

Learning Mathematics Modeling Through Student Worksheet In Senior High School: Using Financial Context

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Abstract. This study aims to get the modeling assignments in the form of student worksheets to study mathematics in high school using financial context. This study uses a development research method consisting of preliminary and formative evaluation. At the preliminary stage includes analysis, design, and development. Whereas the formative evaluation stage includes self-evaluation, expert review, one to one, small group and field tests. And large group classes are also equipped with videos, field notes, and student interviews to support existing data in the field. The criterion for the success of this study is to produce student worksheets based on a valid and practical modeling approach as a source of student learning. The subjects of this study were high school students in the city of Palembang. Data were collected and analyzed using Tessmer, (2006). In addition, it is supported by data in one-to-one groups, small groups to gain practicality. And the last of the field test group data also explains students commenting and giving interviews related to student worksheets to get the potential for mathematical modeling ability. Based on validation, practicality evaluations and field trials can be concluded that the modeling assignment in the form of student worksheets (LKPD) based on modeling designed using financial contexts in mathematics learning in schools is valid, practical and has potential effects.

Keywords: mathematics modelling, financial context, student worksheet

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1. Introduction

One of the keys to success in learning mathematics is problem-solving (Schunk, D.H, 2012 and Anderson, 1993). The problem-solving component includes understanding the problem, planning a solution, solving the problem and checking again (Polya, 2004). And one of the relevant learning approaches in bridging students understanding abstract mathematical problems representing real-world problems to form mathematics and finding solutions is mathematical modeling (Ang, 2011).

In learning mathematics, students can build modeling competencies and understand real-world phenomena (Blum and Ferri, 2009). Modeling itself is a process that uses mathematics to represent, analyze, make predictions or provide insights about real-world phenomena (problems) (Comap&siam, 2016). A process of changing problems in the real world into mathematical form with the aim of finding a solution to a problem (Ang, 2001). So the importance of students' abilities in learning mathematics is closely related to solving real problems through modeling based mathematics learning (Niss, et al., 2007). Research has shown that the modeling approach has motivated students' interest in learning mathematics (Less, R, 2012 and English, L. D., & Watters, J. J, 2004). The results of this study indicate that at the elementary school level only students are invited to be motivated, feel interested and compelled to learn mathematics. And one way to reduce boredom in the learning

process is the teacher provides a varied learning strategy, the teacher designs activities that involve students in the modeling process and focuses on learning mathematics by using context. Then also made an instrument that can be used in modeling-based mathematics learning in the form of the use of tasks in the learning process. Learning tasks used in this case can be in the form of student worksheets (LKPD). Students will focus on understanding learning material using LKPD (Rahmadani, A, et al, 2012). LKPD also emphasizes the process of concept discovery in students' road directions to find out and solve problems in modeling-based mathematics learning (Sari, F, and Darmawijoyo, 2019).

The use of relevant contexts also facilitates the ability of students to get to know deeply about modeling. So the context used aims to guide students to find the relationship of material and situations in everyday life and reduce mathematical formulas, (Wethal, 2011). The financial context is one of the problems that is expected to play an important role in the mathematics learning process today. Reporting from (OECD, 2005) that education regarding financial problems must begin at school. Students should get to know finances as early as possible in their lives. So students who are literate in financial problems will have a basic knowledge of financial concepts. Knowledge about finance can be used in the global competition in large-scale international studies such as PISA.

It can also be used as one of the trends in the 2013 curriculum in Indonesia using financial context in mathematics learning aimed at maximizing students' potential regarding financial matters.

2. Method

The method used in this research is the Design Research type development study. The development process carried out focuses on assignments given to students using student worksheets (LKPD). The assignments given to students in the form of LKPD are analyzed, designed and developed into products that are fit for use in the modeling-based mathematics learning process. To see the validity, practicality and potential effects of LKPD presented using the preliminary and formative evaluation stages that were tested on one to one group, small group, and field tests.



Figure 1. Formative evaluation's chart (tessmer 1993; zulkardi 2006)

The criterion for the success of assignments with this student worksheet (LKPD) is to use financial context in modeling-based mathematics learning. Students taken as research objects here are high school students of class XI IPA at a high school in Palembang, namely SMA Negeri 11 Palembang. High school students used are students whose skills and knowledge regarding financial concepts used in LKPD are presented.

