

Design of Student Worksheet Problem based Learning to Improve Critical Thinking Skills Students of Class VIII Junior High School in Indonesia

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ABSTRACT

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The purpose of this study was to develop student worksheet designs based on problem-based learning issues to improve students' critical thinking skills in grade VIII. This study uses a four-D development model. This development procedure covers four phases, namely: defining, designing, developing, and disseminating. The subject of this study is an eighth grade student in SMP Negeri 15 Yogyakarta, Indonesia. The objects of the study are curriculum, student characteristics and teaching materials evaluation. This research generates a) analysis of the students' need for learning problems based on worksheets to improve students' critical thinking skills according to the curriculum, student characteristics, learning materials and objectives. b) The results of Student worksheet designs consisting of covers, introductions, table of contents, instruction manuals, basic competencies, supporting information, action steps, and exercises. This research can be continued to develop and disseminate.

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1. Introduction

Critical thinking can be interpreted as a process of using active and rational thinking skills with full awareness and weighing and evaluating information [2]. In line with that, critical thinking ability is needed by students when facing challenges and he must make decisions, evaluate and consider well with the information received, make plans, and determine the actions taken [11]. Critical thinking ability is the ability to think logically and reflectively focused on making decisions that will be trusted [8]. Support students in managing their learning skills, and then empower individuals to contribute creatively to their chosen profession [1].

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One effort to improve students' critical thinking skills can be done by choosing the right and innovative learning model. The right learning model for this learning is Problem Based Learning. Problem Based Learning is a student-centered learning approach that empowers students to practice, as well as research, and integrates theory, applies knowledge and skills to develop appropriate solutions, teaching strategies that claim to support high level learning are when students try to solve unstructured problems [12]. Problem-based learning is learning that is not only teacher-centered, but is more student-centered and can create education that is more innovative and effective because teachers direct students toward thinking skills and play a more active role than the teacher during learning. process, seen when students face problems related to everyday life. and more efforts to find solutions when studying or discussing [3]. Problem Based Learning has a centralized characteristic of the problems needed to support learning in problem solving, and problem-based learning can improve students' mathematical problem solving skills and learning activities, [5]. The process is taught through problem-based learning between understanding, planning, problem solving, and checking answers [9], and there is a significant influence on students' independent learning abilities. Wilder said problem-based learning not only encourages the development of content knowledge, but also various skills, such as communication skills, collaboration, problem solving, decision making, critical thinking, and independent learning [7].

To practice problem-based learning more efficiently, we need learning resources that can support learning, one of them is the Student Worksheet. Student Worksheets are a guidebook used by students to carry out learning activities [4]. Student Worksheets are part of teaching aids intended to facilitate teaching and learning activities, making students easier to understand the concepts of learning. This Student Worksheet contains a series of actions that students can use to maximize their understanding. The purpose of this study was to develop the design of a Problem Based Learning Student Worksheet to improve the critical thinking skills of eighth grade students.

2. Method

This type of research is development research. The product developed in this study is a student worksheet based on Problem Based Learning, to improve students' critical thinking skills. This research model uses the Four-D development model. The development of this research refers to four stages, namely: defining, designing, developing, and disseminating [10]. The research subjects were grade VIII students of SMP Negeri 15 Yogyakarta, Indonesia. there are three objects in this research, which consist of: curriculum, evaluation of teaching materials, and characteristics of students. While there are four instruments for data collection, which consist of observations, interviews, questionnaires, and questions. Observation guidelines were made to extract curriculum data and student characteristics. Interview guidelines are used to retrieve teaching resource evaluation data. These questions are used to see students' abilities. Data analysis in this study used Miles and Huberman which consisted of data reduction, appearance, and conclusions. The development flow can be seen in Figure 1 below. This research was carried out until the design stage.

