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DEVELOPMENT OF AN E-MODULE BASED ON A TIERED TRAINING PATTERN TO IMPROVE PROBLEM SOLVING SKILLS IN CLASS 5 STATE PRIMARY SCHOOL 050661 KWALA BINGAI

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Abstract

This research aims to develop a mathematics module with a problem-based learning model that is valid, practical and effective in improving elementary school students' mathematical problem solving abilities. This type of research is research and development (*Research & Development*) which refers to the *ADDIE* (*Analysis, Design, Development, Implementation, Evaluation*) model. The research instruments used consisted of expert validation sheets, student practicality assessment sheets, and student learning outcome tests. The research results show that a) the e-module developed is suitable for use in mathematics learning based on the overall percentage of media experts 79%, material experts 78%, language experts 77%, and the practicality criteria meets 87% in the very practical category b) based on the results of evaluation tests , e-modules are effective in improving problem solving abilities with a percentage of 80% of students achieving classical completeness. The result of the development is an e-module with a problem-based learning model that is valid, practical and effective for use in mathematics learning.

Keywords : E-Module, Problem Solving Ability, Problem Based Learning

Introduction

Learning is a process of interaction between teachers and students in the school environment. As time goes by, the learning system undergoes changes which are usually called curriculum changes from KTSP to the 2013 curriculum or commonly referred to as K13, with the 2013 curriculum change policy according to Imam (2014: 2) is an effort and goal of the basic curriculum principles of *change* and *continuity* which forms the results of studies, evaluations, criticism, responses, predictions and various challenges passed. The 2013 curriculum is strategic in preparing and facing the obstacles and pressures of Indonesian society in the future. One of the lessons that students must master is problem solving, for example solving mathematical problems. Problem solving ability according to Mukasyaf, et al (in Ihwatul Islahiyah, 2021) is an ability that is important in learning mathematics. According to Nuangchalerm (in Ihwatul Islahiyah, 2021) Students being able to solve problems and improving problem solving abilities is the goal of mathematics learning in accordance with the 2013 curriculum. However, solving mathematics problems during the Covid-19 pandemic experienced a few problems. However, with the development or changes to the curriculum, it makes it easier for each individual to carry out teaching and learning activities as if they were at school. What can be done is to develop e-modules based on tiered practice patterns, which is an effective method for improving the problem solving skills of grade 5 students. In the current digital era, student-centred learning approaches and using technology are becoming increasingly important. E-modules are a digital learning tool that can be used to improve students' skills in problem solving. Problem solving is a very important skill for students to face challenges in the real world. By developing emodules based on tiered practice patterns, students can learn independently and progressively.

This module can be adapted to students' level of understanding and ability, so they can learn at their own pace. One way to solve problems in mathematics is a tiered practice pattern. A tiered practice pattern is an approach that allows students to build their understanding gradually. This module is designed with gradually increasing levels of difficulty, so that students can gain a deeper understanding of concepts and problem-solving strategies. Through the use of e-modules based on tiered practice patterns, students can hone their problem solving skills better. They will become familiar with various kinds of problems and problem-solving strategies that they can apply in everyday life. In addition, this e-module can also provide direct feedback to students, so they can see the progress they have made as well as areas that need improvement. By using this approach, it is hoped that the problem solving skills of grade 5 students can improve significantly. They will become more confident in facing challenges and have the ability to make the right decisions. In the ever-growing digital era, developing e-modules based on tiered training patterns is an effective way to prepare students to face a complex and challenging world. Based on potential problems that occur in the field, the e-module that will be developed should contain problem-based learning in order to improve students' abilities in solving mathematical problems. This is supported by Minister of Education and Culture Regulation Number 65 of 2013 concerning Process Standards, it is highly recommended that using problem-based learning (PBL) can improve students' problem-solving abilities by being creative in producing contextual work either independently or in groups. By applying the PBL model, students are able to identify known information and strategies needed to solve problems. Problem-based learning is a learning model where students acquire and develop high-level skills such as problem solving and critical thinking by obtaining information from real-life experiences that students experience. and gain definite knowledge about their own learning. It is hoped that the e-module being developed can make the learning process more interactive, through pictures and videos discussing questions, so that the material presented is easier to understand. Apart from that, it encourages students to analyze problems to find, understand, apply mathematical concepts related to solving mathematical problems. and think in connection with the real world.

