THE DEVELOPMENT OF COMPUTER-BASED LEARNING MEDIA AT A VOCATIONAL HIGH SCHOOL

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ABSTRACT: The learning process in formal education institutions is still generally conventional. This can be found in the secondary schools such as vocational schools. As widely practiced, conventional learning method applied by the teachers in the teaching learning process fails to capture students' attention. Students are not actively engaged in the learning process. Hence, to arouse students' attention, this paper reports on the development of a computer-based learning media design at a Vocational High School in Medan, Indonesia. The research model used in this study is ASSURE model (Analyze State Objective Select Method Utilize Require Evaluate). Based on the results of the questionnaires as the data collection instrument in this study, an average value of 4.82 is obtained from material experts and an average value of 4.77 is obtained from media experts whilst an average value of 4.40 is obtained from students as the users. It is concluded that the media developed is effectively designed and can be put into practice in the learning process.

1. INTRODUCTION

Various problems in the learning process need to be harmonized so that the goals can be optimized. Breakthroughs in the curriculum development, learning innovation and fulfillment of educational facilities and infrastructures are indispensable in improving the quality of education. In enhancing the learning process, the teachers are required to make more innovative learning tools that help students to learn optimally both in self-learning and in the classroom. To complete the components of teaching and learning in schools, teachers should use the media or tools that are capable of stimulating the learning process in an effective and efficient way.

Vocational High School is one of the education institutions that should be able to utilize computer technology in the teaching learning process. High or low quality of Vocational High School has somehow interrelated to determining the quality of the learners themselves. Vocational High School as one of the secondary education institutions aims to prepare its graduates to be competent in the job market with competitive advantages of highly skillful human resources.

Generally, the learning process in formal education institutions is still conventional, as applied in the secondary schools particularly in Vocational High School. This phenomenon was discovered during an observation and an interview with one of the subject teachers who also serves as the Head of Techniques Audio Video workshop at Vocational High School 1 Lubuk Pakam. He stated that during the teaching and learning process, subject teachers are faced with barriers to delivering the lessons due to the lack of tools media as an aid.

The teachers solely rely on textbooks and power-point application which cause less interaction between the teachers and the students. In addition to that, the data showed that students' achievement in basic electronics engineering subject is still relatively low. It can be seen from the student learning results from the two classes which indicate that nearly 18.5% of the students of 10th class were unable to reach a score of at least 70. A class is classified as passed if at least 85% of the students reach the scoring criteria. The results, however, showed that only 81.5% of the students were able to achieve the scoring criteria.

By using a tool such as computer-based learning media for basic electronics engineering subject it is expected that the teachers are assisted in teaching practice so that optimal learning objectives can be achieved. Computer-based learning can potentially mitigate static atmosphere and thus creates an effective, interesting, interactive, and fun learning process.

2. THEORETICAL FRAMEWORK

2.1 Learning

Learning is a structured combination comprising intertwined elements of human, facilities, attributes and procedures to achieve the goal of learning itself [1]. It shows that learning is an attempt for students to develop their self-competencies. Implicitly, in learning, there are activities to choose from and to define, teaching methods to develop in order to achieve the desired results, and based on the existing conditions of the learning. This activity is the core of the learning plan [2]. Instructional theory is defined as identifying methods that will

best provide the condition under which learning goals will most likely be attained [3].

The main objective of school learning is for students to be able to process and acquire the knowledge, skills, and stand-alone attitudes. The key points is that the students experience the whole process of obtaining the knowledge, skills, and attitudes they need.

2.2 Computer-based Learning

A multimedia computer system is one that can create, import, integrate, store, retrieve, edit, and delete two or more types of media materials in digital form, such as audio, image, full-motion video, and text information [4].

There are three factors which cause barriers to media selection and delivery system: (1) availability of existing instructional materials, (2) barriers to the production and the implementation, and (3) the amount of facilitation the instructor provides during instruction [5].

