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Developing Interactive Learning Multimedia on Basic Electrical Measurement Course

Krismadinata Krismadinata, Elfizon Elfizon, Tiara Santika
Department of Electrical Engineering, Faculty of Engineering
Universitas Negeri Padang
Padang, Indonesia
krisma@ft.unp.ac.id

***Abstract*—This article discusses on the valid, practical and effective of an interactive learning media. This media is applied as a learning media for Basic Electrical Measurement Course for Vocational High School. The Adobe Flash CS6 is employed to design of media interactive features. The four-D model (Define, Design, Development and Disseminate) is employed in designing interactive learning media. The content of media is validated by media interactive experts. The results show that the content of interactive media learning materials is valid, practical and effective to increase the learning outcomes and it suitable for applying on the learning process.**

Keywords—interactive multimedia; adobe flash CS6; basic and electrical measurements

I. INTRODUCTION

Learning strategies and media influences to effectiveness of learning process. There are many learning strategies such as direct instruction, indirect instruction, experiential learning, independent learning strategy and interactive instruction. The selected of learning strategies has an impact on the learning media used. Therefore, to achieve the learning outcomes, the learning strategies and learning media must have conformity. Interest, motivation and participation of students can be raised and stimulated by using learning media.

Currently, many tools or learning media are created for independent learning, but to find a choice or solution that is really good for the learning process to be effective, interesting and interactive and fun is a problem that needs to be looked for the solution. Aids or media for independent learning in the era of progress technology is needed in the learning process [1, 2].

Basic Electrical Measurement Course (BEMC) is one of courses in vocational high school with electrical majoring. Voltage, electric current, electrical resistance and electrical conductance, electrical reactance and susceptance, magnetic flux, electrical charge by the means of electrometer, magnetic field by the means of Hall sensor, electric field, electrical power by the means of electricity meter, S-matrix by the means of network analyzer (electrical), electrical power spectrum by the means of spectrum analyzer, electromagnetic force, permeability, magnetic force, magnetic field, electric current are subject materials that must be learned in Basic Electrical Measurement Course. These materials need high imagination to understand electromagnetic force, magnetic field, electric current and so on. For example, form and direction of electric current flow cannot be shown, but their effect can be felt. Therefore, it will be difficult to understand them through only verbal messages poured into forms lectures and media presentations [3, 4].

Learning outcomes of BEMC on some vocational high schools in Indonesia are still lower than the value of the completeness minimum, namely 75 % for individually and ≥85% for classical [5]. For example, at State Vocational High School Number 5 Padang West Sumatera Indonesia, student learning outcomes can be shown in table 1.

TABLE I. SCORES AND PERCENTAGES OF BASIC ELECTRICAL MEASUREMENT EXAMINATION

Classes	Number of students	Scores		Percentages	
		<75	≥75	uncompleted	completed
X IL1	30	22	8	73%	27%
X IL2	32	24	8	75%	25%
X IL3	32	25	7	78%	22%

[a.] Source: Score book of BEMC intake year 2016/2017

Based on table 1 it can be seen that the delivery of material verbally through lectures and presentations in learning process has not been effective. From observations made at the time of observation at State Vocational High School Number 5 Padang, teachers generally used blackboard media, presentations with Microsoft Power Point and teaching aids. The way to deliver material with the blackboard media is the main media used by the teacher. This media has a very important role in the delivery of material. But there are shortcomings, such as not being able to visualize directly a clear picture and requiring a long time to create an image on the board.

Several interactive media have been developed to increase student learning outcomes. For example using web [6], simulators[4], mobile-learning [7] and interactive CD.

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This article discusses an interactive multimedia development for BEMC subjects. This media is developed using four-D models. This media is tested for its validity, practicality and effectiveness. This media is made so that students in learning can achieve the required competencies.

II. METHODOLOGY

Research and development method are employed in this study. The development of BEMC material is organized using Four-D model. This model has been employed by researchers [8]. It comprises four stages, namely define, design, develop, and disseminate. It is shown in Figure 1.

The first year students and teacher of State Vocational High School Number 5 Padang City are involved in this study.

The first stage is conducted by defining the problems faced by students and teachers in this course to achieve the required competencies. Group discussion was also carried out to mapping the problems faced.

Secondly, after defining the problems faced, the required products are designed including media selection. The initial design in the development stage needs to be tested and evaluated by experts to get feedback in order to achieve the expected results.

In the third stage the development process is carried out. Learning strategies and media are developed based on basic needs and also feedback from other parties while still considering the required competencies

The last part of the Four-D model is the disseminate stage. The resulting product is tested, validated, and evaluated until it can be launched as a final product. the responses of students, teachers and learning outcomes have also been evaluated within developing stage.

