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Interactive E-Modules with Discovery Learning: Increase Informatics Motivation for Vocational Students

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ABSTRACT

This research aims to develop and determine the feasibility of flipbook-based interactive e-modules in informatics subjects and determine student motivation after using the product. The development model applied is Hannafin and Peck with three stages, including (1) needs analysis, (2) design, and (3) development and implementation. Experts in learning media and material validated the product. Data was collected using a validation questionnaire sheet and distributing questionnaires with product feasibility instruments and learning motivation. The results of the media expert validation assessment get a percentage of 91% or very feasible, while the material expert's percentage is 98.4% or very feasible. The small group testing was 93.44% or very feasible, and the extensive group testing was 88.58% or very feasible. Student learning motivation after using the product obtained a percentage of 87.21%, or very high. Thus, the interactive e-module product is considered capable of increasing student learning motivation and is very feasible to be used in the learning process at school.

I. INTRODUCTION

Education is crucial in shaping the nation's young generation of achievers. The rapid development of the times requires education to improve its quality and quality to achieve national education goals. Achieving quality education depends on how well teachers understand their responsibilities, including their understanding of the curriculum implemented at school. [1]. Vocational High Schools called Sekolah Menengah Kejuruan (SMK) in Indonesia use the Independence Learning Curriculum, where learning focuses on students. Thus, students' personalities, experiences, backgrounds, points of view, abilities, interests, and other needs during the learning process are considered. The curriculum made teachers design learning media creatively and innovatively and be able to make learning classes active and fun for students. Interactive learning media such as electronic modules or e-modules are one type of media that can be created. Electronic modules, often e-modules, are structured digital learning resources to support independent learning. [2].

In this digitalization era, students can easily independently search for information, or materials needed in the learning process. However, students find it challenging to optimize the use of this technology. This has an impact on reducing students' motivation to learn. [3]. One strategy to foster motivation in learning is to design appropriate learning media to stimulate student learning motivation to persevere and achieve the desired goals. [4], [5], [6], [7], [8]. Learning using interactive e-modules based on digital flipbooks will be an alternative to foster student learning motivation. Flipbooks offer a variety of variations in visual and audio-visual aspects to make the learning atmosphere more exciting and interactive and can foster student learning motivation. [9].

Informatics is a compulsory subject that grade X vocational students must study. Informatics subjects provide a foundation for problem-solving skills, an important general

skill with the rapid development of digital technology. Based on the results of initial observations by distributing questionnaires at SMKN 5 Malang, SMKN 2 Singosari, and SMKN 1 Purwosari, researchers found problems in informatics learning including (1) students find it challenging to understand the material because the teaching materials provided are less exciting and not motivating, (2) the lack of availability of teaching modules to support the informatics learning process independently, (3) low student interest in learning if using conventional learning models such as the lecture method.

Based on the problems, the solution that can be taken is to choose a student-centered learning approach, one of which is the Discovery learning (DL) model. [10]. Discovery learning is a learning model based on constructivism, where learning activities are more efficient and meaningful. In this approach, students are invited to play an active and creative role in exploring the concepts of their knowledge to gain a solid and memorable understanding. [11]. The learning scheme in this discovery learning model can be harmonized with various technologies, learning media, methods, and tactics based on students' needs. [12].

II. RESEARCH METHODS

A. Research and Development Model

This study used research and development methods. The research design used the Hannafin and Peck model, which consists of three main stages: the needs analysis stage, the design stage, and the development and implementation stage.

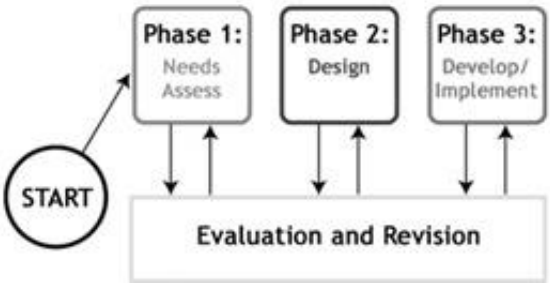

Fig. 1. Hannafin and Peck model

B. Research and Development Procedure

1. Needs Analysis

The needs analysis stage is the initial stage that aims to describe student needs and identify problems faced by students during the learning process. The results of this analysis will form the basis of the product development objectives by the needs of students and schools.

2. Design

The interactive e-module product developed is a flipbook-based module with a discovery learning approach. The following is a correlation between the learning stages of the discovery learning model and the interactive e-module.

