Effectiveness of E-Modules Based on Problem-Based Learning to Improve Student Learning Outcomes

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Abstract
Improving the quality of education is important for every educational institution from elementary school to college. In reality, the learning and learning process at school does not go well, especially in the thinking ability of students, thinking ability is a cognitive domain that provides a knowledge process from the knowledge that will be obtained by students. To overcome the difficulties of learning environmental pollution science class VII, it is important to use an approach that facilitates a thorough understanding of the concept. Teachers are facilitators in learning, of course, can provide solutions to problems that occur during the teaching and learning process, 21st century teachers are no longer as teacer centers but as facilitators in the learning process to achieve learning goals. This study aims to determine the effectiveness of problem-based learning-based e-module product development to improve the learning outcomes of seventh grade students of SMP Negeri 1 Blambangan Umpu Way Kanan. This research is a development research using the ADDIE approach, with 30 research samples to test the effectiveness of the product using the N-Gain test. The results of the study can be concluded that the results of the development carried out by researchers on environmental pollution material are known to be very effective e-modules based on problem-based learning to improve the learning outcomes of Science Class VII SMP Negeri 1 Blambangan Umpu Way Kanan with the results of 71% there are changes when before and after using e-module development products.
Keywords: E-Module, Problem Based Learning, Learning Outcomes

INTRODUCTION

Improving the quality of education is important for every educational institution from elementary school to university level. Various ways are done by educational institutions for this such as improving learning facilities for students that are complete, comfortable, and fun, improving the welfare of teachers and education personnel, improving the soft skills of teachers and educators by conducting training and competency development. Along with the development of increasingly dynamic technology, all sectors take part in benefiting from technology. (Setiabudi et al., 2022).

One sector that benefits from the advancement of technology is the world of education. Technology in education has become a system that creates effective, efficient and systematic learning conditions in problem solving. (Salsabila, 2020). In its role, technology can be an innovation for teachers in creating learning that is full of creativity so that learning does not take place monotonously. Lots of innovations have emerged by emphasizing technology in learning such as learning media, teaching materials, and technology-based learning resources. The development of teaching materials is one of the positive impacts of the inherent technology in the field of education such as the packaging of learning materials made in the form of animated videos, learning modules that can be accessed only by using a smartphone. With various forms of packaging, it is still adjusted to the learning objectives so that they can be achieved properly (Daryanto, 2013).

Education is a conscious effort to prepare students through guidance, teaching and training. Education that develops students' abilities is expected to be able to support the development and welfare of the nation in the future (Sukmawati, 2021). Education in the 21st century is expected to produce human resources with 21st century skills. Teachers must integrate information technology means to assist participants' learning with teaching materials, methods, and technology-based teaching media. (Sri Andhi Endaryanti, Idam Ragil Widianto Atmojo, 2021) School programs are designed to support each school in creating a generation of lifelong learners who have the personality of Pancasila student learners. For the success of all this, the role of a teacher is needed "The teacher as the main subject whose role is expected to be able to be a driving force to take actions that provide positive things to students" (Ade Aransyah, 2023).

In reality, the learning and learning process in schools does not go well, especially in the thinking ability of students, the ability to think is a cognitive domain that provides a knowledge process from the knowledge that will be obtained by students. Cognitive ability is the ability to acquire, process, store, and use information in thinking and behavior in everyday life. Cognitive abilities also involve various mental processes such as attention perception, memory, problem solving, abstract thinking, language and reasoning. Problem-based learning (PBL) is an innovation in learning, because in the PBL model students' thinking skills are truly optimized through a systematic group or team work process, so that students can empower, hone, test and develop their thinking skills continuously ". PBL is learning that begins with a problem that must be solved, not starting with learning to teach the content of the lesson as in conventional learning that we usually encounter.(Surya, 2017).

The PBL model is one of the innovative learning models that departs from the real world problems of students to learn about how to think critically in solving a problem. Initial observations found the lack of ability of students at SMP Negeri 1 Blambangan Umpu Way Kanan in science subjects is a rigid or traditional learning method that is dominated by lectures and memorization which results in superficial understanding and is less relevant to the real world. In this approach, students are often only passive recipients of information without being actively involved in the learning process. As for the problems that occur from the decline in the learning outcomes of students at SMP Negeri 1 Blambangan Umpu Way Kanan, it is known from 30 students that the results of daily assessments get learning outcomes below the average KKM, as for the table of average results.

