

Design of Learning Video Using Realistic Mathematics Education Approaches to Developing the Problem-Solving Ability of Students of Class VII High School

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Abstract: *Problem solving is one of the important abilities in 21st century skills. Students who have low problem solving skills will have difficulty solving PISA and HOTS type problems. Learning media that have not integrated problem-solving skills will hinder the achievement of learning outcomes. This research has two objectives. First, this study aim to analyze the needs of learning media that are appropriate to students character, subject matter, and 2013 curriculum. Secondly, this research is to create a Realistic Mathematics Education approach learning video design to improve students' problem solving abilities. This type of research is a research development with the 4D model. The subjects of this study were teachers and students of class VII. The research instruments used were interview guidelines, observation guidelines, questionnaires, and validation sheets. Interview guidelines are used to obtain information from teachers regarding the needs of learning media in the classroom. Data analysis uses the Miles Huberman model. This research resulted: the material taught in schools was in accordance with the 2013 curriculum, the learning video was not based on RME, the learning model applied by the teacher had not facilitated students to develop problem-solving skills, and the RME-based learning video design. This study concludes that RME-based learning videos that can improve students' problem solving abilities need to be developed further.*

Keywords: *Problem-solving, RME, Learning Video*

INTRODUCTION

Mathematics is one of some important lessons for every student who studies in school. It is intended that every student is equipped with logical thinking and problem-solving ability. Students develop arithmetic, reasoning, critical thinking skills and problem-solving ability through learning and applying mathematics in daily life (Akinmola, 2014). Mathematics learning activities are involved in most problem-solving cases. However, most of students haven't acquired the basic skills in solving the problem they need in mathematics (Berch, 2007). As a result, many of the students face difficulties in mathematics especially solving mathematics problems (Tay, 2005). Recognizing the problem faced by the students in mathematical skills are required in problem solving. It is a one way to help group of students (Tambychik, 2010, Leonard, 2004).

Problem-solving as an activity that involves students in various cognitive actions including accessing and using previous knowledge and experience (Lester, 2013). Problem-solving has four phases: a) figuring out the problem, b) constructing plan, c) implementing the plan, d) verifying the final answer . Problem-solving can be solved and developed using problem presentation, finding solution, and evaluating (Tan, 2004, Foshay, 2003). The importance of teaching and learning mathematics are to develop mathematical problem-solving ability and to find out the solutions towards problems in real-life (Kannan, 2016). Therefore, problem-solving is the basic ability which must be possessed by every student (Kirkley, 2003, Mariati, 2017).

According to the 2012 PISA report, Indonesia has a rank 64 out of 65 participating countries, in other words students' mathematical abilities in Indonesia were still low (OECD, 2015). The average score obtained by students only 375, the score is still below the average international score of 494. One of the factors that affect the low achievement of Indonesian students is the

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weakness of problem solving abilities. Causes of this is problem solving abilities are needed during the learning process. Problem solving ability is the core of mathematics learning, not only the ability to learn material but also the emphasis in forming good thinking ability methods.

There are some problem-solving methods and one of them is by utilizing learning videos (Mariati, 2017). The advantages of learning using video are a) to find out problems in real-life situations, b) to be able to access the videos at any time, c) to present two dimensional moving things, and d) to help students to construct and develop their understandings by varying videos (Teese, 2007). One method to improve students' skills and problem-solving abilities is to employ learning media (Setyaningrum, 2017). By doing so, students will be helped to visualize mathematical abstract object (Berney, 2016). Learning videos can also be very beneficial in making learning processes to be more interesting and fun (Cope, 2015). Thus, the use of learning media such as videos may improve the result of students' learning (Moyer, 2012, Chiu, 2015).

Realistic Mathematic Education (RME) is defined as contextual learning. It means that students learn mathematics through their participations to solve real problem in significant context (Searle, 2012). Experts mention that mathematics in RME is humans' activities that should be related to real-life situations (Ekawati, 2016). RME is an approach which can be used as alternative learning in the process of students' mathematical problem-solving (Harahap, 2018). There are two cores of RME that believe mathematics should be related to real-life situations and mathematics should be viewed as human activities (Habsah, 2017). The characteristics of RME accentuate meaningful learning by relating mathematics to real life or daily life so it can be used as the source or media in mathematics learning process (Zulkardi, 2002).

This article does some questions. First, this study is to analyze the necessity of learning media that are in accordance with student material and curriculum. Second, this research is to design RME-based learning media that can improve the problem solving ability.

This article has 4 sections. The first part explains the introduction. The second section presents research methods. The third section outlines the results of the research and discussion. The fourth section provides conclusions and implications. According to a necessity analysis that has been done previously that students need video learning, because the characteristics of students there are more like to visually learning than the teacher who explained. Students also prefer to associate learning with daily life. Based on the description above, the researcher proposes an RME-based learning video design.

