THE EFFECTIVENESS OF LEARNING USING E-MODULES BASED ON PROBLEM BASED LEARNING TOWARDS PHYSISCS STUDENT LEARNING OUTCOMES

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Abstract

This research aims to design e-module based on problem based learning in work and energy materials. This research method uses Research and Development (R&D) with ADDIE model that are Analysis, Design, Development, Implementation, Evaluation. The research population was students in SMA Negeri 1 Tanah Pinem Class X Science. The data instruments used in this research consisted of validation questionnaires for material expert, media expert, teacher, and student responses questionnaires. The effectiveness quality of the e-module is seen from the pretest and posttest results with N-gain of 0.78 in the high category which shows that the class had increase learning outcomes in the high category. Based on the data, it can be concluded that the e-modules based on problem based learning on work and energy materials are valid and effective.

Keywords: E-module, Problem Based Learning, Outcomes

The Education is an interaction between educators and students in achieving learning goals that can be carried out and planned by educators to produce a good learning process so that students have intelligence, good personalities, and are active in society, nation, and state. According to Undang-Undang nomor 20 Tahun 2003 concerning the National Education System states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills they need, society, nation, and state.

The problem faced by the world of education today is the low quality of qualified graduates (Megawanti,2015). In the learning process, there are many things that must be observed to increase the quality and quality of learning outcomes, namely in the form of methods, models, procedures, approaches, or the selection of learning materials that must be developed in teaching and learning activities.

In the school environment, education is more formal in nature, where the learning activities that take place are only the transfer of knowledge from teachers to students. This is what causes students to lack an active role in the process and construction of knowledge within themselves. (Elida 2015)

Physics is a part of science that studies and understands natural phenomena that occur in everyday life empirically, systematically, and rationally. Physics lessons are related to the

development of intelligence and national insight to teach science and ways of thinking that play an important role in supporting science and technology, thus encouraging teachers to design and implement education that is more effective and focuses on understanding concepts so that they can be applied in life. This makes learning physics not only about facts, but how students can master the concept of physics itself (Astalini et al, 2019).

Understanding physics does not have to be taught directly by educators. Students can understand in various ways, especially in the 4.0 era. Utilizing technology is one way to understand the concepts of physics which then from these concepts can be applied in everyday life. So, an educator must have effective methods and strategies so that all concepts can be conveyed properly to their students.

Based on the results of interviews conducted, the Physics teacher of SMA Negeri 1 Tanah Pinem said that currently student learning tends to be passive by not responding when the teacher asks or explains the material. In addition, in learning, teachers rarely apply problem-based learning models and teachers only emphasize learning outcomes. Meanwhile, the learning model used is a model of lectures, discussions and taking notes on the material read by the teacher. Most students are less interested and not active in participating in the learning process, the teacher does not stimulate children's thinking skills in solving social problems, especially those related to physics subjects, and students are less enthusiastic about participating in learning. This turned out to have a negative impact on the low learning outcomes of students on subjects. And of course not in accordance with the demands of the 2013 curriculum used, resulting in low student understanding of the material being studied.

The books used in learning are worksheets and printed books and the learning process in this school has not utilized multimedia or electronic teaching materials in learning. Even though in today's classroom learning can be filled with all kinds of technology that can be used for learning. These sources support learning activities and assist students in acquiring knowledge. One form of utilization of technological developments is to make printed teaching materials electronic, one of which is teaching materials in the form of e-modules (Ramirez-Velarde, Garcia-Rueda, and Alexandrov 2007).

Based on the information distributed, it turns out that this school needs teaching materials that can make students more enthusiastic, interested and active in participating in the physics learning process as well as to stimulate students' thinking skills in solving problems, especially those related to physics subjects in students' real lives. so that students learn not only about knowledge

but also feel and experience.

One solution that can be used to overcome this problem is the use of problem based learning (PBL) learning models. Problem based learning is a learning that starts with solving a problem, but to solve that problem students need new knowledge to be able to solve it. Learning with this problem based learning model invites students to actively seek their own knowledge, (Saniman 2015).

