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Interactive E-book Development for Graphic Design Subjects at Multimedia Department of Vocational School in Malang

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ABSTRACT

This research is based on learning media that is not suitable enough to the needs of students. Most of students don't understand about the using of e-book in the class because of incomplete learning media material. The development of e-book is used for printing graphic design subjects for grade XI in SMKN 5 Malang. The purpose of this research is: (1) to develop an e-book as printing graphic design learning media for grade XI in multimedia department SMKN 5 Malang. (2) to increase students' understanding of printing graphic design material by using an e-book. (3) to know the efficiency level of e-book on printing graphic design subjects in even semester. The method of this research is true experimental and pretest-posttest control group as the design model. Data analysis uses 4D e-book development model. There are four important steps in 4D model, that are: (1) Define, (2) Design, (3) Development, and (4) Disseminate. The validation of e-book is done by material experts, media experts, small-scale test, and wide-scale test. The average results of the validation percentage of media experts and material experts is 91,5%. The average percentage of small-scale test media validation is 87,75% and the average percentage of wide-scale test media validation is 86,42%. Based on validation, the total average percentage of learning media is 88,55%. On the students learning outcomes show that there is an increasing of average value from pre-test value to post-test value. The average pre-test value is 46,67% and the average post-test value is 88,09%. These results show that the using of e-book is efficient in learning process for printing graphic design subjects.

I. INTRODUCTION

Information technology is currently developing very rapidly and many new innovations have been found which clearly have a positive impact and are very helpful for humans in living their daily lives. One of the benefits that can be seen from the development of information technology is in the field of education which can help especially in carrying out the teaching and learning process in the classroom[1]. The current learning process is certainly inseparable from the help of media or learning aids that can be used to facilitate teaching and learning activities in the classroom. The notion of teaching materials is all forms of materials used to assist teachers in carrying out teaching and learning activities. The material in question can be in the form of written material or unwritten material. Based on these definitions, it can be concluded that teaching materials are learning components used by teachers as learning materials for students and assist teachers in carrying out teaching and learning activities in the classroom. Several studies have been conducted in an effort to develop interactive e-books and have been proven to improve student learning experiences [2]–[5].

There are 4 characteristics of e-books [6], namely first, e-books are book software products. Second, e-books are software products that work using the internet or without the internet. Third, e-books are always equipped with e-book readers. Fourth, e-books have the ability to integrate advanced

and modern forms of technology. There are many types of human thinking abilities, for the category of students, higher-order thinking skills are considered suitable for measuring the level of students' abilities. One of the higher-order thinking skills is the ability to think creatively [7]. Creative thinking is a process (not a result) to generate new ideas and the idea is a combination of ideas that have not been put together before [8]. ICT is considered an important tool in improving performance, collaboration, learning experiences and learning outcomes [9]. The use of ICT can support project based learning which eliminates the difficulties associated with managing large classes, learning outcomes can be improved through more interactive learning [10].

Several benefits of learning media in the learning process of students, namely learning will attract more students' attention so that it can foster students' learning motivation, learning materials will be clearer in meaning so that they can be better understood by students, allows students to better master and achieve learning objectives, teaching methods will be more varied, not merely verbal communication through the utterance of words by the teacher, and students do more learning activities, because not only listen to teacher descriptions, but also activities others such as observing, doing, demonstrating, acting out, and so on [11]. Although in the world of education learning media has many benefits that can support the achievement of learning objectives, there are still many schools that have not used learning media in supporting the teaching and learning process in the classroom, especially at SMKN 5 Malang Class XI Multimedia Expertise Program.

Based on the results of observations that have been carried out through interviews with several teachers from several SMKN in Malang City in the subject of Printing Graphic Design, several problems related to learning media have been found. Problems regarding the media used in the learning process are considered still not perfect for use in the teaching and learning process in the classroom or as learning media for students outside of class hours. Another problem that exists is that the current teaching materials are considered too basic in the delivery of the material given to students. Therefore, teachers and students must look for material from other media such as the internet to improve understanding of the material needed.

The objectives of this development are (1) to develop e-books as a support for learning activities in the subject of Graphic Design Printing for class XI Multimedia at SMK Negeri 5 Malang, (2) to increase students' mastery or understanding of Printed Graphic Design materials through e-books that developed, (3) to determine the level of efficiency of the media developed in the subjects of Printing Graphic Design.