TABLE I. Correlation between Discovery Learning and Interactive E-modules

No	DL Stages	Interactive E-modules
1	Stimulation	There is a stimulus in the form of initial stimuli regarding the connection of material to things that occur in real life accompanied by pictures or videos.
2	Problem Statement	There are some interesting problems related to the material to be learned as a starting point for student discussion.
3	Data Collection	Students can look for answers to the problems identified from the material provided in this interactive e-module or other sources.
4	Data Processing	Students interpret new knowledge through group discussions related to the material learned.
5	Verification	Students explain their findings in the form of presentations of group discussion results and take evaluations in the form of quizzes contained in the module to determine each individual's ability after doing stages 1, 2, 3, and 4.
6	*Generalization*	There is a conclusion at the end of each material so students can better understand the material.

3. Development and Implementation

The development stage of the interactive e-module was carried out based on the previously designed design stages. At the beginning of this development, the preparation of materials and evaluations that contain the stages of discovery learning is carried out. Then, the interactive design with flipbooks continues.

The interactive e-module learning product that has been developed will go through the validation test stage by media expert validators and material experts before finally being tested on prospective users. The validation test is carried out using a questionnaire to determine the level of product feasibility. After going through the validation process, which is an evaluation process, it is necessary to make revisions based on suggestions or additions from media experts and material experts.

The instruments in this study include a media expert validation questionnaire, a material expert validation questionnaire, a user trial questionnaire, and a learning motivation questionnaire. The data analysis technique is descriptive data analysis.

III. RESULTS AND DISCUSSION

A. Development Results

This research produced a learning product as a flipbook-based interactive e-module with a discovery learning approach. This e-module is intended for grade X vocational students in Informatics subjects, especially the Data Analysis element. E-modules can be accessed online and used anytime and anywhere using a smartphone or computer.

Fig. 2. Hannafin and Peck model

The developed interactive e-module consists of the cover page, motivation, menu, instructions for use, learning objectives, choice of learning materials, pre-test, learning materials, post-test, bibliography, about e-module, and feedback.

The application of the discovery learning model in each material topic in the interactive e-module is explained as follows.

1. Stimulation

At this stage, illustrative videos and introductory sentences are presented to arouse students' desire to conduct their investigations and increase curiosity. This is integrated into the e-module in the "Pengantar" section.

Fig. 3. Stimulation

2. Problem Statement

At this stage, the teacher provides opportunities for students to find problems and then formulate them as hypotheses or temporary answers to questions in the e-module in the "Ayo, Diskusi!" section.

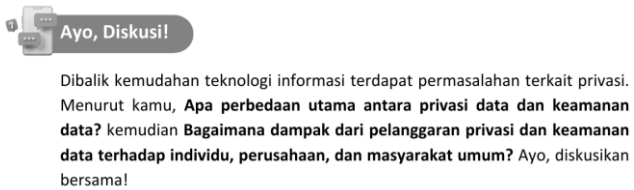

Fig. 4. Problem Statement

3. Data Collection

At this stage, students can look for answers to the problems identified from the material in the e-module in the "Materi" section or other reading sources.

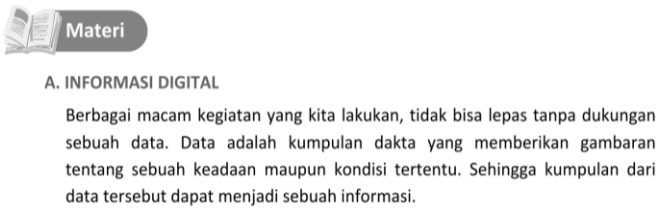

Fig. 5. Data Collection

4. Data Processing

At this stage, students interpret the information obtained through group discussions related to the material studied, then write the results of their discussion in the e-module as a Google Form in the "Apa Jawabanmu?" section.

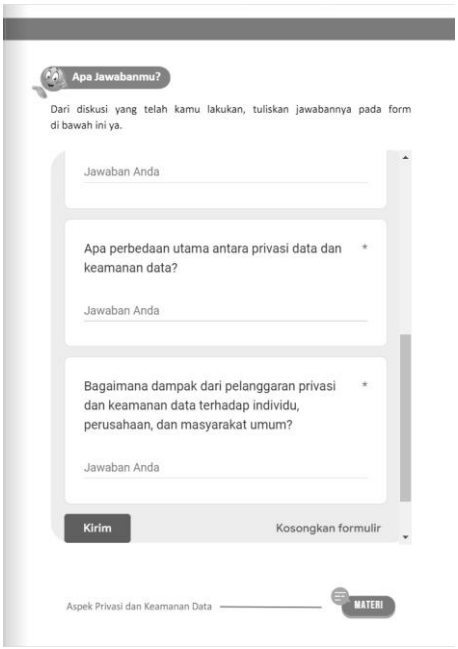

Fig. 6. Data Processing

5. Verification

At this stage, students explain their findings in the form of a presentation of the results of group discussions, and there is an evaluation in the form of a quiz in the e-module in the "Evaluasi" section to determine the ability of each individual after doing stages 1, 2, 3, and 4.