Multimedia learning can be defined as multimedia applications used in the learning process. In other words, it functions to deliver the message (knowledge, skills and attitudes) and can stimulate mind, feelings, concerns and willingness of the learners so that the learning process might be purposeful and is in under control.

3. RESEARCH METHODOLOGY

3.1 Place and Time

The research was conducted in May 2015 on the10^{th} class students of Vocational High School 1 in Lubuk Pakam District of North Sumatera Province, Indonesia with competency in Audio Video Engineering expertise Academic Year 2015.

3.2 Research Steps

This study is conducted in two steps. The first step is to develop the media by designing the product. The second step is to test the product in order to evaluate its effectiveness in the learning process.

3.3 Research Subject

Developing and implementing the product of computer-assisted learning media requires inputs in the form of formative evaluation. The inputs are obtained from the subject matter and media experts, as well as the product users i.e. the10^{th} class students of Vocational High School with competency of video audio engineering expertise.

3.4 Methods of Research and Development

Some steps taken in the research and development are as follows: (1) Determining Research Potentials and Existing problems. Potentials are everything useful and have some added values to it, (2) Gathering Information. Once the potentials and problems are identified in a factual and an updated way, we then need to collect a variety of information that serve as source materials for planning a specific product which can solve the problems, (3) Product Design. The products produced in research and development are assorted. In the field of technology, technology-oriented products that come in handy for human life are products of high quality, energy efficient, attractive, low cost, light weight, ergonomic, and double-functioned (e.g. advanced computer which double function as type-writer, drawer, and a TV set, etc.). In the field of education, the products generated through research & development is expected to improve the quality of education, to be able to boost the employment rate of abundant graduates, and to make it relevant to job skill requirements, (4) Design Validation. The design validation process aims to assess the activities involved in the product design. In this case, we attempt to find the applicability of the new teaching method as compared to the old one. Product validation is done by some experts with experiences in assessing the newly designed products. The experts were individually asked to assess the design, so that any product weaknesses and product deficiencies can be further identified, (5) Product Revision, (6) Testing the product, (7) Product Revision, (8) Trial Usage, (9) Product Revision (10) Mass Production. This research covers only the steps from 1 (one) to 8 (eight) [6].

3.5 Development Model

This product development model is a set of procedures in producing computer-based media in basic electronics engineering subject for the10^{th} class students of Vocational High School.

Product development model of computer-based learning multimedia uses ASSURE product which include 6 main steps as follows : (1) Analyzing the learners, (2) Stating Standards and Objectives, (3) Selecting Strategies, Technology, Media, and Materials, (4) Utilizing Technology, Media, and Materials, (5) Requiring Learner Participation, (6) Evaluating and Revising [7].

3.6 Development Procedures

The development procedures adopted to produce interactive multimedia-based learning media on basic electronics engineering subjects

matter are divided into five stages, namely: (1) In the first stage, preliminary research is conducted, (2) In the second stage, the learning media is created, (3) In the third stage, the materials are collected (4) In the fourth stage, the software is created and produced, (5) In the last stage, the product is reviewed and tested.

3.7 Data Collection Instrument

Data collection instrument on this experimental study is assessment instruments for evaluating the product that has been developed. The main instrument used to collect the data is questionnaires. According to the test, the media is divided into two stages, namely Alpha and Beta Test. Alpha Test was conducted by validating interactive learning media through assessment of media and material expert. While Beta Test is the stage of testing or evaluating the product fully performed by the users [8].

There are three research instruments used in this study, instruments for material and media experts and instrument of product testing for students. Questionnaires were created in a structured form of open-ended questions where some information related to the theory, information for model development and information on whether students can use the interactive learning media as well as the assessment of the quality of interactive learning media provided can be obtained.

3.8 Data Analysis Technique

This study focuses on the feasibility of learning media that is designed as a computer-based learning media for basic electronics engineering subject.