Table 1. Science learning outcomes of seventh grade students of SMP Negeri 1 Blambangan Umpu Way Kanan

Ddescription	Number Of Learners	Percentage	KKM	Category
Total Completion	5	16,7	68	Completed
Number Not Completion	25	83,3	68	Not Completed
Total	**30**	**100%**		

Source Excel data

Based on the results of the daily assessment, it is known that out of 30 students only 5 students or 16.7%, students who are complete in learning IPA environmental pollution material while 83.3% or 25 students are not complete in the subject. The results of interviews conducted by researchers found that the decline in learning outcomes, especially in critical thinking skills, was influenced by a lack of problem-solving skills where students often did not have effective problem-solving skills because they were rarely involved in real situations. Lack of intrinsic motivation: Passive and teacher-centered learning approaches can reduce students' intrinsic motivation to learn. Lack of deep understanding: Traditional approaches often focus only on factual knowledge and provide less opportunity for students to develop a

deep understanding of the concepts being studied. Lack of collaboration skills: Teacher-centered approaches often neglect the development of collaborative skills that are essential in the world of work and everyday life.

Teachers are facilitators in learning, of course, can provide solutions to problems that occur during the teaching and learning process, 21st century teachers are no longer as teacer centers but as facilitators in the learning process to achieve learning goals. The 21st century certainly has a significant impact on the world of education, especially for students who are literate in the world of information and communication technology. But the implementation in the field of teachers is more of a learning center, compared to students such as teachers only explaining material, giving assignments and applying conventional learning learning, the industrial revolution certainly provides convenience for teachers and students in the learning process by developing learning, of course, learning will become more meaningful where students are more emphasized to learn independently, which means student center.

To overcome the difficulties of learning environmental pollution science in grade VII, it is important to use approaches that facilitate a thorough understanding of concepts, provide real examples and applications, and encourage students to actively engage in learning through experiments, observations, or group discussions. Providing the right resources, such as clear textbooks, learning videos or interactive simulations, can also help students better understand science concepts. In this context, Problem-Based Learning (PBL) emerges as an alternative approach that addresses some of these issues. PBL places students as active agents in the learning process by providing tasks that encourage them to seek solutions to real-world problems. In the process, students are developed in various cognitive skills, such as problem solving, collaboration, communication, and critical thinking, while deepening their understanding of relevant subject matter. Thus, PBL has the potential to provide a more meaningful and relevant learning experience for students.

Furthermore, in addition to using the Problem Based Learning (PBL) learning model, the solution that will be given is to provide a learning media that is integrated with learning material, namely by using e-Module media. E-modules are learning materials that are systematically designed based on a certain curriculum and packaged in the form of a certain time unit, which is displayed using electronic devices. He created it. Then, the electronic module has the meaning of a digital-based media used in the learning process to provide opportunities for students to explore themselves in learning activities (Arsyad, 2015). The creation of e-modules is to increase student learning motivation. One of the factors that affect student achievement is motivation (Frima Suci Agustia, 2020).

Along with technological developments, teaching materials are not only in conventional form but in electronic form such as e-books, e-modules, audio compact discs, and tapes. With this electronic teaching material, it can make it easier for educators and students to access learning anywhere and anytime. Since the development of teaching materials includes a process that is the same as learning activities, teaching materials should be prepared based on the needs of learning objectives (Vianis et al., 2022). Research conducted by Frima Suci Agustia & Ahmad Fauzi, in 2020 with the title effectiveness of E-modules of high school physics Integrated Fire Material Based on Problem Based Learning Model confirms the development of e-modules based on problem based learning models has effective criteria for increasing students' knowledge competencies (Frima Suci Agustia, 2020). Based on the background explanation and review of previous research, the researcher aims to determine the effectiveness of e-modules based on problem-based learning (PBL) to improve the learning outcomes of students of SMP Negeri 1 Blambangan Umpu Way Kanan.