II. METHODS

The desktop-based learning media development method in this research and development uses a 4D development model, with steps as shown in Fig. 1. The learning media development stage is carried out starting from the define, design, development stage, and ends with the disseminate stage

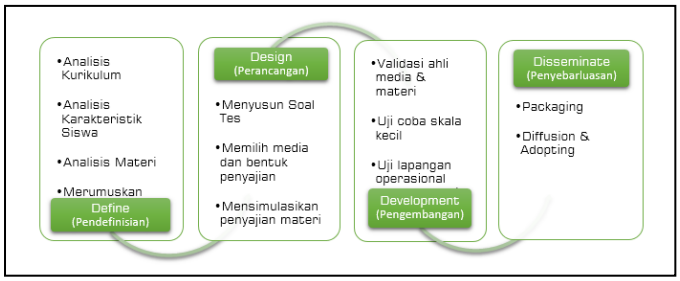

Fig. 1. ADDIE Development Model

Research and Development Procedure

In the define stage, the main activity is to validate to focus the problem, determine learning objectives, choose the subject in question, identify the resources needed to complete the entire 4D process.

This design stage is designed to structure content, materials, pictures, videos, practice questions and also storyboards for the design of desktop-based learning media.

The development stage contains the realization of product design activities. In the design stage, a conceptual framework for the application of new learning models/methods has been developed. In the development stage, the conceptual framework is realized into a product that is ready to be implemented. At this stage the product is validated from the media side and the material side by media experts and material experts. In the validation process, the experts provide an assessment of the products developed and are equipped with suggestions and comments for revision and improvement. In addition to validation by experts, the product was also tested in advance on small-scale trials and large-scale trials on students.

The disseminate stage is the stage for disseminating the product. There are 2 stages that must be passed, namely packaging and diffusion and adoption. At the packaging stage, the e-book is packaged according to the design that was developed and is in accordance with the evaluation results that have been validated so that the media has a valid value and is laid out for use. In the diffusion and adoption stage, the developer disseminates the e-book by distributing it to subject teachers and students of class XI Multimedia who are the subject of the trial.

Product Testing

The test design carried out was to validate by two media experts and a material expert. Research test subjects have been determined with the following criteria: small-scale testing, large-scale testing, and operational field tests. The design of the trials carried out was aimed at obtaining the validity of the syllabus, lesson plans, teaching materials, and learning media, as well as dropping items for the implementation stage. Comments and suggestions from the results of small-scale trials and large-scale trials are used as material for revision if necessary.

The type of data obtained from the research and development of desktop-based learning media is in the form of quantitative and qualitative data. And the results of the e-book assessment questionnaire using a Likert scale in the form of a

score of 1 to 5 obtained from the validator's assessment, small-scale test, and broad-scale test.

In the instrument validity test, the validated instruments are the syllabus, lesson plans, teaching materials, media, as well as pre-test and post-test questions. The validity of the assessment results is calculated in percent (%) using the formula (1). The level of validity criteria is shown in Table 1.

$$Validity\ Score = \frac{score}{max.score}\ x\ 100\% \quad (1)$$

TABLE I. VALIDITY CRITERIAS

Score's Intervals	Categories
81% - 100%	Very High
61% - 80%	High
41% - 60%	Enough
21% - 40%	Low
0% - 20%	Very Low

Validity is a measure that shows the levels of validity or validity of an instrument. Testing the validity of the instrument is done by means of external validity using the product moment correlation formula (2) proposed by Subana [12],

$$r_{xy} = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{\{n\sum x^2 - (\sum x^2)\}\{n\sum y^2 - (\sum y^2)\}}} \quad (2)$$

where r_{xy} is the correlation coefficient between variable x and variable y, n is the number of subjects, x is the score of the questions, and y is the total score.

The reliability of the instrument shows that the instrument is quite reliable as a data collection tool. The reliability of the instrument is sought by using the Cronbach Alpha formula (3) according to Purwanto, where r_{11} is the reliability of the instrument, k is the number of statement items, σ_{b^2} is the number of item variants, and σ_{t^2} is the total variance [13]. The level of reliability criteria is as shown in Table 2.

$$r_{11} = \left(\frac{k}{(k-1)}\left(1 - \frac{\sum\sigma_{b^2}}{\sigma_{t^2}}\right)\right) \quad (3)$$

TABLE II. RELIABILITY CRITERIAS

Score's Intervals	Categories
0,00 – 0,20	Very Low
0,21 – 0,40	Low
0,41 – 0,60	Enough
0,61 – 0,80	High
0,81 – 1,00	Very High

The normality test in this research and development uses skewness normality and kurtosis normality. The efficiency test in this research and development was carried out on two paired samples. The hypotheses used in this research and development efficiency test are 1) H0: the average population of class XI before and after treatment is identical or the same and 2) H1: the average population of class XI before and after treatment is not identical or not the same.