In analyzing the data from the questionnaires, the following steps are taken: (1) Validating interactive learning media done by material experts and media experts, (2) The results of experts' validation are checked, should there be any discrepancies, the revision on interactive learning media is done, (3) After the media interactive learning is feasible, the assessment validation of material and media experts is quantified, (4) The data are tabulated (5) Then, distributing questionnaires for the students to fill in after using interactive learning media, (6) The results of the questionnaires by the respondents are assessed their answers completeness, (7) Quantifying respondents' assessment for further scoring according to the quality as previously set, (8) Tabulating the data, (9) Calculating the interpretation of courseware feasibility of each sub variables by using the following formula:

$$\bar{X} = \frac{\sum X}{N}$$

Description :

$\bar{X}$: average score eligibility

$\sum x$: Total score of each sub variable N : Number of sub variable

The scores are then transformed into Table 1 below:

Table 1 Interpretation of Multimedia Courseware Feasibility

Numb	Score Interval	Interpretation	
1	0.00 – 2.49	Not Good	Not Feasible
2	2.50 – 3.32	Less Good	Less Feasible
3	3.33 – 4.16	Good	Feasible
4	4.17 – 5.00	Very Good	Very Feasible

Source [8]

4. RESULTS AND DISCUSSION

4.1 Preliminary Analysis

The preliminary analysis was conducted in several phases. The first phase is direct observation to the school. The second phase is to conduct an interview with the subject teachers and the students as well as to conduct classroom observation during the learning process in progress. It was discovered that during the teaching-learning process, subject teachers are faced with common problems. Teachers still adopt conventional teaching methods in which they that rely solely on text books and lack of learning media that are used in delivering the materials. The teachers only use simple power point slides that are displayed through a projector. It was also discovered that, during an interview with some of the students, to understand both theories and practices of the basic electronics engineering subject requires deep imagination and concentration. This condition places them in a uneasy situation in comprehending and focusing on the subject.

Based on the results of the preliminary analysis, it can be inferred that the school is in need of an interactive learning media. Therefore, to fill in this gap, the researchers feel the urge to design an interactive computer-based learning media of which has an attractive look, ease of use and can be used on low specs computers. The program contains suitable materials such as those in the curriculum and facilitates the students to learn from anywhere and anytime where the computer facilities exist.

4.2 Creating and Producing Software

This phase is the process of producing software for use by students of Engineering

Audio Video Vocational High School 1 Lubuk Pakam. The researchers designed an interactive computer-based learning media packed in a Compact Disc Interactive.

4.2.1 Home Menu Display

Home Menu or Main Menu is built as a foundation in establishing a content of interactive multimedia-based learning media. On home menu, buttons are built and action scripts are given which connect every parts of the menu that can be controlled from home menu.

The Home Menu display on interactive multimedia-based learning media is shown in Figure 2 below:
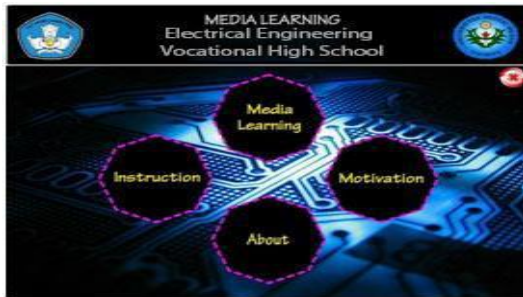

Fig 1. Home Menu Display

4.2.2 Materials Menu Display

The Material Menu on this learning media contains materials which are suitable to the competencies in the syllabus.

The Material Menu display is shown in Figure 3 below.

Fig 2. Material Menu Display

4.2.3 Quiz Menu Display

Quiz menu is built with the aim of training and reinforcing students to understand the material that has been previously studied. The questions are in the form of multiple choices. In the first step, students are required to fill in their own names before starting doing the quiz. The initial view of the Quiz menu is showed in Figure 4 below:

Fig 3. Quiz Menu Display

4.3 Validation and Testing of Product

4.3.1 Validation

Before the product is put into test to the users, learning media being developed should be reviewed by material and media experts in order to improve the deficiencies that the product has. In this process, the researchers gain some inputs on the media weaknesses and shortcomings.