Research Methodology

This research method uses research and development methods (*Research and Development*). according to Smith & Ragan (in Ihwatul Islahiyah, 2021) which refers to the *ADDIE* (*Analyze, Design, Development, Implementation and Evaluation*) model. This research was conducted at SD Negri 050661 Kwala Bingai **,** with a total of 4 subjects The object of this research is a mathematics module developed using the Problem Based Learning model on tiered training pattern material. Data collection instruments through a) interviews, b) expert test validation questionnaires and student responses to the practicality of the module; c) Evaluation test to determine the effectiveness of the e-module in improving students' mathematical problem solving abilities. The module is declared valid after going through a validation test process by media experts, language experts and education experts. With a percentage of 76%-100% with valid criteria. Through the results of questionnaire responses, the module received a positive assessment from students in the category considered very practical and effective for use in online mathematics learning. According to Sugiyono (in Ihwatul Islahiyah, 2021) the E-Module indicator is said to be practical if the results of the module assessment via questionnaire have reached the practical category.

Result & Discussion

Student learning success is determined by many things. One of them is the way of learning. According to Gagne in Setiawan (2008), each higher level depends on mastery of lessons at the lower and related levels. So students use facts to recognize concepts, then make connections between concepts to recognize principles or principles and finally apply the principles to develop problem solving. The tiered practice pattern is one of the patterns used to facilitate mathematics learning which has a tiered principle. The learning process is divided into three stages, namely the Enactive, Iconic and Symbolic stages. Enactive Stage or Activity Stage (Enactive), the first stage when children learn concepts is to relate to real objects or experience events in the world around them. At this stage the child is still in reflex and trial and error, not yet harmonious. Manipulating, arranging, lining up, fiddling, and other forms of movement. Iconic Stage or Image Image Stage (Iconic), at this stage the child has changed, marked and stored events or objects in the form of mental images or the child can re-imagine in his mind about objects or events that he experienced or knew at the enactive stage, even though the event was has passed or the real object is no longer in front of him. Symbolic stage (Symbolic), at this stage children are able to understand symbols and explain them using their language. The results of research and development of e-modules using the ADDIE model can be described into several stages, namely:

a. **Analisys (analysis)**

Needs analysis is the first stage in ADDIE research which aims to determine potential problems in schools by conducting interviews with mathematics teachers. In the questionnaire for analyzing the needs for teaching materials, students revealed that they could not understand the explanation of the example questions provided in the textbook if they only looked at the examples without any illustrations of problem solving. Especially elementary school children who could not immediately understand the material without an audiovisual display. The presentation of the material developed includes orienting students to problems, organizing students to study, guiding students to carry out individual investigations, presenting problem solving procedures, analyzing and evaluating the problem solving process.

b. **Design (Design)**

The mathematics material selected in this module is a tiered practice pattern in accordance with K13. Mathematics story problems are a form of problem where the problem is described in the form of a story, and in solving it requires a skill to formulate the problem contained in it.

c. **D*evelopment* (Development)**

The third stage is the Development stage. The product specification developed is an interactive e-module that students can study independently or in groups. The E-Module that has been developed is first consulted with the supervisor. The criteria for determining expert test subjects are: (1) Experienced in the field, (2) Minimum Master's degree.

d. ***Implementation* (implementation)**

The fourth stage is Implementation. Students stated that learning using e-modules helps understand the material and makes online learning easier, although there are still students who need to receive teacher guidance. E-Modules are said to be effective if they succeed in improving students' mathematical problem solving abilities and meet the learning completeness of at least 70% of students. For students who meet learning completeness, students are able to solve problems, problem solving skills are good, they are able to understand the problems presented in the questions by writing down what they know and what is asked in the questions, students are able to carry out the problem solving steps that must be taken to answer questions and solve contextual problems.

e. ***Evaluation* (Evaluation)**

Evaluation can take the form of suggestions, improvements, comments and input from students, teachers and validators. The advice from mathematics experts regarding problem solving ability test instruments is that questions are added with other variations, and the use of question words opens up students' minds to think critically in solving problems. These suggestions have been corrected through a revision process. The *Problem Based Learning-* based module was developed as follows: (1) Module Cover (2) Foreword page and table of contents (3) Concept maps (4) Contents of the material (5) Games practice link

The advantage of the e-module is that students can do evaluation practice questions and immediately find out the score they got via the link. According to Subekti & Akhsani (in Abu Syafik, 2020) games and quizzes are designed to adapt the practice questions so that students get used to solving questions in a tiered practice pattern that is in line with students' activeness in solving the questions in the module, making it practice and repetition so that students get used to solving the problems given. The drawback is that the soft file module has not yet reached the internet publishing stage, so not everyone can access the e-module except students who have been given the access link.

Conclusion

The results of this research are the development of PBL-based e-modules which are declared valid, practical and effective in improving mathematical problem solving abilities. This research still has limitations, namely implementation in only one class. The tiered practice pattern is one of the patterns used to facilitate mathematics learning which has a tiered principle. The learning process is divided into three stages, namely the Enactive, Iconic and Symbolic stages.

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