Fig. 7. Verification

6. Generalization

The sixth step, or the last step, is generalization or concluding. There is a conclusion at the end of each material so students can better understand the material.

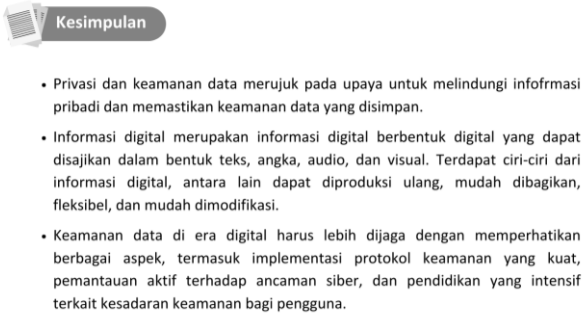

Fig. 8. Generalization

B. Data Presentation and Discussion.

The interactive e-module that has been developed is validated by one of the lecturers of the Department of Electrical Engineering and Informatics at UM. The material in the interactive e-module was validated by a teacher from SMKN 2 Malang who teaches Informatics subjects.

1. Data from Media Expert Validation Results

Based on the results of media expert validation, interactive e-modules with a discovery learning approach that have been developed get average results in the very feasible category with a percentage of 91%.

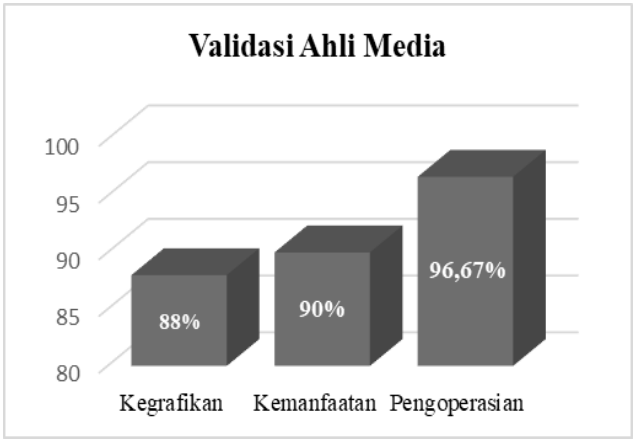

Fig. 9. Diagram of Media Validation

2. Data on Material Expert Validation Results

Based on the material expert validation results, the material contained in the interactive e-module with a discovery learning approach obtained average results or was in the very feasible category with a percentage of 98.4%.

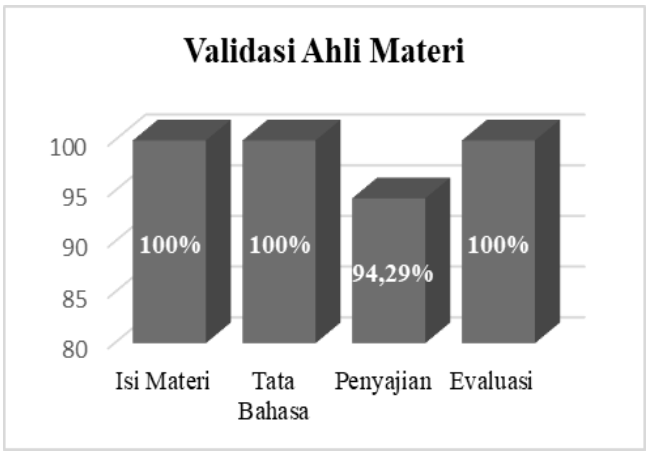

Fig. 10. Diagram of Material Validation

3. User Trial Result Data

User trials are divided into two, namely small-group respondents and large-group respondents. The subjects of this research were SMKN 2 Malang class XI students majoring in TKJ who had taken Informatics subjects. There were ten students at the small-scale trial stage and a large-scale trial of 33 students.

a. Small Group Trial

Based on the results of the trial, it can be seen that the interactive e-module with a discovery learning approach that has been developed gets average results in the very feasible category with a percentage of 93.44%.

