Development of Flipbook Maker-Assisted E-Modules Based on Problem Based Learning Models on Quadrate Equations Material

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ABSTRACT

This study aims to develop a mathematics e-module assisted by a flipbook maker based on a problem-based learning model on the material of valid, practical, and effective quadratic equations. The type of research used is research and development with the ADDIE model, namely: Analyze, Design, Develop, Implementation and Evaluation. The subjects of this study were grade VIII students at SMP Negeri 5 Tombolo Pao. The instruments used were validation sheets, learning management observation sheets, student activity observation sheets, student and teacher response questionnaires and learning outcome tests. Based on the trial results, the validation results of the e-module were 3.97 in the valid category. Practically, based on the analysis of teacher responses to the e-module, a positive response of 100% was obtained, while the analysis of student response data to the e-module found that 95.27% of students gave positive responses. Effective based on learning management, an average of 3.7 was obtained in the very good category, student activity was in the very good category, namely 75%, and the learning outcome test was in the high category with an average test score of 86.5. In the trial stage, the e-module assisted by a flipbook maker based on a problem-based learning model on the quadratic equation material met the valid, practical and effective criteria.

Keywords: e-module, flipbook maker, problem-based learning model, quadratic equation

1). INTRODUCTION

Education is the most important part that every human being cannot separate. Education has a very central role in improving human resources. The expected human character is a person who is faithful and devout, has a good personality, has a noble character, is advanced, skilled, creative, intelligent, disciplined, responsible, and physically and mentally healthy. Effective efforts to shape human character can be made by improving the quality of education (Sofyan, 2012). According to the Big Indonesian Dictionary (KBBI), education comes from the basic word, namely, maintaining and

providing training in morals and intelligence. Meanwhile, education is defined as the process of changing the attitudes or behaviour of a person or group of people to mature humans through teaching and training efforts (Nurkholis, 2013). However, currently, what is still a hot topic of discussion regarding the quality of education is the low learning achievement of students in mathematics. The reality in the field is that mathematics is seen as a complicated subject because there have always been judges that mathematics is complicated.

One of the main causes of low student mathematics learning outcomes is poor learning quality. Teachers often only rely on textbooks provided by the government and do not utilize varied learning models, such as Problem-Based Learning (PBL). PBL invites students to learn by actively solving mathematical problems so that they can improve their critical, analytical and creative thinking skills. To improve the quality of learning, efforts need to be made to provide more interesting teaching materials and utilize existing technology. In this way, it is hoped that students' mathematics learning outcomes can improve (Hotimah, 2020).

Technological developments have encouraged the emergence of various types of teaching materials that are more interesting and effective. Teachers are expected to not only deliver material but also be able to create a conducive learning environment by utilizing technology. One potential teaching material innovation is e-module. E-modules are digital learning materials that students can study independently (Damarsasi, D. G., & Saptorini, 2018). Flipbook maker is a piece of software that can be used to create interesting e-modules. With a flipbook maker, learning material can be presented in a format similar to a physical book, complete with images, animations and other interactive features. This makes the learning process more enjoyable and effective.

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In connection with this explanation, research has been carried out by Evi Intan Pornamasari with the title "Development of a Flipbook Maker Assisted Learning Module with the Numbered Header Together (NHT) Learning Model based on Vygotsky's theory of Main Material Relations and Functions". The results obtained from validation by media experts were 83.37% with very good criteria, and validation by material experts was 91.78%. The student response questionnaire obtained a score of 73.47% with good criteria so that the media can be said to be valid. From the right-hand t-test hypothesis, it is obtained that tcount> ttable, namely 3.0703 > 1.67, with a significance level of 5%, so Ho is rejected. So, it can be concluded that student learning achievement using the flipbook maker-assisted learning module with the Vygotsky theory-based NHT model is better than student learning achievement using the previous module on relations and function material (Pornamasari, 2017).

This research was conducted because problems were found in mathematics learning at SMP Negeri 5 Tombolo Pao. Students have difficulty understanding the material, especially quadratic equations, due to several factors. First, the teaching materials used are limited and less interesting. Second, teachers have not utilized technology optimally to assist the teaching and learning process. Third, the learning methods used are less effective in developing students' problem-solving abilities. To overcome this problem, researchers developed an interactive e-module using Flipbook Maker software. This e-module was designed by applying the Problem Based Learning (PBL) learning model which places greater emphasis on problem solving. The hope is that with interesting e-modules and active learning methods, students will more easily understand mathematical concepts, especially quadratic equations, and improve their critical thinking skills.