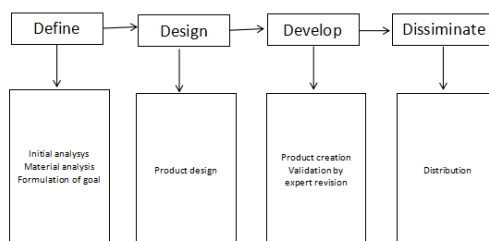


Fig. 1. The development flow of Four-D [10]

3. Results and Discussion

3.1 Define Stage

All documents are arranged in Times New Roman. Development of Student Worksheets using the Four-D development model starting with define. Previously the problem analysis phase was carried out so that students' worksheets were based on Problem Based Learning to improve critical thinking skills of class VIII middle school students. Based on interviews with mathematics teachers at Yogyakarta State Middle School 15, information was obtained that the teacher had not developed teaching materials such as student worksheets. The results of interviews between teachers and researchers indicate that the student worksheets used by teachers and students are student worksheets purchased from publishers. Based on the results of conversations with teachers, there are several disadvantages of the Student Publisher Worksheet, including not covering all indicators of competency achievement prepared by the teacher. Competency tests or tests conducted so far have not contained steps in problem-based learning. Furthermore, in the definition phase indicated starting with: curriculum analysis, analysis of recipient characteristics, material analysis, and formulating objectives [6]. The curriculum used is the 2013 curriculum, which is learning about student components that include competence, media, format, attitudes towards learning tools. The competency level of class VIII B and VIII E SMP 15 Yogyakarta as the test subject is included in the medium category. This can be seen from the average value of daily math tests for both classes 75 and 70. The competencies of students in mathematics are quite diverse which are divided into several categories, namely high categories, low categories and moderate categories. Based on discussions with teachers and students obtained information that students like to learn by using student worksheets. Students expect student worksheets that can direct them to work on math problems actively. on the publisher student worksheet, there are many routine questions that are often found and needed in this student worksheet are non-routine problems to practice students' mathematical problem solving skills. Students need student worksheets with difficulty levels from low to complicated and language in student worksheets that are clear and easy to understand by students and student worksheets with attractive appearance. At the stage of defining, compiling indicators of achievement of competencies, analyzing the material will be taught, and preparing the objectives of mathematics learning for SMP in class VIII.

3.2 Design Stage

Then, the next step is the design stage. This design stage is done by designing student product worksheets according to the results of the analysis at the initial stage or define stage. This student worksheet consists of several components, namely: front cover, back cover, introduction, table of contents, manuals, basic competencies, action steps, and exercises. The steps of this activity are based on Problem Based Learning. In student worksheets, activities are carried out by students in groups and provide opportunities for students to find their concepts for learning. The results of the initial design are called draft 1.

a) Front cover

Front cover of the Student Mathematics Worksheet entitled "Mathematics Based Worksheet Based on Problem". This Student Worksheet is designed or made based on Problem Based Learning in the material to construct a flat side space used for class VIII students. the front cover can be seen in Figure 2.



Fig. 2. Front cover of "Mathematics Based Worksheet Based on Problem"

b) Back cover

The back cover design of the Student Worksheet can be seen in Figure 3 below



Fig. 3. Back cover

c) Introduction

The introduction serves to help show the reader of the text in the Student Worksheet. Writing translation presentations are not only a thank you to God and people who helped write and apologize, but the opening also consisted of general reviews about the subject and supplemented

with descriptions that encouraged others to read the Student Worksheet. The introduction can be seen in Figure 4 below.

