: 2011).

In order to improve the quality standards of graduates and curriculum improvement of physics majors regularly and periodically, it needs to develop programs such as lecturing, so that the results achieved and the material presented are still efficient, effective and relevant to market demands.

The subject of Physics is one of the subjects that must be followed by the Physics education program students FMIPA State University of Medan. This course studies the meaning of concepts, conceptions, misconceptions, concept maps and mastered the concepts of physics taught in schools, mastered ways to overcome misconceptions, in physics learning and able to apply physics concepts in everyday life.

This course is given in the third semester. Supporters of this course are 1) Basic Physics I and II, 2) Mechanics, 3) Electric Circuits, 4) Measuring Tools, and 5) Modern Physics. The curriculum of Physics Education Study Program is based on a competency-based curriculum that implies mastery in learning. Assessment is given in reference to the benchmark assessment (PAP) as applied in State University of Medan. (GBPP Physics School)

The course of School Physics deals with the subject of physics in junior and senior high schools. Implementation of school physics teaching has been using cooperative model.

Discussion of each basic competence is used lecture method, discussion, Q & A, using media followed by assignment. On the other hand, students are less motivated to organize learning materials from various sources, have not used much optimal learning time outside of face-to-face hours and limited resources / books used mainly in English. As a result of this theoretical mastery as well as understanding the concept to be practiced is still lacking. This is observed when given the questions, discussion of filing and approval of the remedies of misconceptions that will be practiced still many that have not been understood.

Another indicator that shows finish optimal learning outcomes obtained by students following the school physics lecture is the acquisition of the average value per semester. The result of studying the subject of School Physics in Physics Education Program of Faculty of Mathematics and Natural Sciences in State University of Medan, Academic Year of 2010/2011 for Regular Class is A value of 2.17%, B value is 56.52%, C value is 41.30% and E is missing. Extension of A value of 1.79%, B value is 23.21%, C is 73.21% and E is 1.79% (DPNA: 2010). From the result of studying the subject of School Physics this shows that students' still have a low understanding of the physics concept.

Along with the development of technology learning activities both in the form of discussion and question and answer can be done anywhere and anytime. Thus the need for learning strategies that can support IT-based learning. One way to be able to grow the spirit and involvement of students in learning as an effort to improve learning outcomes is to create a computer-based learning media. Animation used by using Macromedia Flash 8. According to According to Astuti Salim (2011: 2) Macromedia Flash is one of the Future Splash Animator that facilitates the making of animation on the computer screen in displaying audiovisual and more interesting images.

II. METHODS

This type of research includes research development, namely the development of computer-based learning media. The subject of the study is computer-based learning media with the subject matter of Newton's laws of motion. The equipment used in this study includes hardware, computer software and questionnaires. The design of this research refers to the development of ADDIE which includes 5 stages: Analysis, Design, Development, Implementation, and Evaluation.

1. Analysis (Analysis)

This stage consists of various activities, namely: a) Needs analysis on computer-based teaching materials as a medium of physics learning. The analysis of the need for computer-based teaching materials is a program of physics learning package of Newton's principal matter of motion. b) The 2006 curriculum

analyzes the field of physics study of class X of Newton's semester about Newton's law of motion.

2. Design (planning)

The results of the analysis used as a reference in the preparation of learning media program content. The framework of the program content to describe the entire contents of the material covered in the teaching materials complete with the learning flow along with the design of computer-based teaching materials.

3. Development (production)

Activities of making physics teaching materials that refer to the Design stage.

4. Implementation (implementation)

Learning media that have been made is tested to several media design experts and physicists. Testing of instructional media is done by questionnaire test.

5. Evaluation (Evaluation)

The final process is obtained from the results of the questionnaire during implementation, at this stage improved software research results can be widely used as one of the learning media of physics. Data collection techniques used questionnaire questionnaires. (Arikunto, Suharsimi, 2006). Questionnaires used to collect data are: 1) Black Block Test questionnaire and 2) Alpha Test. Black Block Test is a test performed to show the function of the program made about how the operation and its usefulness, whether the data entry in accordance with the expected. This test is done to determine whether the program is made can be run or not, if there are still errors (errors) then the program cannot run (Nurhayati, 2006). The Alpha Test is used to invite some students to run the program, and provide a questionnaire to test the program's performance, and to be asked to provide feedback on the appearance of user friendly programs in the use of the program. In this study determined that a criterion, the media made will be improved if more than 75% answer respondents questionnaire Alpha Test is a negative answer (Nurhayati, 2006).