2) METHODS

The type of research used is research and development. Research and Development is a type of research used to develop a particular product and test the product, both in terms of the product's effectiveness and practicality. The development model used in this research is the ADDIE model, namely: Analyze, Design, Development, Implementation and Evaluation. The test subjects for the product development of e-module teaching materials were students in class VIII of SMP Negeri 5 Tombolo Pao, consisting of 24 students. The data collection instrument used in this research is the research instrument suggested by Arikunto (2014). The validity instrument consists of an expert validation sheet for the product and all instruments used in the research, then the practicality instrument consists of a learning management observation sheet and teacher response questionnaire. Meanwhile, the effectiveness instrument consists of student activity observation sheets, student response questionnaires and learning outcomes tests.

3) RESULTS AND DISCUSSION

The development of e-modules assisted by a flipbook maker based on a problem based learning model was carried out using the ADDIE development model through the stages of Analysis, Design, Development, Implementation and Evaluation.

The Analysis Stage is a stage that begins with analyzing student needs and curriculum analysis. First of all, observations were made of student learning activities carried out at school as well as interviews with teachers. As for the results of the observations, information was obtained that the teaching materials used had not been presented using audio-visual media as another alternative which turned out to be sufficient to increase students' interest in the learning material and could motivate them. students to take part in mathematics teaching and learning activities. The content in these teaching materials does not yet lead to a learning model that can support students' problem solving abilities to increase. In the needs analysis, it can be seen that what teachers and students need is mathematics teaching materials that are appropriate to the characteristics of students, namely mathematics teaching materials that require students to solve problems that are rich in mathematical concepts, involving students actively in the learning process. where this is in accordance with the Problem Based Learning learning model which according to Syawaly & Hayun (2020), the Problem Based Learning model is used to position students as self-directed problem solvers through collaborative activities, encouraging students to be able to find problems and collaborate on them by

proposing conjectures and planning solutions, facilitating students to explore various alternative solutions and their implications, as well as collecting and distributing information, training students to skillfully present findings, and familiarizing students with reflecting on the effectiveness of their way of thinking in solving problems. Then, according to Magdalena et al., (2020), teaching materials are also needed that can take advantage of technological developments. In connection with this, one of the teaching materials that can be developed is electronic modules. Electronic modules themselves are independent learning media containing topics or units of learning material that students use to study on their own with minimal assistance from the teacher. So it is felt that e-module teaching materials assisted by a flipbook maker based on the problem based learning model need to be developed.

The Design Stage is the stage of starting the design of teaching materials which begins with selecting the right teaching materials to be used in order to help students achieve competency. In the learning process, students need teaching materials that suit their own needs that are relevant to the conditions currently experienced with the development of technology and information, namely the learning process must focus on the students. One of the learning models that supports the 2013 curriculum is the problem based learning model which is a way to convey ideas or thoughts through the process of finding them themselves, in this process students try to find concepts and formulas or the like facilitated by the teacher, so this model places great emphasis on student activity. The importance of learning planning is based on the theory put forward by Dolong (2016), emphasizing that learning planning actually aims to encourage educators to be better prepared to carry out learning activities with thorough planning. At this stage, e-module teaching materials and mathematics learning outcomes tests based on problem based learning models are designed which will be used in learning.

Development stage, the e-module teaching materials developed are teaching materials prepared with specifications in the form of electronic media, displayed with a display that matches the display design that has been determined at the design stage and prepared using flipbook maker software, namely Heyzine Flipbook, by applying problem based learning model syntax. This is the character that researchers want to show. At this stage, instruments were also developed in the form of student response questionnaires, teacher response questionnaires, student activity sheets, learning implementation sheets using e-module teaching materials, learning management sheets and learning outcomes tests. After the development of e-module teaching materials and instruments has been

completed and approved by the supervisor, the next stage is to validate the e-module teaching materials and research instruments by the validator using the assessment sheet that has been prepared. Validate several suggestions for improvement before the e-module teaching materials are tested. The results of the validation analysis of e-module teaching materials include the following:

Table 1. E-module Validation Sheet Analysis Results

Source	Average score	Criteria
RPP	4.15	Valid
Teaching materials (e-module)	3.97	Valid
Teacher response questionnaire	4.15	Valid
Student response questionnaire	4.25	Valid
Learning management sheet	3.86	Valid
Student activity sheet	4.05	Valid
Learning result test	4.18	Valid
Average Total Instrument Validity	**4.05**	**Valid**

The conclusion of the two validators states that the e-module teaching materials assisted by a flipbook maker based on the problem based learning model on the subject of quadratic equations can be used without further revision with an average total validity of 4.05 which is in the valid category. This is in accordance with theory put forward by Arsyad (2016), that the criteria used to state that learning materials have an adequate degree of validity is the average value of validity for all minimum aspects. The results of this research are in line with research conducted by Abidin, Zainal & Walida (2017) where the teaching materials designed meet the criteria for validity and are suitable for use and are in the interval $3.5 \leq M < 4.5$. E-modules that have been declared valid are then tested to see their level of practicality and effectiveness.