METHOD

This research has been conducted at SMA Negeri 1 Tanah Pinem, which is located Desa Kutabuluh, Kecamatan Tanah Pinem, Kabupaten Dairi. The population used in this study were all students of class X IPA at SMA Negeri 1 Tanah Pinem in odd semester of 2022/2023 school year academic. The sample of this research were students of class X IPA 1 at SMA Negeri 1 Tanah Pinem wich consist of 10 students as small group trial and 33 students as large group trial to implemented the e-module. This type of research is quantitative and qualitative research, in product development using the ADDIE development model, that are Analysis, Design, Development, Implementation, Evaluation. The flow of research can be seen in Figure 1.
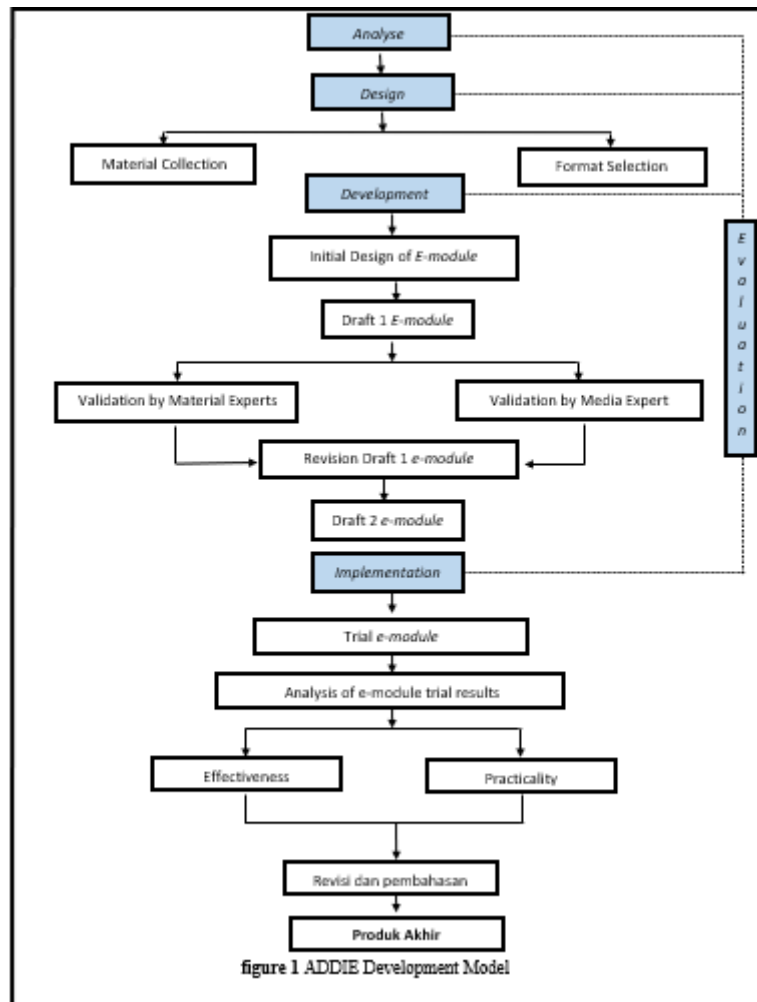
figure 1 ADDIE Development Model

Figure 1. The process of developing an instrument using ADDIE model

In Figure 1 there are four steps: (1) The analysis stage is the initial stage to find out the needs and problems that are owned in the learning process and making solutions related to existing problems; (2) The design stage it begins with collecting learning materials and designing teaching materials; (3) The development stage is carried out by developing a framework that has been prepared at the design stage and producing a draft module for validation or due diligence; (4) The implementation phase is testing the e-module to students to obtain data on the practicality and effectiveness of the developed module through a distributed questionnaire; (5) The evaluation stage in the development of the ADDIE model is carried out at each stage in the development process. The evaluations carried out were product evaluations by supervisors, evaluations by validators, evaluations after limited trials and evaluations after large-scale trials

RESULT AND DISCUSSION

Analysis Stage

For the analysis stage the technique used is the interview technique where this technique is carried out when coming to school. Based on the results of the interview process conducted with the physics teacher at SMA NEGERI 1 Tanah Pinem, it was revealed that so far the physics learning process in class still uses the lecture method, the books used by students are in the form of text books and only use the books provided by the school and have never used modules. as well as e-modules.

Design Stage

For this stage the thing to do is to design the learning electronic modules that are developed. The steps taken include preparing the module framework, compiling and selecting reference materials, compiling the electronic module learning content, and preparing research instruments.

Development Stage

In development stage, researcher analysis validation by material and media experts to the use of e-modules. The questionnaire validation of the material and media expert referred to the scoring description adapted by BNSP.

Implementation Stage

The teachers and students response to e-module is carried out offline (at school). The instrument used to obtain responses was in the form of a questionnaire using a Guttman scale of one to four cover three aspect. Based on the percentage of teacher and student responses to the e-module obtained in a very practical category.

The level of effectiveness of problem-based learning-based e-modules on work and energy materials assisted by Flip PDF Professional was obtained based on the results of tests conducted on students in a large group test of 33 students. At this stage, a pretest is carried out before using the module and a posttest after using the module. The pretest and posttest were carried out using the same questions, namely as many as 10 essay questions in class X MIA 2 at SMA Negeri 1 Tanah Pinem. The results of the analysis can be seen from the results of the test and posttest in the form of obtaining an N-gains score. The method used is to calculate the average value of the pretest and posttest, then look for the N-gain value by entering the existing numbers into the formula. After calculating the N-gain value of 0.78 in the high category. The following calculation of the value of N-gain can be seen in table 1.