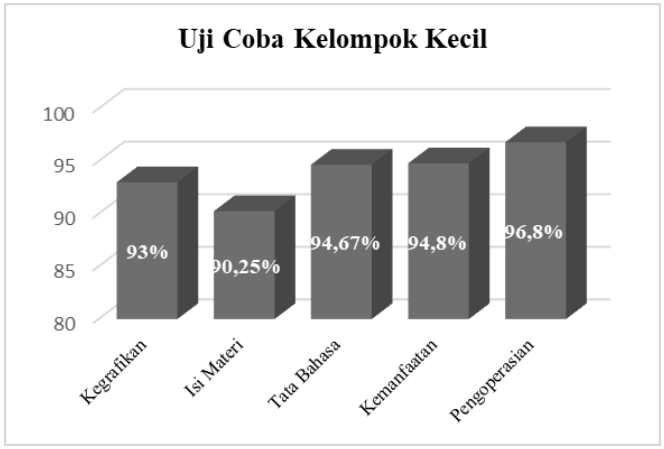

Fig. 11. Diagram of Small Group Trial

b. Large Group Trial

Based on the trial results, it can be seen that the interactive e-module with a discovery learning approach gets average results in the very feasible category, which is 88.58%.

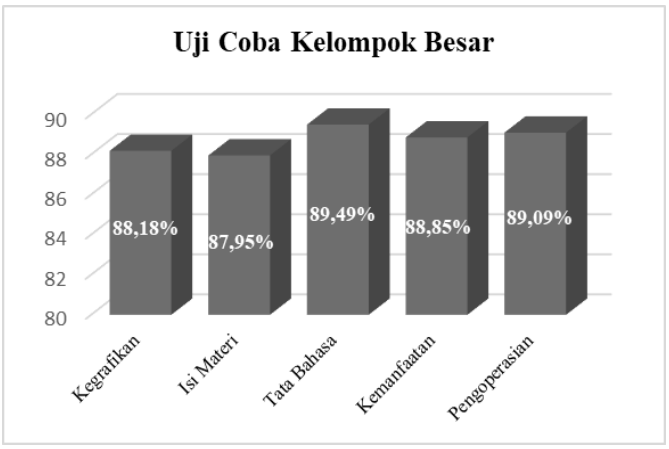

Fig. 12. Diagram of Large Group Trial

4. Learning Motivation

Measurement of learning motivation in this research and development was done by filling out a questionnaire with respondents in the large group trial. Filling in the learning motivation questionnaire was carried out before and after using the interactive e-module that had been developed.

TABLE II. Results of Learning Motivation Improvement

No.	Aspect	Average Score			Category
		Pre-Test	*Post-Test*	*N-Gain*	
1	*Attention*	65,54	85,11	0,57	Medium
2	*Relevance*	65,45	86,26	0,60	Medium
3	*Confidence*	62,73	89,29	0,71	High
4	*Satisfaction*	63,79	88,48	0,68	Medium
	Total	**64,33**	**87,21**	**0,64**	Medium

Based on Table II, the overall data results have a pre-test value of 64.33, which shows learning motivation before using the interactive e-module, and a post-test value of 87.21 after learning using the developed interactive e-module. Then, the value of increasing student learning motivation is calculated using the N-Gain calculation formula, which produces a value of 0.64. This value produces a positive value so learning motivation using the interactive e-module that has been developed has increased and is included in the "Medium" improvement category.

Student learning motivation plays a vital role in learning because learning motivation can trigger students to participate actively in the learning process. [13], [14], [15]. Motivated students tend to be more diligent and have higher endurance when faced with learning challenges. Student motivation is the basis for getting the best learning results applied to achieve the desired goals.

The results of expert judgment responses to large-scale media trials, as from the results of previous studies, show that the development of learning media in the form of interactive e-modules is feasible to use as a support for student learning and can increase student learning motivation, especially in class X informatics subjects, The finding was supported by previous studies about how appropriate learning media can increase student learning motivation. [16], [17].

IV. CONCLUSIONS

The conclusion of the research and development that has been carried out is the production of a product in the form of an interactive e-module with a discovery learning approach in the form of a flipbook that students can access online. The validation assessment carried out by media expert validators obtained a score of 91% or was very feasible. Assessment by material expert validators obtained a score of 98.4% or very feasible. The trial carried out on small-scale testing obtained a score of 93.44% or was very feasible. Then, in large-scale testing, it obtained a value of 88.58% or very feasible. Learning motivation testing that has been carried out results in an increase with a gain score of 0.64, which is included in the category of medium improvement. Before using interactive e-modules, student learning motivation obtained a value of 64.33%. Then, after using the interactive e-module, student learning motivation obtained a value of 87.21%, thus showing the effect of implementing interactive e-modules as learning support to increase student learning motivation, and the product development objectives have been achieved.

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