DESIGNING STUDENTS WORKSHEET BASED ON MEAS OF THREE VARIABLES LINEAR EQUATION SYSTEM MATERIAL

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Abstract

This study aims to produce the student worksheet designs based on MEAs. In designing it uses the development of ADDIE (Analysis, Design, Development, Implementation and Evaluation) models. This study only steps were taken to analyze and design. In the analysis phase, an assessment of basic competencies is carried out. Next, it composes indicators based on basic competencies. Beside that, researchers also study the MEAs approach. After the first step, proceed with compiling student worksheet.

INTRODUCTION

The purpose of learning mathematics was written in Permendiknas No. 22 of 2006. Then, the National Council of Teachers of Mathematics also stated that mathematics learning should be done in an effort to develop problem solving skills, reasoning and verification, mathematical connections, mathematical communication, and representation (NCTM, 2000: 288).

But in reality students have not been able to solve the math problems given by the teacher. This can be seen in the results of the 2015 Program for International Student Assessment (PISA) in the field of mathematics, Indonesia ranked 62 of the 70 participating countries with a score of 386. As well as the results of the 2015Trends In International Mathematics and Science Study (TIMSS) in the field mathematics, Indonesia is ranked 52 of 57 participating countries. Students in Indonesia are used to solving problems at a low level. So when given questions with a higher level or non-routine questions, students find it difficult to solve the problem (OECD, 2015).

By Polya (1973), there are four steps - troubleshooting steps, the four steps are continuity and unity that can not be separated. To solve a problem, students must be able to understand the problem correctly.Without the right understanding, they cannot possibly make a settlement plan. Preparation of the completion plan is also influenced by the experience of students in solving a problem. If the settlement plan has been prepared, then the problem can be resolved according to plan. Furthermore, it is necessary to review or re-examine the settlement process that has been carried out to ensure the correctness of the answers obtained(Romawati, Elniati, & Murni, 2012) . In the problem solving steps above, there are steps to develop a solution strategy or design a mathematical model.

Model-Eliciting Activities (MEAs) is one approach that can improve students' modeling ability to model problems into mathematical models. MEAs development has two objectives in thinking when MEAs were created. First, MEAs will encourage students to create mathematical models to solve complex problems, just as mathematicians apply in the real world. Second, MEAs are designed to enable researchers to investigate students' mathematical thinking and leading mathematical educators (Lesh & Doerr, 2003). Learning Model-Eliciting Activities (MEAs) are based on real life problems of students, working in small groups, and presenting a mathematical model as a solution. The model made by students is then measured for accuracy in presentation activities (Jumadi, 2017).

Lesh et al. (2000) describe mathematical modelling as when, "students are asked to develop an explicit mathematical interpretation of situations". Lesh and colleagues further refer to this process as 'mathematizing' situations. In effect, when creating mathematical models students consider highly technical situations that may be not formally mathematized. However with MEAs, they are asked to mathematize data in an attempt to make sense of a novel situation. In using the term mathematized, one can consider situations in which mathematics has been applied to formalize the system.

Learning MEAs will be more successful if there is help for students to be more effective and increase student activity in developing their knowledge. According to the National Council of Teachers of Mathematics , one way to help students is to use teaching materials that are deliberately designed so that students can work together to solve the mathematical problems they face (NCTM, 2000: 289). To teach the modeling, the teacher needs help in the form of a Student Worksheet that can support the learning process. Student Worksheet is one of the right learning alternatives for students because Student Worksheethelps students to add information about concepts learned through systematic learning activities (Aryani, 2011) .

Currently many Student Worksheets are circulating, but lack emphasis on the learning process. Most only contain summary material. The material presented is not accompanied by structured steps about how a concept is formed, but only fills the points that make students unreasonable. If students are not invited to reason, then how students can solve problems. therefore, need to be designed in accordance with the approach Student Worksheetmodel-eliciting Activities (MEAs).