Table 1 Percentage of Completeness Results

No	Student's Name	Pretest Score	Posttest Score	Posttest-Pretest	Ideal Score	N-Gain Score	Presentage N-Gain Score	Information
1	Adryanta Ginting	16	87	71	84	0,85	85%	Very Effective
2	Alpin Praninta Tarigan	18	80	62	82	0,76	76%	Effective
3	Ananda Siska Anggraini	18	88	70	82	0,85	85%	Very Effective
4	Anisa Vahara Br Manik	18	66	48	82	0,59	59%	Effective Enough
5	Apri Karo-Karo	14	87	73	86	0,85	85%	Very Effective
6	Armanda Ginting	16	87	71	84	0,85	85%	Very Effective
7	Destri Sartika Naibaho	8	68	60	92	0,65	65%	Effective
8	Dataria Winnie Sari Ginting	15	86	71	85	0,84	84%	Very Effective
9	Dio Karo-Karo	12	74	62	88	0,7	70%	Effective
10	Edenia Sembiring	7	71	64	93	0,69	69%	Effective
11	Ego Revaldo Tuahta Sembiring	16	88	72	84	0,86	86%	Very Effective
12	Elprima Tarigan	13	72	59	87	0,68	68%	Effective
13	Feby Sri Neta Br Ginting	15	88	73	85	0,86	86%	Very Effective
14	Hermina Priscilla Sembiring	16	78	62	84	0,74	74%	Effective
15	Heryanto Berutu	12	84	72	88	0,82	82%	Very Effective
16	Kelvin Mikel Pratenta Ginting	15	75	60	85	0,71	71%	Effective
17	Kheren Elbrina Br Sembiring	25	87	62	75	0,83	83%	Very Effective
18	Laura Anatasya Tarigan	14	82	68	86	0,79	79%	Effective
19	Mamora Hulu	15	71	56	85	0,66	66%	Effective
20	Nova Evi Nora Sitanggang	12	84	72	88	0,82	82%	Very Effective
21	Pelpridu Okto Ginting	13	90	77	87	0,89	89%	Very Effective
22	Prengki Ginting	16	85	69	84	0,82	82%	Very Effective
23	Reva Afriani	14	77	63	86	0,73	73%	Effective
24	Riska Sri Ulina	14	87	73	86	0,85	85%	Very Effective
25	Riski Abdi Pranata Ginting	15	74	59	85	0,69	69%	Effective
26	Rosa Eka Risti Br Sembiring	13	87	74	87	0,85	85%	Very Effective

27	Sastarina Sembiirng	26	88	62	74	0,84	84%	Very Effective
28	Selvi Sari Br Ginting	12	84	72	88	0,82	82%	Very Effective
29	Siska Savitri	11	84	73	89	0,82	82%	Very Effective
30	Valentina Pinem	14	77	63	86	0,73	73%	Effective
31	Valentinus Pinem	16	85	69	84	0,82	82%	Very Effective
32	Yenni Prisca Br Tarigan	19	79	60	81	0,74	74%	Effective
33	Wina Pinem	16	68	52	84	0,62	62%	Effective
Nilai Rata-rata						0,78	78%	

Based on table 1 above, the calculation results show that the average gain criteria obtained are in the high category. So it can be seen that the results of testing the activity of using modules in improving learning outcomes (gain) are in the high category. The gain value shows that the use of modules developed in the learning process can be considered very effective in improving students' cognitive learning outcomes. The module is said to be effective if the cognitive learning outcomes of students can be obtained before being given a product that is implemented (used) by students.

Evaluation Stage

The results obtained from the validation results from expert validators, teacher and student responses and student test results for the e-modules that have been developed meet the valid, practical and effective category for use with percentage results obtained. In the e-module there are still shortcomings that must be revised through suggestions from the validator to make the e-module better and very suitable for use in learning.

Discussion

Based on the students' learning tests through the pretest and posttest given to a large group of 33 students consisting of 10 essay questions, it was found that the increase in learning mastery scores showed significant results where the answer scores obtained by students increased. The results of the calculation of the normalized score (N-gain) state that the n-gain learning outcomes of students' cognitive knowledge aspects are high because they have a score between 0.70-1.00. Apart from that, the development of problem-based learning-based e-modules assisted by Flip PDF Professional can make it easier for students to access e-modules anywhere and anytime using their smartphones.

Furthermore, the results of this study are also in line with the results of Latifah's research (2020) that the results of the effectiveness test carried out showed that students who studied using

e-modules assisted by Flip PDF Professional were higher than the use of conventional teaching materials with printed books. Based on the results of research conducted by the researchers themselves and previous researchers obtained the same results, namely that students better understand the concepts of physics and improved learning outcomes.

The effectiveness of the developed e-module based on Problem based learning in terms of improving student learning outcomes. The improvement of critical thinking skills was obtained from the pretest and posttest scores. This shows that e-modules based on problem-based learning assisted by Flip PDF Professional on the subject matter of work and energy can significantly improve student learning outcomes.

CONCLUSION

Based on the results of the data analysis that has been carried out in this study, it can be concluded that the E-module based on problem based learning on work and energy materials to improve student learning outcomes was developed in five stages that are analysis, design, development, implementation, evaluation. Furthermore, The e-module feasibility which has been developed based on an assessment by experts gets an overall average score of 98.63% for material feasibility in very feasible criteria and 90.95% for media feasibility in very feasible criteria. Teacher and students give a positive response and from respone from teacher rate of 91%% in very good category, response from students rate of 95.28% in very good category and The effectiveness quality of the e-module is seen from the pretest and posttest results with N-gain of 0.78 in the high category.

ACKNOWLEDGMENTS

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