Analysis of learning media development data using a questionnaire technique with an instrument in the form of a Likert scale questionnaire. The data obtained from the assessment by material experts, media experts, and product trials will be analyzed using the percentage technique adapted from Akbar with the formula for processing the data as follows (4), where P is the percentage of eligibility, $\sum x$ is the total number of respondents' answers, and $\sum y$ is the number of maximum scores [14]. The product eligibility criteria can be seen in Table 3.

$$P = \frac{\sum x}{\sum y}\ x\ 100\% \quad (4)$$

TABLE III. APPROPRIATENESS CRITERIAS

Percentage's Intervals	Categories	Descriptions
85% - 100%	Very High	Very good to use
69% - 84%	High	minor revisions
53% - 68%	Enough	major revisions
37% - 52%	Low	Cannot be used
20% - 36%	Very Low	Cannot be used

III. RESULT AND DISCUSSION

The learning media in the Printing Graphic Design subject developed is a desktop-based learning media that contains material about lighting which is equipped with materials, pictures, videos, simulations and practice questions. This learning media was created with the aim of making it easier for students to learn in class and outside class hours which can motivate students to make learning easier and more fun.

This learning media can be used using a computer or laptop that has software that supports such as Adobe Flash Player. The interface display and the results of making learning media in the subjects of Printing Graphic Design for the subject of lighting are as shown in Fig. 2.

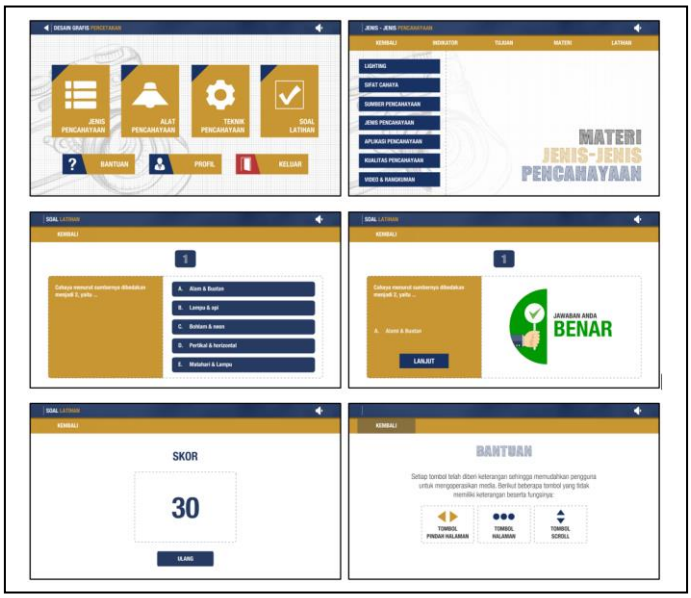

Fig. 2. Learning Application's Overall View

Media Expert and Material Expert Validation Results

The results of the validation of teaching materials as a whole are obtained from the three validators, which are 90.56% (Table 4). From the results obtained with predetermined criteria, the conclusion is that the material developed is declared to be very valid and does not need to be revised and is ready to be used for research.

TABLE IV. TEACHING MATERIAL VALIDATION RESULTS

Validators	Percentage	Category
Learning Material Expert 1st	100%	Very High
Learning Material Expert 2nd	82,96%	Very High
Learning Material Expert 3rd	85,85%	Very High
Average	**90,56%**	**Very High**

The overall validation results obtained from the three validators are 92.14% (Table 5). From the results obtained with predetermined criteria, the conclusion is that the desktop-based learning media in the Printed Graphic Design subject developed is declared to be very valid and does not need to be revised and is ready to be used for research.

TABLE V. MEDIA EXPERT VALIDATION RESULTS

Validators	Percentage	Category
Learning Media Expert 1st	100%	Very High
Learning Media Expert 2nd	84,28%	Very High
Average	**92,14%**	**Very High**

Small-Scale Test Validation Results

From the small-scale test, the overall validation results from all validators were 87.75% (Table 6). From the results obtained with predetermined criteria, the conclusion is that the learning media used is declared very valid and does not need to be revised and is ready to be used.