RESEARCH METHODS

This research is an R&D development research using the ADDIE approach, Analysis, Design, Development, Implementation and Evaluation. Data collection techniques using observation techniques, questionnaires, and tests. research conducted on December 3, 2022, the research sample in this study amounted to 30 respondents in class VII SMP Negeri 1 Blambangan Umpu Way Kanan, data analysis using the N-Gain test based on pretest and posttest results. The steps of applying the ADDIE approach in this research are as follows:

Table 2. ADDIE Approach

Analysis Stage	1. The analysis stage includes analyzing the initial needs of the product development to be developed. 2. Conduct a learning analysis related to the needs of learner characteristics 3. Facilities and infrastructure
Design Stage	1. Designing products related to environmental pollution material 2. Designing e-modules 3. Compiling the material 4. Creating a product display design 5. Develop competency test
Development Stage	1. At this stage, researchers develop e-modules related to content 2. Conducting evaluation and improvement 3. Conduct validation tests and small group tests
Implementation Stage	1. The implementation phase was conducted with a large group 2. Formative evaluation conducted
Evaluation Stage	1. In this phase, the researcher evaluated and revised the deficiencies of the module.

RESEARCH RESULTS AND DISCUSSION
Research Results

The results of the research conducted using the ADDIE approach are known:

1. The potential and conditions of the development of e-modules based on Problem Based Learning (PBL) to improve learning outcomes of environmental pollution in class VII SMP Negeri 1 Blambangan Umpu Waykanan are known that PBL-based e-modules can enable learners to engage in situations or problems that are authentic and relevant to the real world, this module can be designed by considering the context that is manerik for learners so that they can see the value and direct relevance of their learning, then in the development there are problem solving skills. E-modules present complex problems or challenges, where learners are required to apply their knowledge in finding creative and evidence-based solutions.

2. Effectiveness of problem-based learning (PBL) based e-module development on environmental pollution material

Before the product is implemented in large groups, a validation test is carried out first. Based on the results of the expert validation test and limited group test, which are as follows:

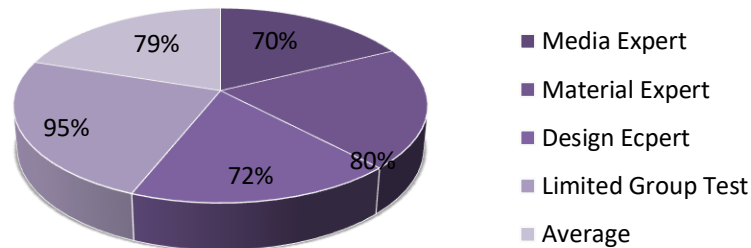**Recapitulation of Expert Test and Group Test of interactive media products**

Figure 1 Percentage Recapitulation Of Expert Test And Small Group Test Results
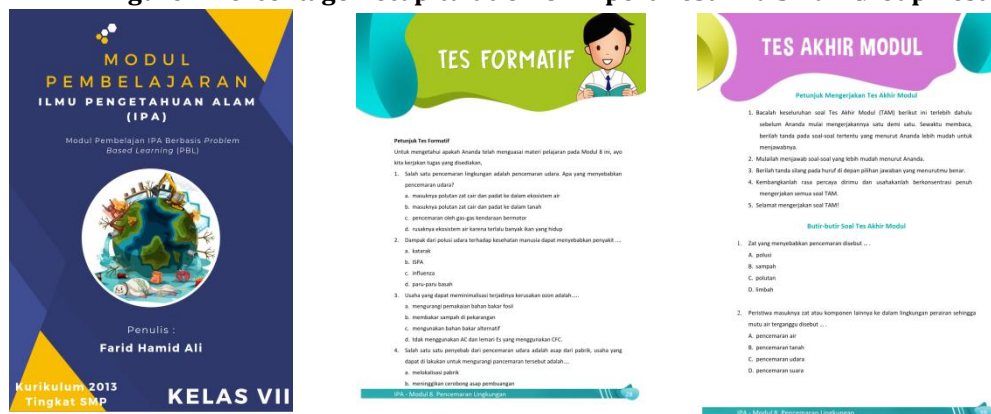

Figure 2. Product Display

Based on the product validation test, it is known that the media expert test provides a product assessment with a percentage level of 70%, material experts 80%, design experts 72%, limited group test 95%, with an average percentage of product feasibility test of 79% with a very attractive classification, meaning that the product can be used and tested to large groups. After the product is tested for feasibility, then VII grade students are given treatment in the form of a test, where the test is to describe changes in student learning outcomes before using the product and after using the product which is then tested using the N-Gain test, which is as follows:

Table 3. Results of the N GAIN Test.