Interviews, expert tests, questionnaires and learning outcome tests are carried out to obtain the required data. Interviews were conducted with teachers who taught this course to get information about the learning media that had been used and the learning atmosphere in the classroom.

Expert testing includes a validation process carried out by three experts namely two media experts and one material expert. Questionnaire is given to students and teachers to find out the practicality of interactive multimedia that has been developed by looking at students 'and teachers' responses to interactive multimedia.

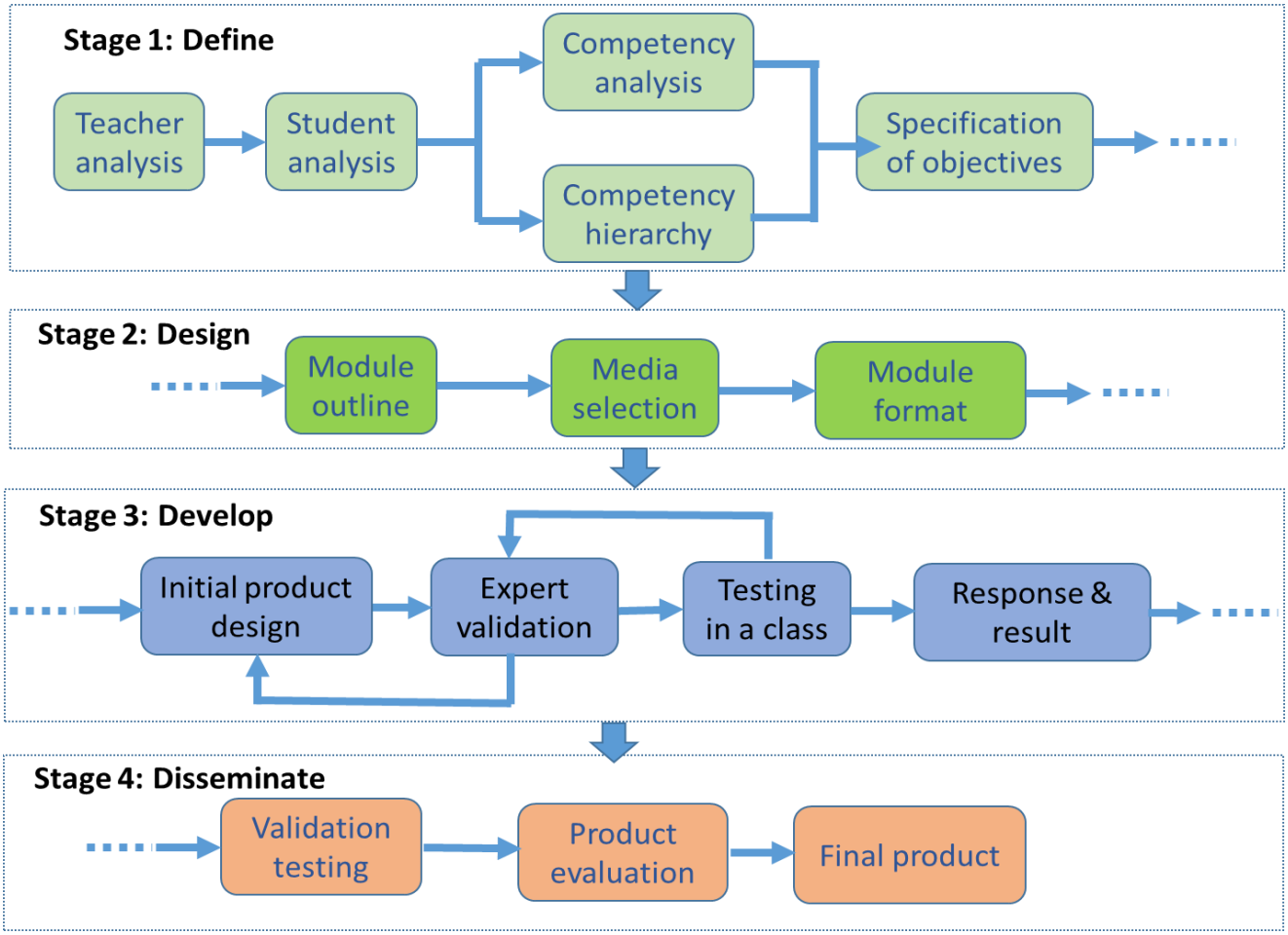

Fig. 1. Four-D model for developing learning media.

Data analysis were carried out by collecting all data, namely data from media validation, media practicality and media effectiveness. The data obtained from the learning media validation were analyzed for all aspects presented in table form using a Likert scale such as in Table 2 [9].

