

## Development of Problem Based Learning E-Module on Two Variable Linear Equation Systems

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### ABSTRACT

*The aim of this research is to figure out how to construct e-modules based on problem-based learning on two-variable linear equation system that from a valid, practical, and effective. This research employs to conduct a development study using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) method. The research analysis technique is using a validity test in the form of scores from material experts, media experts, and the value of teacher responses to e-modules using questionnaire scores. The goal of the practicality test to determine the study effectiveness is in the form of student responses using pretest and posttest scores. The results of this research resulted in an e-module product. To determine the product's feasibility using validation, practicality, and effectiveness tests. The resulting assessment by material experts got a score of 89% with a classification of valid or feasible. The resulting assessment by media experts got a score of 84% with a valid or feasible to use. The results of the educator's response questionnaire scored 86% with a classification of valid or feasible. The results of the student response questionnaire got a score of 81% with a very practical classification. The results of the pretest and posttest of students got a score of 56% with a classification of quite effective to use. Based on these results, the conclusion of the research is the development of an e-module based on problem-based learning on the material of a two-variable linear equation system that is valid, practical, and quite effective to use.*

**Keywords:** *Problem Based Learning; E Module.*

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### INTRODUCTION

Mathematics as one of the fields of study that is taught in formal institutions and one of the subjects that is very important for everyday life, which deals with many concepts. Concepts in mathematics are closely related to one another. The interrelationships between concepts are evidence of the importance of understanding mathematical concepts. Concept errors in learning mathematics are caused by teacher and student factors. One of the teacher factors is that the teacher does not master the appropriate approaches, learning strategies and learning methods used in delivering mathematics material. In addition, there is also a lack of teachers in mastering the core material provided. Mastery of the material must be mastered by the teacher. If the teacher does not master the concept as a result, the delivery of the wrong concept will be accepted by students. Learning Media is needed so that students can focus students' attention (Maghfiroh et al, 2020).

The student factors including the lack of interest of students in learning mathematics so that students do not pay attention to the material and consequently students do not understand mathematical concepts. In other cases, students only memorize formulas or concepts instead of understanding them, so that when faced with different situations or problems, students cannot use the concepts in these problems. Based on the researcher's interviews with several students of class VIII at SMPN 2 Kabuh, the factors of students in understanding mathematical concepts, including the appearance of mathematics teachers who seemed unfriendly to students, the models and learning methods chosen by the teachers were mostly not in accordance with the existing circumstances, so that students' interest in learning decreases and causes students to be bored and lazy with math lessons, besides that, teachers in teaching mathematics are very

monotonous who still use learning using conventional methods, namely still using the lecture method, taking notes, and giving assignments without completion, sometimes without even being discussed at all. resulting in students lazy to learn which resulted in learning outcomes achieved under the KKM, success in learning was not achieved. Learning that quality can be created through there is a learning process that pay attention to goals, materials, models learning, learning media, and student character (Nasrulloh, 2020).

The implementation of the 2013 curriculum, the Government published books for students, including mathematics textbooks. This book is expected to facilitate teachers in carrying out classroom learning by applying a scientific approach. In fact, the existing student books seem less in line with what is expected in the 2013 curriculum. The student books have not clearly shown how teachers should carry out learning by applying scientific methods. Based on the researcher's interview with the mathematics teacher at SMPN 2 Kabuh, the students experienced many difficulties in understanding the concepts in the material of a two-variable linear equation system, if only using the student's book. Students are less motivated and less challenged in learning and make them feel bored so that the average learning outcomes are below the KKM. The willingness and ability to ask questions and collaborate with their friends is very minimal, so the book is difficult to inspire teachers to make students more active and creative. Problem now is how find the best way to convey various concepts are taught so that students can use and remember longer the concept and how teachers can communicate well with students. How teacher can open careful thinking diverse from all students so that they can learn various draft and method relate it to real life (Qomariyah et al, 2021).