No	Name	Pretest Score	Posttest Score	N-gain Percen	Classification
1	Respondent1	42	86	76	High
2	Respondent2	70	88	60	Medium
3	Respondent3	50	88	76	High
4	Respondent4	54	86	70	High
5	Respondent5	42	84	72	High
6	Respondent6	40	88	80	High
7	Respondent7	58	88	71	High
8	Respondent8	64	90	72	High
9	Respondent9	50	88	76	High
10	Respondent10	48	80	62	Medium
11	Respondent11	70	92	73	High

12	Respondent12	50	90	80	High
13	Respondent13	48	88	77	High
14	Respondent14	48	86	73	High
15	Respondent15	50	92	84	High
16	Respondent16	46	88	78	High
17	Respondent17	72	94	79	High
18	Respondent18	60	90	75	High
19	Respondent19	60	90	75	High
20	Respondent20	64	86	61	Medium
21	Respondent21	74	88	54	Medium
22	Respondent22	46	86	74	High
23	Respondent23	48	88	77	High
24	Respondent24	42	90	83	High
25	Respondent25	40	70	50	Medium
26	Respondent26	40	72	53	Medium
27	Respondent27	72	88	57	Medium
28	Respondent28	58	90	76	High
29	Respondent29	58	88	71	High
30	Respondent30	48	86	73	High
	Average	**54**	**87**	**71**	**High**

Source: Excel Data

Based on the results of the N-Gain test, it is known that based on the tests given to students, it is known that the learning outcomes of students before and after using e-modules based on problem-based learning (PBL) get an average increase of 71%, from the results of the pretest and posttest conducted on 30 students of class VII SMP Negeri 1 Blambangan Umpu Way Kanan, 23 students experienced an increase after using the product with a high classification while 7 students experienced an increase with a medium classification.

Discussion

The learning model is a planning pattern carried out to arrange learning steps in the classroom during learning activities, the problem-based learning model in the problem-based learning model is a learning model that involves students in learning activities and prioritizes real problems both in the home, school, and community environment as a basis for building knowledge and concepts through the ability of skills in critical thinking and problem solving. Meanwhile, according to Astari, Suroso, and Yustinus (2018), the PBL model is a model that makes everyday life a source of problems to encourage stimulus and shape ways of thinking in exploring information to solve problems. The PBL model was first developed to assist students in developing the ability to think, solve problems, and train intellectual skills (Olivia et al., 2022).

The results of the effectiveness of the development carried out by researchers on environmental pollution material are known to be very effective problem-based learning e-modules to improve the learning outcomes of Science Class VII SMP Negeri 1 Blambangan Umpu Way kanan with the results of 71% there are changes before and after using e-module development products. The results of this study are in accordance with research conducted by Arista Khoirul Mugzllina et. al in 2018 with the title of applying a problem-based learning model to increase the responsibility and learning outcomes of grade 2 elementary school students. The results showed that student responsibility in the initial condition had no students who were included in the criteria for Very Responsible, 15 students (39.5%) including Responsible, 18 students (47.4%) including Moderately Responsible, 5 students (13.1%) including Not Responsible, and no students including Very Irresponsible criteria. So

that students who are at least moderately responsible are 33 students with a percentage of 86.8%, then there is an increase in the final condition, namely there are only students who are in the Very Responsible criteria 16 students (42.1%), and Responsible criteria 22 students (57.9%). So that students who are at least moderately responsible have increased to 38 students with a percentage of 100%. The learning outcomes of the initial conditions for Indonesian content were 50% complete with an average score of 72.1, cycle I increased to 55.3% with an average of 74.5, cycle II increased again to 100% with an average of 81.1. Then in the content of Civics, the initial conditions were completed 47.4% with an average of 70.7, in cycle I it increased to 52.6% with an average of 80.3, then cycle II increased again to 100% with an average of 90.1. While the mathematics content of the initial conditions was completed 39.5% with an average score of 69.2, cycle I increased to 47.4% with an average of 72, then cycle II increased again to 100% with an average of 81.6. (Mungzilina, Arista Khoirul, 2018).

CONCLUSION

The results of the study can be concluded that the results of the development carried out by researchers on environmental pollution material are known to be very effective problem-based learning-based e-modules to improve the learning outcomes of Science Class VII SMP Negeri 1 Blambangan Umpu Way kanan with the results of 71% there is a change when before and after using the e-module development product.

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