This study focuses more on how to develop computer-based physics-based learning media, so that the data is analyzed by descriptive percentage system. Calculates the percentage of each sub-variable by the formula: $P(s) = \frac{s}{N} \times 100\%$

P (s) = percentage of sub variable

S = total score of each sub variable

N = maximum number of scores

(Ali in Kristiningrum, 2007: 41)

III. RESULTS AND DISCUSSION

This research produces a product of Multimedia Interactive Learning (MPI) by using Macro Media Flash 8 on Newton's Law material, on Physics student of Semester III which is feasible to be used as instructional media. Multimedia is packed in the form of an interactive CD with format.exe allowing the program can be used on the computer without having to install first

1. Analysis (Analysis)

This stage of analysis is an early stage of multimedia development using macro media flash 8.

a) Curriculum analysis

The material developed in this medium is Newton's Law of motion. is the material for high school students of class X.

b) Analysis of student characteristics

Students who sit in the third semester on average have reached their teens. In accordance with the cognitive development according to Piaget in Joseph (2006), the cognitive development of children aged 11 years and over has reached the formal stage of operational meaning has increased from the operational concrete stage. hypothesis or abstract.

c) Technology Analysis

According to Riski Rahman J. (2008) Macromedia Flash is software that is widely used by web professionals because of its amazing ability in displaying multimedia, combining text, graphics, animation, sound and interactivity for users of internet animation program. Next animation compiled by combining animated scenes to be a movie. The final step is to publish the media to the desired media.

Macromedia Flash is a program that can generate small files (light) so easily accessible on web pages without requiring long loading time. Macromedia Flash generates files with the extension .fla. Once the file is ready to load the web page, then the file will be saved in .swf format so it can be opened without installing Flash software, but simply use Flash Player installed in Windows based browser.

Based on the above explanation, it can be concluded that Macromedia Flash 8 is a software capable of producing presentations, games, movies, interactive CDs, and learning CDs, as well as to create interactive, interesting, and dynamic websites. From the description above, then Macromedia Flash 8 suitable used as a tool to improve the quality of physics learning.

d) Analysis of the Use of Computers as Medium of Learning

Computers are technologies that have many advantages. According to Sutarman (2009), the advantages include data access speed, the ability to process data in large sizes, the ability to store data in large sizes, easy process data processing, and the number of computer applications that support and can be utilized. Many applications from

computers have been used for educational purposes. Development of multimedia learning that can create an active interaction between students and multimedia can help achieve more effective learning. As expressed Arsyad (2010: 9), multimedia seeks to display the stimulus (stimulus) that can be processed with various senses.

2. Design (Design)

a. The preparation of the framework in multimedia includes the intro section (opening), the core (fill), and the cover.

- 1) Intro section (opening section).
- 2) The menu page contains features for accessing multimedia content.
- 3) The newton study page contains three submenus of material, animation and exercise ..
- 4) Quiz page that aims for evaluation ,.
- 5) The quiz result page, contains the evaluation value that has been done in the user, and the user's complete information in completing the learning.
- 6) The instructions page, contains the operating instructions of the program
- 7) The compiler page, contains a brief biography of multimedia developers.
- 8) Reference page, contains a list of references in multimedia creation.
- 9) Background music control, contains features for controlling background music that can be played during multimedia use.

b. Systematic determination of material presentation

The necessary ingredients are taken from relevant sources.

c. Instrument Planning

Questionnaire instrument evaluation by media experts and material experts. The questionnaire was given to the expert when reviewing multimedia before being tested in the field. While the questionnaire after the test is given to lecturers and students in the form of a questionnaire response to multimedia. The questionnaires were adapted from the questionnaire used by Ratna (2011) in his research, then adjusted for the purposes of this study. Preparation of the problem there are 8 questions form test essays. (Product Creation).The exit button works to exit / close this multimedia. The button in question is on the main page.

d. The Closing Section

This cover section contains the outgoing confirmation view of this multimedia program. After the process of making this multimedia is completed, the multimedia in the review of media experts and material experts. Each expert fills out an evaluation questionnaire that has been compiled based on predetermined aspects. In the questionnaire also provided a field to provide comments and suggestions for improvement. Therefore, from the questionnaire will be obtained a reference to make revisions and improvements.

1) Expert Review Results

Data from the assessment of media experts and material experts in the form of suggestions, criticisms, forms of errors and suggestions for improvement can be detailed as follows:

- a) Added logo of State University of Medan on opening Flash;
- b) Change background image to be more dynamic (moving and varied);
- c) Fixed the type, color and font size are not clear;
- d) Fixed an image that does not match the material;
- e) Replace music with a fast rhythmic slow music;
- f) Fixed the order of presentation;
- g) Add a separate evaluation problem in the main menu;
- h) Fixed the look and row of the content;
- i) Silence the background music when the content is opened.

2) Second Revision

Based on individual test on 3 students semester 3 (three) State University of Medan, there is no suggestion of product improvement.

3) Third Revision

The third revision of small group trials conducted on 9 students semester 3 (three), all respondents did not recommend to be repaired.

4) The fourth revision

Based on the results of field trials on 34 students semester 3 (three), there is no suggestion of product improvement on multimedia-based multimedia learning (Flash) material Newton's Law Dynamics.

5) Expert Evaluation of Materials and Media Expert Results

In addition to the review of material experts and media experts obtained also data about the score of each statement in a questionnaire with a score of at least 1 and a maximum score of 5. Score assessment is used to determine the validity and multimedia.

a) Scores of Questionnaire Assessments from material experts

According to the material expert, the feasibility of multimedia-based learning media (flash) from the aspect of the content of learning content of majority in the criteria of "Very Good".

b) Scores of questionnaire assessments from media experts

The results of media expert validation show that the feasibility of Flash learning display, programming feasibility is generally stated "Very Good".