Implementation stage, at this stage trials are carried out so that practical and effectiveness data analysis is obtained. Based on practicality criteria seen from the results of teacher response questionnaire analysis and learning management observations, it is stated that the implementation of learning using e-module teaching materials that have been developed and validated by experts shows that teachers' responses to e-module teaching materials state that teachers give a 100% positive response to e-module. The learning management carried out by the teacher during the learning process using e-module teaching materials assisted by a flipbook maker based on the problem based learning model is in the good category, namely 3.7 with an interval of $3.5 \leq KG < 4.5$. This is in accordance

with the theory put forward by Purnama (2016) that the criteria used to state that e-module teaching materials have a degree of practicality are e-module implementation sheets, teacher response questionnaires and learning management sheets with average scores for all minimum aspects. . This is in line with research on the development of teaching materials conducted by Wibowo & Pratiwi (2018) where the teaching materials designed meet practical criteria seen from learning management which shows an average of 3.64 and the response of teachers and students to the teaching materials developed is positive.

The effectiveness of e-module teaching materials is the success of an e-module in achieving learning objectives. The effectiveness of e-module teaching materials can be seen from the results of student response questionnaires, student activity sheets, and learning outcomes tests. It was found that the results of the analysis of students' responses to the e-module showed that 95.27% of students gave positive responses. Student activities during the learning process are observed based on 8 criteria for student activity, namely students pay attention to problems related to quadratic equations that are related to real life, pay attention to the teacher's questions and try to answer them according to the results of observations of the problems presented, pay attention to the teacher's explanations and record the steps for solving quadratic equations as an initial step, students identify initial problems presented in modeling quadratic equations in everyday life in the e-module, analyze the problems obtained and develop concepts that have been learned in solving problems, ask about things that are not yet understood regarding the results of identifying problems in the e-module, presenting the results of their work in front of the class, and responding to the results of their friends' work. In the learning process it is in the very good category, namely 75% with a percentage interval of $80 \leq P \leq 100$. And the learning outcomes test is in the high category with an average score of 86.5 from the ideal score of 100. The following is the learning outcomes test taken by 24 students after using the learning media in Table 2.

Table 2. Results of Analysis of Learning Outcomes Tests

Score	Category	Frequency	Percentage
≥ 75	Complete	21	87,5%
< 75	Incomplete	3	12,5%

Based on the results of the analysis of the learning outcomes test, it is known that the percentage of learning completion for SMP Negeri 5 Tombolo Pao is 87.5% and 12.5% has not yet completed

the learning outcomes test. This shows that classical learning completeness for junior high school is in the high category. Therefore, it can be concluded that the e-module teaching materials developed are effective for use in the learning process.

This is in accordance with the theory put forward by Okpatrioka (2023) that the criteria used to state that e-module teaching materials have a degree of effectiveness are teacher response questionnaires and learning management sheets with minimum average scores for all aspects. This research is in line with research conducted by Ariastutik et al. (2016). So it can be concluded that the e-module teaching materials assisted by a flipbook maker based on the problem based learning model are very good for learning, because students can learn on their own with minimal assistance from the teacher using the e-module teaching materials that have been developed.

The Evaluation stage is the final stage carried out in this research. At this stage a revision is carried out based on criticism of the use of e-module teaching materials as a complement to the e-module teaching materials that have been developed. This is in line with the theory put forward by Tegeh (2016: 440), which says that evaluation at each stage can minimize the level of errors or product deficiencies at this final stage.

4) CONCLUSION

This research was developed using the ADDIE model, namely Analysis, namely conducting needs analysis and curriculum analysis and it was found that students and teachers needed teaching materials presented using audio visual media, Design, namely designing e-module teaching materials with the help of a flipbook maker. based on a problem based learning model on quadratic equations and designing learning outcomes tests; Development, namely products and instruments that have been designed and then developed into complete teaching materials, then validated and revised according to suggestions from the validator until they are declared valid; Implementation, namely valid teaching materials, was then applied on 15-28 February 2024 on trial subjects, namely class VIII students at SMP Negeri 5 Tombolo Pao until practical and effectiveness data were obtained; Evaluation (Evaluation), namely carrying out revisions based on input from users.

Based on the results of testing e-module teaching materials assisted by a flipbook maker based on the problem based learning model, valid, practical and effective teaching materials were obtained. Valid criteria were obtained based on the e-module validation results of 3.97 which were in the valid category. Practical criteria obtained based on the results of data analysis of teacher responses to the e-

module stated that teachers gave 100% positive responses; and learning management carried out by teachers in the good category, namely 3.7. Effective criteria were obtained based on data analysis of student responses to the e-module, with 95.27% of students responding positively. Student activity during the learning process is in the very good category, namely 75% and the learning outcomes test is in the high category with an average test score of 86.5 from the ideal score of 100.

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