Based on the suggestions made to improve during the evaluation and after discussing and analyzing with the experts, the researchers re-designed the media.

Having completed the necessary repairs, the product is re-submitted to the reviewer whom are media and materials experts for further re-validation.

4.3.2 Data of Material Experts Validation

Table 2 Data of Material Experts Validation

No.	Evaluation Aspects	Material Experts
1	Instructions on using program application	5
2	Ease of use of the program	5
3	Program Structure and application	4
4	Clarity of learning objectives statement	5
5	The suitability of the content/materials with the aim of learning	5
6	The suitability of the content/materials to the curriculum used	5
7	Instructions and guidance of the application use of the content/ materials	4
8	Concepts presentation and restrictions on the content	5
9	Giving examples and illustrations	5
10	Current content/material presented	5
11	Ease of understanding the language used	5
	Average	4,82

The results of the evaluation and validation conducted by subject matter experts on media interactive learning with an average value of 4.82, were classified in the excellent category.

4.3.3 Media Expert Validation Results

Validation performed by two experts as validators with expertise in learning media aims to get information on their responses towards the computer-based interactive media to see the test worthiness.

Table 3 Data of Media Expert Validation

No.	Evaluation Aspects	Average of Validator I & II
1	Instructions on using program application	5
2	Ease of use of the program	4
3	Program Structure and application	5
4	The quality content presented	4.5
5	Techniques and systematics of presentation	5
6	The use of color on the display screen	4
7	The composition of the text used	5
8	The composition of graphics and images presented	5
9	The audio quality	4.5
10	Quality video or animation	5
11	Ease of understanding the information presented	5
12	Use of directional buttons	5
13	Reliability and stability of the program cycle	5
	Average	4.77

The results of the evaluation and validation performed by the interactive media experts with an average value of 4.77 were classified into the excellent category.

4.3.4 Testing Students

The test was given to 30 students majoring in Engineering Audio Video of 10th class Vocational High School 1 Lubuk Pakam. The test was conducted in the school computer laboratory with the purpose of getting information on student responses when using the media of interactive computer-based learning.

Table 4 Students' Questionnaires Results

No.	Evaluation Aspects	Average of Respondents
1	Instructions on Program Application	4.6
2	Ease of Use of the program	4.43
3	Structure and application of the program	4.53
4	The clarity of learning objectives statement	4.43
5	The suitability of the content to the learning objectives	4.4
6	The suitability of the content to the curriculum	4.47
7	Application Instructions and guide to the use of the content	4.5
8	Presentation of concepts and restrictions on the content	4.37
9	Giving examples and illustrations	4.6
10	Content updates presented	4.3
11	Ease of understanding the language used	4.37
12	The quality of content presented	4.5
13	Systematics of resentation	4.53
14	The use of colors on the display screen	4.3
15	The composition of the text used	4.27
16	The composition of graphics and images presented	4.47
17	The audio quality	3.93
18	The video or animation quality	4.47
19	Ease of understanding the information presented	4.57
20	Use of directional buttons	4.43
21	Reliability and stability of the program cycle	4.27
22	Students' interaction with courseware used	4.2
23	Stimulates students' minds after using the courseware	4.27
24	Motivates students to learn after using the courseware	4.43
25	Interest to use the courseware	4.43
26	Increased competencies through the Courseware	4.23
	Average	4.40

Based on the results of the 30 students questionnaires with different characteristics, the average students questionnaires result in the focus group was 4.40 which falls into the excellent category.

5. CONCLUSION

Based on validation data of material and media experts, it was discovered that the media developed

with an average score of 4.80 falls into the category of very good and decent use of learning media.

Based on the questionnaires results of 30 students majoring in Engineering Audio Video of 10th class Vocational High School 1 Lubuk Pakam with different abilities, it was discovered that this learning media positively affect students' interests with an average score of 4.40 which falls into the very good category.

6. ACKNOWLEDGEMENTS

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