The data was collected by the researcher in seeing the validity and practicality of the LKPD presented. Valid is based on the walkthrough (expert notes) and one to one stage. LKPD's initiative is based on the readability, interest, and interest of students in understanding the financial concepts contained in the presentation of LKPD. So that a valid and practical LKPD can be used at large class stages, namely field tests. At the field test stage, students' interest and interest in working on LKPD in modeling-based mathematics learning were also analyzed to see the effectiveness of LKPD presented using the financial context.

3. Result and Discussion

Student worksheets are developed based on 2 stages, namely the preliminary stage and formative evaluation. The problem raised in the modeling-based mathematics learning process is the financial

context. Problems in the financial context that the researchers designed in the LKPD sheet based on mathematical learning are modeling the level of inflation and investment. The problem of inflation used is taken from data in the State of Indonesia for the past 10 years. The data is used as an initial problem given to students to explore information about the concept of inflation. Other data used by researchers is an investment. The investment problem used is taken from the composite stock price index (CSPI) data. The relationship of the problem of inflation and investment (CSPI) is contacted by researchers to design LKPD which is a task that will be given to students.

In the process of learning mathematics based on modeling, researchers give assignments to students using several instruments to explore knowledge and financial concepts using a modeling approach. The expected results aim at developing assignments given to students using the financial context in modeling-based mathematics learning.

The results of the tasks designed by researchers at the preliminary stage of analysis, design, and development. The initial design of the assignment was designed by the researcher in the form of a draft, which was then processed into worksheets for students (LKPD). After being analyzed and the LKPD design was developed and tested.

In self-evaluation, LKPD that was developed was evaluated using discussion forums. The activities carried out to provide good benefits, comments, and suggestions for the advantages and disadvantages of LKPD have been developed. The next step was also carried out by the researcher at the expert review stage, the researcher conducted a walkthrough (expert notes) to 5 experts. The experts who helped in revising the LKPD that had been made were Prof. St. Budi Waluya, Dr. Destiniar, M.Pd, Dr. NilaKesumawati, M.Sc, Dr.YuliaResti, M.Sc and also Dr. BambangSuprihatin, M.Sc. The experts retrieved the data by sending emails and face reviews. Assistance from experts was used by researchers in making improvements to the LKPD presented. In addition to comments from experts, LKPD was also commented on by colleagues. Two peers also helped in commenting on the validity of the LKPD.

After comments from experts, LKPD was also trialed to students in the one to one stage. One to one activities is conducted for 2 students. Student 1 is conducted at grade X students of SMA 17, and student 2 at students of grade XI at SMA Negeri 11 Palembang. The results of several comments from the expert review stage, peers and one to one were used as a material in the improvement of LKPD that had been designed by researchers.

Furthermore, the researcher also looked at the practicality of LKPD which was presented in small groups. The small group stage was conducted by researchers as many as 6 students of class XI majoring in Natural Sciences at SMA Negeri 11 Palembang. The practicality of LKPD can be seen from the analysis of students' answers in groups in working on the presented LKPD. Mathematics learning uses modeling stages which also use relevant learning models in solving the given LKPD problems, namely eliciting activities (MEA) models. MEA is one of the learning models that is relevant to mathematical modeling. The students' interest and interest in LKPD work that is given can be seen from the way they do LKPD using sequential modeling steps. In addition to using MEA's as a learning model conducted, researchers also allow students to use instructional media in the form of calculators and ms.excell in working on the problems contained in LKPD.

Upon the successful testing of the practicalities of LKPD presented, the researchers also tested it on a large class, namely the field test. Field test activities were carried out as many as 39 heterogeneous students in class XI Natural Sciences in SMA Negeri 11 Palembang. It turns out that in large groups, researchers conducted an analysis to see the potential effects of students on students' mathematical modeling abilities.

4. Conclusion

From the results of studies conducted by researchers, it can be concluded that validity, practicality and potential effects are found in the assignments given by researchers in the form of modeling-based

mathematics learning LKPD. Students' interest and interest in working on assignments in the form of LKPD using the financial context can be seen from the results of the tests at each stage presented in the modeling process. Analysis of the results of the researchers' trials at each stage in mathematical modeling provides positive energy in deepening modeling-based mathematics learning using financial contexts.

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