TABLE II. VARIABLES INDICATOR LIKERT SCALE

No.	Variable Indicators	Scores
1	Very bad	1
2	Bad	2
3	Good	3
4	Very good	4

The scores of the validator are summed and analyzed using the following Aiken's formula:

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

where :

s = r-1o

N1o= number of expert

= Lowest Validity Assessment Number

(in this case=1)

c = Highest Validation Assessment Rate (in this case = 4)

r = Figures given by an appraiser

Based on the results of the validity values obtained, then it can be categorized according to the level of validity as in Table 3.

TABLE III. LEARNING MEDIA VALIDITY CATEGORY

No.	Achievement level	Category
1	≥ 0,6	valid
2	≤ 0,6	not valid

Based on the assessment obtained from the media experts, this can be said to be valid with a validity score of 6 0.6 [10]. While the practicality of this media can be concluded as practical and easy to use with its practicality ≥ 41% [10]. the practicality categories can be shown in table 4.

TABLE IV. PRACTICALITY CATEGORIES

No	Achievement Level (%)	Categories
1	81-100	very practical
2	61-80	practical
3	41-60	quite practical
4	21-40	Less practical
5	0-20	Not practical

III. RESULTS AND DISCUSSION

The final results of interactive media developed can be seen in Figure 2 to 5. In Figure 2 is shown a page that contains competencies in studying BEMC. Figure 2 shows the material discussed, such as electricity and magnetism. Menu questions to evaluate the material discussed are shown in Figure 4, while the results obtained from the evaluation interactive learning can be shown in Figure 5.

Material selection is done at the definition stage by setting competency standards and core competencies. Multimedia design is done at the design stage through tutoring with the teacher supervisor. At this stage sketches, object designs and media creation are carried out. At the stage of developing or developing tests, tests of practicality and effectiveness were carried out on the results of the initial design of multimedia interactive learning.

Validity test is done by involving experts from the field of material and ICT. The results obtained show that the developed media are included in the valid category with a score of 90%. in addition, some suggestions and comments were also obtained which were then followed by revisions and modifications of the developed media. Practicality testing is carried out through filling out practicality questionnaires by respondents, namely teachers and students. the students tested were 29 students. The results of the practicality test on students were 89.65% and the practicality results by the teacher were 87.5%.

The effectiveness test is done by looking at classical learning completeness after the use of this media. Classical completeness seen in student learning outcomes through post-test of 29 students. Post-test results show classical completeness of 89.65% with effective category. This value shows that the learning outcomes obtained have met the classical completeness standards set in the 2013 curriculum which is 85%.

Fig. 2. Page of competency standard.

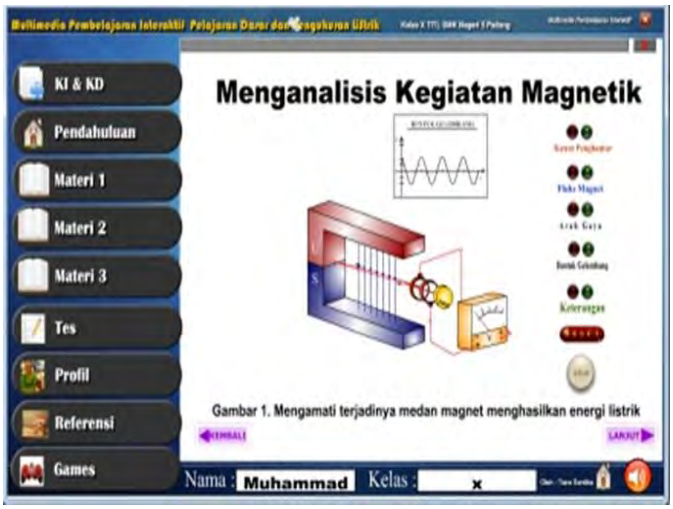

Fig. 3. Page of material 2.

Fig. 4. Page of final test score.

Fig. 5. Page of final test score.

IV. Conclusion

An interactive learning multimedia on basic electrical measurement course was developed. Four-D model was employed to develop material of BEMC. It was tested on State Vocational School Number 5 Padang City West Sumatera Indonesia.

Validity, practicality and effectiveness test was conducted to the media developed. Validation has been conducted by involving 3 validators. The results shown that all validators stated the developed media is valid. This media can be implemented for vocational high school.

Practicality tests are carried out by involving students and teachers. All of them stated that the developed media was practical. Thus interactive multimedia learning that is developed is easy and simple to use in the learning process.

Test the effectiveness of interactive media that was developed was referred to the results of the level of student classical completeness. This media developed has been already effective for use in the learning process.

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