Learning by using modules and worksheets makes most students bored and lazy to study, so the module needs to be combined with electronic media, which is often called an electronic module (e-module). Learning is said to be realized well if it is integrated with e-modules and will produce good graduate products. In order to make learning look active and have direct experience, the module must be packaged in constructivist-based learning that provides opportunities for students to construct their own knowledge and develop scientific attitudes, namely the Problem Based Learning model. Problem based learning models can also train students to improve their problem-solving abilities. Problem-based learning helps students develop thinking skills and problem solving skills, learn adult roles, and become independent learners. Therefore, With the implementation of this learning model, students are expected to be able to develop students' character in applying mathematics learning so that students are able to present the results of their completion in accordance with the stages and the concept of completion (Nasrulloh & Nisa', 2021). Problem-based learning helps students to process ready-made information in their minds and construct their own knowledge. Students are also trained to become adults and become independent students in their future lives. The Problem Based Learning Model is also expected to help the analysis process of students and students are expected to be more active in critical thinking so that they can solve problems in everyday life related to mathematical concepts, when compared to using conventional models.

## **METHOD**

Research and development methods or in English Research and Development (R & D) is a research method used to produce certain products and test the effectiveness of these products. This study aims to develop an e-module based on problem based learning on the material of a two-variable linear equation system for class VIII SMP/MTs. In developing this e-module, this researcher uses the ADDIE (Analysis, Design, Development, Implimentation, Evaluation) learning design model developed by Dick and Carry (1996) on the basis of learning that the model is suitable for developing learning media that is targeted, effective and very assist teachers in the learning process. The ADDIE model can describe a systematic approach to instructional development. According to Suparman (2012) instructional design is a systematic, effective and efficient process in creating an instructional system to solve learning problems or improve student performance through a series of problem identification, development and evaluation activities. ADDIE itself is an acronym for the steps carried out in the development of learning media: Analyze, Design, Development, Implementation and Evaluation (Sugiyono, 2013).

Data in research is all the information needed to solve problems in research. The type of data needed in this study is data from interviews, data from filling out questionnaires or questionnaires. These data include quantitative and qualitative data. Quantitative data obtained from the results of questionnaires or questionnaires and tests (pretest and post-test) given to students. While qualitative data obtained from the results of interviews and filling out questionnaires or questionnaires whose results are

processed in descriptive form. Research instruments are very important to achieve goals in research. Research instruments are tools used to obtain or collect data in order to solve research or to achieve research objectives. Data collection techniques in this e-module development research use three types, namely interviews, documentation and questionnaires (questionnaires).

## RESULT AND DISCUSSION

### Result

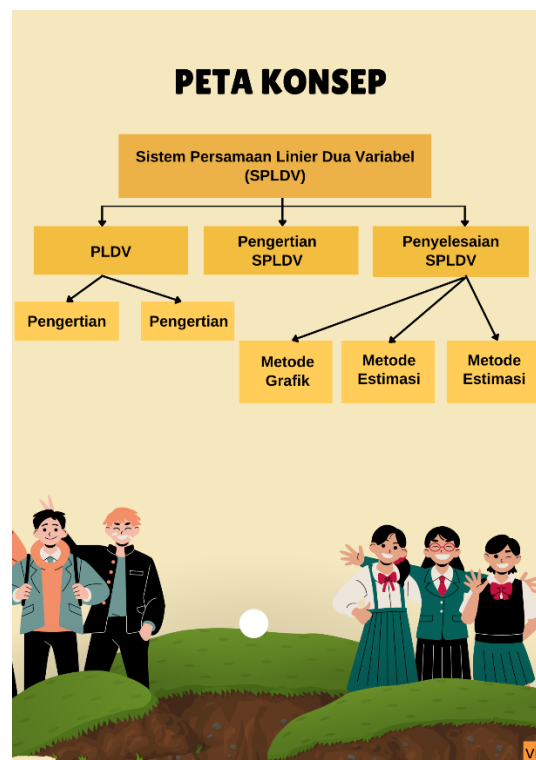
This research uses research and development (R&D) methods. The development model used is ADDIE. The description is as follows:

- Analyze

This stage of analysis was carried out by researchers by conducting interviews with one of the mathematics educators, namely Mrs. Cicik Rakhmawati, S.Pd. In the interview, Mrs. Cicik stated that students were less enthusiastic about learning mathematics in solving contextual-based math problems, especially in a pandemic situation, where students learn online / online. Many students experience many difficulties in understanding concepts in mathematical material, students are less motivated and challenged in solving problem-based problems. To develop students in understanding mathematical concepts, effective media and methods are needed in learning. Students will be more enthusiastic and enthusiastic about learning mathematics if learning uses media/methods that are in accordance with the material and character of students.

- Design

This E-Module is made by typing on a laptop/computer using the Canva application, then downloading it in pdf form. After that, it is inserted into the Flip Pdf Professional application to create interactive and interesting e-modules in which there are pictures, learning videos, links, animations. Preparation of e-module design, namely cover, material title, Core Competencies, basic competencies, learning indicators, learning objectives, practice questions and bibliography.



**Figure 1.** Designing product in Flip

- Development

The data from this development is obtained from the validation results of material experts. This validation was carried out by mathematics lecturers and mathematics subject teachers. Data on the results of the e-module validation assessment based on problem-based learning on the material of a two-variable linear equation system



**Figure 2.** Developing product in Canva

- Implementation .

The implementation phase data was obtained based on the results of product trials on class VIII students at SMPN 2 Kabuh, totaling 30 students. The assessment is carried out by filling out student response questionnaires after doing the pretest (before using the product) and post-test (after using the product). Based on the results of the recapitulation of student response data, it can be stated that this e-module is practical to use in learning

- Evaluation

This evaluation was conducted to determine whether the e-module based on problem based learning on the material of this two-variable linear equation system was in accordance with the needs of students and educators or not. The evaluation was obtained from the results of the student response questionnaire after working on the pretest and posttest questions. The students showed a good response and were enthusiastic about using the e-module. In addition, students are also willing to work on the pretest and posttest questions enthusiastically.

## Discussion

Based on the data obtained, the results of the media expert validation questionnaire recapitulation obtained a score percentage of 84% with a very valid validity level. Based on these results, it can be shown that this E-Module is very valid to be used as one of the mathematics teaching materials for class VIII SMP/MTs with a system of two-variable linear equations. Based on the data obtained, the results of the recapitulation of the lecturer validation questionnaire obtained a score percentage of 89% with a very valid validity level. Based on these results, it can be shown that this E-Module is very valid to be used as one of the mathematics teaching materials for class VIII SMP/MTs with a system of two-variable linear equations. Based on the data obtained, the results of the teacher response questionnaire

recapitulation obtained a score percentage of 86% with a Very Valid validity level. Based on these results, it can be shown that this e-module is very valid to be used as one of the mathematics teaching materials for class VIII SMP/MTs with a two-variable system of linear equations.

## CONCLUSIONS

Based on the results of the development that has been carried out, the final product of research and development is an E-Module based on problem based learning on the material of a Two Variable Linear Equation System which can be concluded as follows : (1) Assessment by material experts scored 89% with a very valid classification or very feasible to use. (2) Assessment by media experts scored 84% very valid or very feasible to use. (3) The results of the questionnaire response to educators scored 86% with a very valid classification or very feasible to use. (4) The results of the student response questionnaire scored 81% with a very practical classification. (5) The results of the pretest and post-test of students scored 56% with the classification being quite effective. (6) Based on these results, it can be concluded that the development of an e-module based on problem based learning on the material of a two-variable linear equation system is very valid, very practical and quite effective to use.

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