TABLE VI. SMALL SCALE TEST MEDIA VALIDATION RESULTS

Validators	Percentage	Category
Teacher from School 1st	84,5%	Very High
Students from School 1st	91%	Very High
Average	**87,75%**	**Very High**

Large-Scale Test Validation Results

Based on the results of the validation of learning media on the broad-scale test as a whole are 86.42% (Table 7). From the results obtained with predetermined criteria, the conclusion is that the learning media developed is declared very valid and does not need to be revised and is ready to be used.

TABLE VII. LARGE SCALE TEST MEDIA VALIDATION RESULTS

Validators	Percentage	Category
Teacher from School 2nd	80%	High
Students from School 2nd	82%	High
Teacher from School 3rd	91,8%	Very High
Students from School 3rd	91,9%	Very High
Average	**86,42%**	**Very High**

Data Analysis

The implementation of research and development is carried out on students as operational field tests as many as 30 students who are taking Printing Graphic Design subjects. This operational field test aims to see the efficiency of the developed learning media on student learning outcomes.

The data on student learning outcomes were obtained from the pre-test and post-test scores. Data on student learning outcomes for pre-test and post-test are presented in Table 8. The results of the treatment of 30 students statistically can be seen in Table 9.

TABLE VIII. STUDENT LEARNING OUTCOMES DATA (PRE TEST AND POST TEST)

Type of Test	Score		Average
	Lowest	Highest	
Pre-test	25,92	62,96	46,661
Post-test	74,07	100	88,009

TABLE IX. EFFICIENCY TEST (PAIRED SAMPLES STATISTICS)

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post-test	88,01	30	7,996	1,460
	Pre-test	46,66	30	11,158	2,037

It can be seen that the statistical summary of the two samples in the table above shows that there is an increase in the average score of students from pre-test to post-test. Then the results of the statistical correlation between the two variables can be seen in Table 10.

TABLE X. EFFICIENCY TEST (PAIRED SAMPLES CORRELATIONS)

		N	Correlation	Sig.
Pair 1	Post-test	30	,557	,001

The results from Table 10 above show that there is a significant correlation between before giving the media and after giving the learning media. Furthermore, the paired samples test is shown in Table 11.

TABLE XI. EFFICIENCY TEST (PAIRED SAMPLES TEST)

Paired Differences				
Mean	Std. Deviation	Std. Error Mean	95% Conf. Interval of the Difference	
			Lower	Higher
41,348	9,440	1,724	37,823	44,873
t		df	Sig. (2-tailed)	
23,990		29	,000	

It can be seen in the table above that the calculated t value is 23.990 with a probability value of 0.000. Because it is a two-tailed test, then the probability number is divided into 2 so that: 0.000/2 = 0.000 → 0.000 < 0.025

The probability value obtained is less than 0.025, it can be concluded that H0 is rejected, and it can be stated that the average test scores for students in operational field tests before and after treatment are not identical or not the same.

Looking at the results above, it can be concluded that there was an increase in the average value of students after the provision of learning media. So, it can be stated that the use of the developed learning media can improve the learning outcomes of students n the subjects of Printing Graphic Design.

IV. CONCLUSION

The results of this research and development are in the form of the final product of desktop-based learning media for Printing Graphic Design subjects. The developed desktop-based learning media has gone through a validation process from media experts and material experts, small-scale test validation, wide-scale test validation with the result that the desktop-based learning media developed is valid and very suitable to be used as a medium in the learning process. Efficient desktop-based learning media is used in the learning process for class XI MM 3 students to improve student learning outcomes.

The desktop-based learning developed are: 1) The media can be accessed offline so there is no need for an internet connection; 2) Media can be accessed through a computer/laptop that has supporting software such as Adobe Flash; 3) The developed media has complete content, namely learning objectives, materials, pictures, videos, and practice questions to improve students' understanding; and 4) the developed learning media is able to improve student learning outcomes.

While the weaknesses of the learning media developed are: 1) The media only contains Light System material; 2) The use of media is only done in SMK Negeri 5 Malang class XI MM 3 and has not been tested in other places; 3) Media must use a computer or laptop; and 4) The results of the use and utilization of media depend on the characteristics of students, the learning environment of students and the available facilities and infrastructure.

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