METHODS

The research design of this research is the development of 4-D (Four D Models) which is constructed from define, design, develop, and disseminate (Thiagarajan, 1974). Therefore, this research does not implement the disseminate stage because the purpose of this research is the development of learning media. A product was developed in the form of video using RME (Realistic Mathematic Education) approach in the discussion about Algebra, sub chapter of one variable linear equations grade VII.

The define stage was done to determine and define the needs of learning which will be used later to develop learning media as one alternative solutions towards encountered problems. The design stage was used to design the teaching media, starting from the preparation of the test, selection of media, selection of format, and the preliminary design. The result of the develop stage was a learning media which was validated and revised by an expert.

RESULT AND DISCUSSION

This research was done by designing the mathematics learning video development based on RME for Junior High School students grade VII. Below are the results of the development design with 2-D stages.

Definition Stage

Defining by analyzing three aspects including curriculum, materials, and students' characteristics was done in this stage. The results of the analysis are:

Curriculum analysis

Observed from the learning curriculum, school has implemented the 2013 curriculum. The standard achievement related to core and basic competency has met the provisions of the government. The standard to decrease the achievement indicator has also correlated to the basic competency.

Concept Analysis/Material

The purpose of concept analysis is to determine the learning contents and materials needed to develop learning video based on RME. The learning materials of Junior High School odd semester grade VII are numbers, number sets, algebraic forms, one variable linear equations and linear equalities. In that school, learning media in the form of video are not regularly used. Learning video which are used by the teacher have not used the RME approach.

Students' problem-solving ability and learning design

Students have low problem-solving ability. It is indicated from the low score of the needs analysis result concerning students' problem-solving ability. The learning design done by the teacher are still implementing conventional learning design. Teachers explain in front of the classrooms and students listen to the teachers. Such kind of learning methods form the learning environment to be boring and monotonous.

Students' characteristics analysis

Seen from the students' characteristics analysis which had been done in the school, students are more interested towards learning through visual and relating learning material to real-life situations. Students met several obstacles in several materials and one of them was social arithmetic. In the discussion of social arithmetic, students found difficulties in analyzing various situations to solve problems related to real-life situations.

Design Stage

The assessment of learning video' eligibility is based on the quality of the content, instructional quality, and technical quality. In the design stage, the learning video which will be develop using the RME approach are about social arithmetic. The initial design used the first draft in the form of the initial design of the video. The initial designs of learning video based on RME are as follows:

Preview

The preview becomes the most important part of developing learning-based video. It becomes the object to attract students' attention. In the development of the preview, interesting pictures are used to create pleasant impressions towards students. The learning video entitled "Mathematics Learning Video Social Arithmetics Discount". The preview becomes the opening of the video which explains about learning material which is going to be discussed. Pictures 3.1 is the preview of the video.



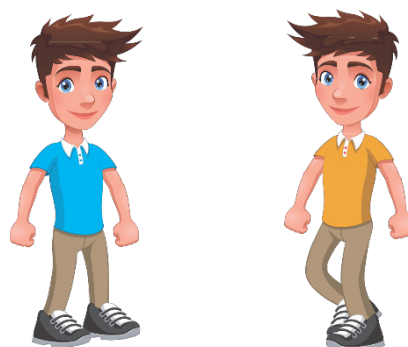
Picture 3.1 video preview

Opening part

The opening part of the video presents the information regarding the Core Competency and Basic Competency which should be achieved through the learning process. Core Competency is functioned as the level of ability to achieve the graduate competency standard. Basic competency is the skill that should be accomplished by the students through the learning process.

Video core material

The material relates to the substance of the subject matter that must be given. A media program in it must contain material that must be mastered by students. In the core part of the video, the problems that occur in everyday life are related to discounts. Arda and Ardi are the characters featured in this learning video. Arda and Ardi will explain the core of the video from finding a case about discounts, analyzing problems, determining how to solve problems and the results obtained from problem-solving. Figure 2.2 is the character of Arda and Ardi.



Picture 3.2 Characters of Arda and Ardi

Exercise

Practice questions are used to train students' abilities in solving math problems on a discount material. Practice questions are presented using issues that exist in everyday life about discounts.

CONCLUSION

This study designs RME-approached learning videos. The initial research stage produces curriculum analysis, concept analysis, analysis of problem-solving abilities and learning models, as well as analysis of student characteristics. The design phase provides the initial design of the learning video which includes the initial video display, opening section, core video material, and practice questions. This design has the advantage of improving students' problem-solving abilities. Video design makes it easy for students to learn and understand mathematical problems related to everyday life. Video design can also increase student learning interest because it is following student characteristics. This research continued further to the assessment.

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