METHODS

This research is part of a research development or research development model ADDIE (Analysis, Design, Development, Implementation, and Evaluation). The goal is to produce a Student Worksheet using a valid and practical Model Eliciting Activities. In this study the preparation of Student Worksheet was carried out until designing.

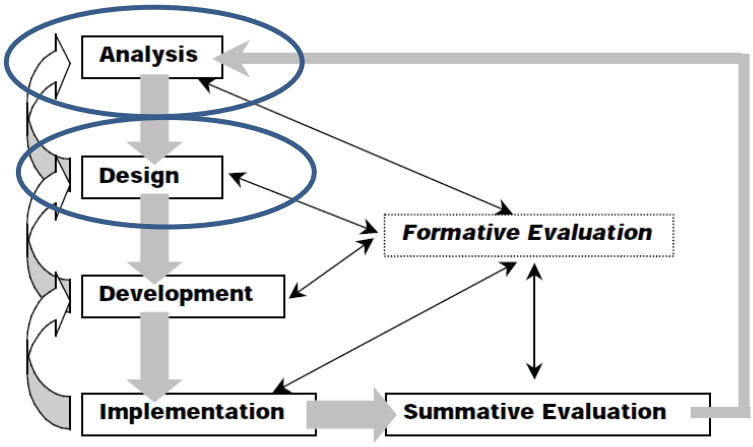

Figure 1. ADDIE Model Design Flow

When viewed from Figure 1, two stages are carried out, namely analysis and design.

RESULTS AND DISCUSSION

The focus of this research is Student Worksheet using model-eliciting Activities (MEAs) on the material system of linear equations in three variables in X class. The subjects of this research were students of class X SMA. Subject selection is purposive samplingwith three criteria namely level sample selection capacity of the same, teachers recommendations, and student readiness.

The step designing in this research refers to the ADDIE (Analysis, Design, Development, Implementation and Evaluation) model, especially in the analysis and design step. The use of the ADDIE model is more effective and efficient and the process is interactive. This design model consists of two stages :

Analysis

In this analysis step, the researcher analyzes the material by determining the core competencies and basic competencies in the applicable curriculum, namely the 2013 curriculum. Ad core competencies are understanding and analyzing factual knowledge and processing and reasoning in the concrete domain. Base competence is essentially a system of linear equations of three variables of the contextual problem.

From these basic competencies the indicator is derived. The following indicators are the references in the preparation of LKPD. Designing a mathematical model of an authentic problem that is system of linear equations of three variables. Compile a system of linear equations of three variables of the contextual problem.

Researchers also analyzed the characteristics of class X high school students through mathematics teachers at the school. Class X students according to Piaget's theory, that students can already think abstractly, reason logically, and draw conclusions from the

information they obtain. Therefore , the preparation of the LKPD is given problems and steps that can make students reason and draw conclusions about the problem given.

MEAs principle there are six namely; (1) The Model Construction Principle , requires the creation of models that require explicit descriptions, explanations, or procedures for significant mathematical situations. (2) The Reality Principle , states that the problem presented should be realistic that occurs in the real life of students so that it can cause student interest. (3) The Self-Assessment Principle , states that students must be able to test the suitability and usefulness of the solutions they have found without the help of educators. (4) The Construct Documentation Principle , states that students must be able to express their own thoughts explicitly and present in the form of documentation. (5) The Construct Shareability and Reusability Principle , requires students to produce models that can be shared with others and can be usedfor other similar situations. (6) The Effective Prototype Principle , shows that the resulting model should be easily interpreted by others.

Design

Researchers design learning objectives, design problems, and design learning models. The researcher designs a teaching material in the form of Student Worksheet so that students can solve problems related to a system of linear equations, so the researcher designs contextual problems that can be solved by a system of three-variable linear equations that are suitable for class X students, and design work steps that are in according to four central components: newspaper article, readiness or warm-up question, data table or other mathematical information, and a problem statement (Chamberlin & Moon, 2005).

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