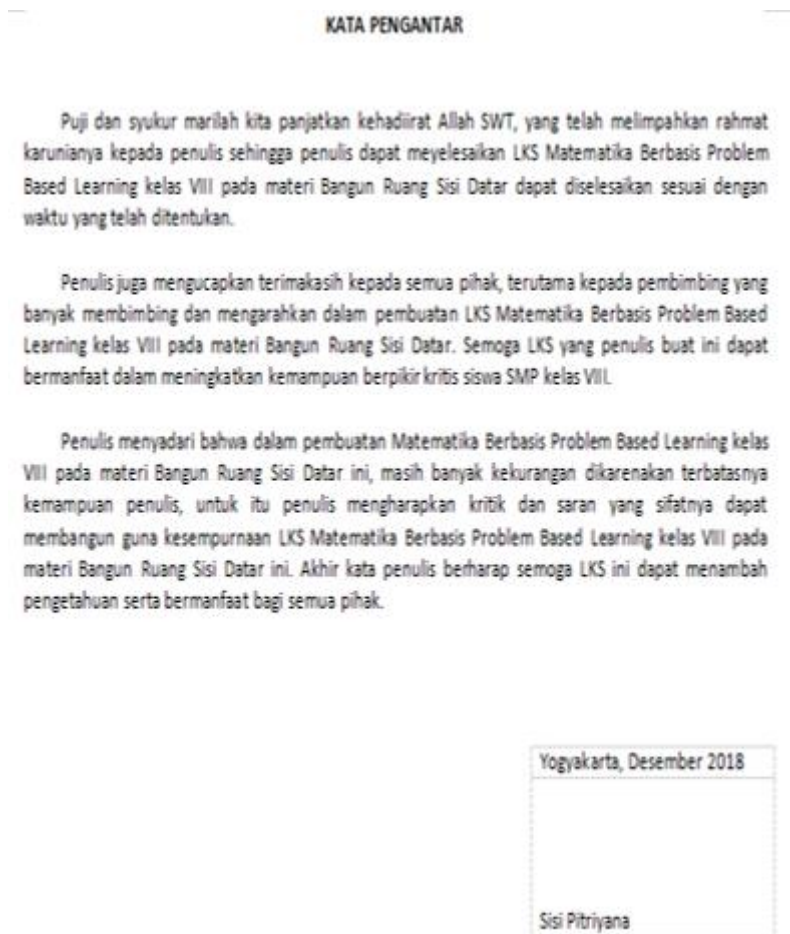


Fig. 4. Introduction

d) Table of Contents

This table of contents can be seen in Figure 5 below. The table of contents is intended to make it easier for readers to find the material they want to learn. This table of contents is created in the order of pages on the Student Worksheet.

DAFTAR ISI	
Kata Pengantar	i
Daftar Isi	ii
Luas permukaan	1
1. Kubus.....	1
2. Balok	2
3. Prisma.....	3
4. Limas	4
Volume.....	5
1. Kubus.....	5
2. Balok	6
3. Prisma.....	7
4. Limas	8

Fig. 5. Table of Contents

e) *Instruction manual*

This manual instruction aims to explain how students use Student Worksheets properly, so that it can facilitate the execution of questions to show the direction in which something must be done. Directions for use can be seen in Figure 6 below.



Fig. 6. Instruction manual

f) *Basic Competence*

Basic competencies are minimum knowledge, skills and attitudes that must be achieved by students to show that students have mastered the competency standards set, therefore basic competencies are the elaboration of competency standards.

g) *Action Steps*

The action step is that it contains several procedural steps. These procedural steps must be taken by students in studying the material and problems presented in this student worksheet. The problem presented is applied to the work of students in groups, the process steps are based on the learning stage of Problem Based Learning.

h) *Excercise*

In this exercise is a form of assignment given to students. The purpose of being given training is to train students' skills after learning teaching material. The questions presented are used to

determine the level of mastery of the material by students and to measure students' critical thinking skills.

4. Conclusion

The results of this study are the design of student worksheets based on problem based learning to improve critical thinking skills. The design of student worksheets has the potential to improve students' problem solving skills. The decisive result is that students prefer learning by using student worksheets, but students expect a Student worksheet that can cause them to work on active mathematical problems. Also in publisher student worksheets, many routine questions that have been found and needed in student worksheets are non-routine problems to train students' mathematical problem solving skills. Students want worksheets with a difficulty level format from low to hard, easy to understand language and have a more attractive appearance.

The design results obtained from this student worksheet consist of: front cover, back cover, introduction, table of contents, instruction manual, basic competency, action steps, and practice. The next re-search steps will continue to the development and dissemination.

Design feasibility is assessed by two experts. The following are the results of calculating the questionnaire regarding the feasibility of design by experts indicated in Table 1.

Table 1
Score of expert judgment

Assessors	position	score	Criteria for Quantitative data
Bustanika Luthfi Harisna, S. Pd	Mathematics study teacher at MTS Taruna AL-Quran	35	Very Good
Syah Fatti Azzatia, S. Pd	Mathematics study teacher at MTS Taruna AL-Quran	30	Good
Total		65	
Average		32.5	Good

Based on Table 1, it can be seen that the average score of expert judgment is 32.5. These results indicate that the design worksheet are at good category.

5. Suggestion

The design of this student worksheet is based on problem-based learning designed to improve students' critical thinking skills, especially in eighth grade students of junior high school. This research can be developed at the development stage as well as to the field testing stage to determine the practice and effectiveness of student worksheets.

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