5) Implementation.

Multimedia that has been developed declared valid and feasible tested on Student.

a. Individual Test Results Data Analysis

Table 1. Individual Trial

No	Categorized	Average percentage	Criteria
1	Feasible aspects of Learning material	98%	Very good
2	Feasible aspect of media display	92%	Very good

3	Aspect of media utility	93%	Very good
	Average	94%	Very good

Analysis of Small Group Test Results Data

Tabel 2. Small Group Trials

No	Categorized	Average percentage	Criteria
1	Feasible aspect of learning material	89%	Very good
2	Feasible aspect of media display	85%	Very good
3	Aspect of media utility	90%	Very good
	Average	88%	Very good

The results of the assessment of multimedia-based multimedia learning (Flash) material Newton's Law of Dynamics on small group trials as a whole is "excellent".

a. Data Analysis of Field Test Results

Table 3 Average Percentage of Field Test Results Evaluation at State University of Medan.

No	Categorized	Average percentage	Criteria
1	Feasible aspect of learning material	93%	Very good
2	Feasible aspect of media display	92%	Very good
3	Aspect of media utility	94%	Very good
	Average	93%	Very good

The results of the assessment of multimedia-based learning media (Flash) on field trials for 34 students of the 3rd semester (three) indicates that the product developed "very good" or feasible to use and no suggestion of improvement submitted in this field trial so that no revision 4.

5. Evaluation (Evaluation)

The results of the questionnaire data analysis in the table above shows that generally the lecturers and students give a positive response to the multimedia that has been developed.

In general, students give a positive impression to the multimedia they have used during the trial. The impression is in the form of their attraction to the multimedia that has been developed and their desire to learn other materials using similar multimedia. As with lecturers, lecturers commented more technically on multimedia.

Limitations in the development of multimedia-based learning media (Flash) and test the effectiveness of this product include: Trial multimedia-based multimedia learning products (Flash) is only done on a limited trial with a sample of 34 students of State University of Medan T.A. 2016/2017. Extensive trials were not conducted, so the possibility of bias factors still affected the results of the study. Therefore, the sample in the study should be representative so that the results of the study can be generalized. Readiness of students to engage in a different learning media with the learning media they used to use. Student unpreparedness can be overcome by giving learning CDs to be used as a tool for independent learning.

The unpreparedness of lecturers of School Physics subjects in using multimedia-based learning media (Flash) in the learning process. There needs to be training for each lecturer in making, developing and using the media in order to achieve student learning outcomes as expected.

Results Of Test Product Effectiveness

Based on the research that has been done on the results of Newton's Law Dynamics on students who were taught by multimedia-based learning media (Flash), found that the score of student learning outcomes from 34 respondents spread in the range 103-160. From the results of the calculation shows that the lowest score 103 and the highest score 160.

The effectiveness of multimedia-based learning media (Flash) is obtained in the following way:

$$x = (\text{Number of scores obtained}) / (\text{Number of ideal scores}) \times 100\%$$

$$x = 4634/5780 \times 100\%$$

$$x = 80.17\%$$

The value of the effectiveness of multimedia-based learning media (Flash) is classified as very good category with assessment criteria as listed in table 4 below:

Table 4. Assesment criteria

Nilai	Kriteria	Persentase
A	Very good	80% < X < 100%
B	Good	60% < X < 80%
C	Enough	40% < X < 60%
D	Not enough	20% < X < 40%
E	Very poor	0% < X < 20%

IV. CONCLUSION

Based on the results and discussion of research development of multimedia-based learning media can be summed up as follows:

1. Questionnaire results obtained 88% of lecturers said need the media learning
2. Validation results from material experts indicate; (1) the feasibility of the contents of learning materials is considered very good, 83.00% average, (2) feasibility of learning presentation is rated very good 89,00% average, (3) language feasibility is considered very good average 93,00 %.
3. The feasibility of learning media display is rated very good average 85%, (2) feasibility pemrem medium raman rated very good average 86%. Validation results concluded that the media developed multi-media based learning is excellent (85.50%), so it is worthy to be used in the learning process.
4. In individual trials declared multimedia-based media advocates developed a very good category 98%, the

feasibility of the appearance of penyajian by 92%, media expediency aspect of 93%.

5. Based on the results of individual trials concluded that multimedia-based learning media developed very good criteria (94%), so it is acceptable and feasible to be used in the learning process. in small group trial it was stated that multimedia-based learning media developed very good category (88%), where aspect of material advocate of jaran 89% average and presentation feasibility of 85%, and media expediency aspect 90%. 7. On field trial it was stated that multimedia-based learning media developed very good category (93%), average learning material aspect 93%, presentation feasibility 92%, media facet aspect 94%. 8. The learning media developed by the researcher is feasible to be used as a learning media for students, has an average value (80.2) higher than the value of KKM (75) specified. Multimedia-based learning media has effectiveness of 80.17% with very high category.

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