Development of Student Work Sheet (LKPD) based on Predict-Observe-Explain (POE) to Improve Students' Critical Thinking Ability in 2021/2022

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Abstract. This study aims to: (1) produce appropriate POE-based LKPD to improve learning activities and critical thinking skills of students at SMPN 38 Medan; (2) knowing the magnitude of the increase in student learning activities using POE-based LKPD; and (3) This study aims to determine the increase in students' critical thinking skills by using POE-based worksheets. This research is a research based on development (R&D) with a 4D Model design consisting of four stages, namely Define, Design, Develop, and Disseminate.The results showed that: (1) POE-based LKPD had been produced with a very good category and suitable to be used to improve learning activities and critical thinking skills of high school students; (2) the increase in students' learning activities using POE-based LKPD is indicated by the standard gain value of 0.726 in the high category; and (3) From the results of this study there was an increase in students' critical thinking skills using POE-based worksheets indicated by a standard gain value of 0.445 in the medium category.

Keywords: LKPD, Predict-Observe-Explain, critical thinking skills.

1 Introduction

Education is very important and cannot be separated from life. The importance of education, so that it becomes a benchmark for the progress of an education in Indonesia. Advanced education in Indonesia is education that has quality human resources, both in terms of spirituality, intelligence and skills. So that with quality human resources, education in Indonesia will be able to proactively respond to the challenges of the ever-changing times. To develop quality human resources, quality Indonesian education is also needed. One thing that can be done to achieve these learning objectives is continuous renewal in the field of education, especially mathematics. In enhancing the role of mathematics in life. By involving all aspects of society, one of the roles of the government is always trying to improve the quality of mathematics education. This can be seen from various government efforts such as improving the curriculum, procuring textbooks, increasing teacher competence and various other efforts aimed at producing intelligent and quality human resources.

However, in reality the conditions that characterize mathematics learning today are around the low quality or quality of mathematics education, which shows that the quality of education, especially in mathematics, is still low, which is marked by Indonesia's low ranking at the junior high school level. Based on data from the 2003 TIMSS study, Indonesia is ranked 35th out of

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46 participating countries with an average score of 411, while the international average score is 467. According to the 2007 TIMSS study, Indonesia is ranked 36th out of 49 participating countries with an average score - an average of 397, while the international average score is 500. And the latest results, namely the results of the 2011 TIMSS study, Indonesia is ranked 38th out of 42 participating countries with an average score of 386, while the international average score is 500 (IEA, 2014).

Many factors affect the low quality of education in Indonesia. One of them is the learning process that has occurred so far has not been maximized because the learning process in schools uses more conventional approaches and the ability of students so far has not been developed because the learning process is rarely carried out with experimental activities, besides that LKPD teaching materials only contain a summary of material and questions and have not involving student activities with mathematical characteristics. Whereas in the 2006 curriculum, namely the Education Unit Level Curriculum (KTSP) (Permendiknas No. 22, 23 and 24 of 2006), it contains Graduate Competency Standards (SKL) and Content Standards (SI), in which both SKL and SI prioritize student competence. In accordance with the demands of the KTSP curriculum, the teacher as a facilitator in the learning process is required to have the ability to manage and develop teaching materials as a source of learning. This is reinforced by government regulation number 19 of 2005 article 20 which states that in carrying out professional duties, one of the obligations of teachers is to plan lessons, implement quality learning processes, and assess and evaluate learning outcomes.

Suggestions for implementing good mathematics learning require one alternative that can be used by teachers in learning activities is the student worksheet (LKPD). LKPD is a type of handout to help students learn in a directed manner (Fadliana, et al., 2013: 159). LKPD allows students to do real activities with the objects and problems being studied. LKPD can contain a set of basic activities that must be carried out by students to maximize understanding in an effort to form basic abilities. LKPD can be adapted to the strategies used in the learning process. One strategy that can be integrated with LKPD is the Predict-Observe-Explain (POE) learning strategy. In the POE learning strategy, students will be asked to give predictions and prove their conjectures by experiment (observation) and then explain (explain).

2 Method

This research is a development research. According to Sugiyono (2011: 407) research and development is a method that is used to obtain a certain product result, and to test the effectiveness of the product. In this study, researchers used research and development methods or better known as Research and Development (R&D), using a modified 4-D model development (Four-D Models) S. Thiagarajan, Sammel & Sammel (1974).

3 Types of research

This research is a development research.Research Time and Place in this study, the authors determine the place of research, namely at SMPN 38 Medan in the even semester of the 2022 academic year.

Target/Research Subject

The subject of this study used all seventh grade students at SMPN 38 Medan in the even semester of the 2022 school year. While the object in this study was a learning device in the form of LKPD to improve critical thinking skills with Algebra material.

Procedure

a. Student

In learning mathematics, a media is needed that can show the subject matter, not just text or pictures like in textbooks. Students need LKPD as attractive as possible in learning mathematics, but with inadequate supporting books used in learning because the images are not clear and colorless.

b. Teacher

Teachers need a media that can help students get direct examples in algebraic material. The use of attractive LKPD is one solution in meeting the needs of teachers.

Design

The following are the design stages:

a. Determine and collect data related to the implementation of LKPD development, including: subject matter and specific learning objectives. The subject matter is obtained from learning that mentions the subject matter through a guide book. While the specific learning objectives are obtained from the development of competency standards contained in the syllabus.

b. Create a learning LKPD plan. At this stage, development will be carried out, collecting various kinds of class books to be used as guidelines for making in the development process.

Data, Instruments, and Data Collection Techniques

Data collection is carried out simultaneously, among others as follows:

1. Early observation of the learning process, this observation is to determine the initial state of students in learning. This observation includes the behavior of students during learning, methods, and learning media used.
2. Assessing the quality of the POE-based LKPD made with validation by media expert lecturers, material experts, and mathematics teachers. The results of the assessment are written in the assessment sheet.
3. Carry out pretest and posttest on students before and after using POE-based LKPD to determine students' critical thinking skills.
4. Knowing the response of students to the learning media through filling out a questionnaire. Then conduct interviews with mathematics teachers related to the implementation of mathematics learning by using learning media as a result of development.

Data analysis technique

Data analysis carried out in this study was descriptive qualitative and quantitative. Qualitative analysis is used to describe the product development process until a product is obtained in the form of a Student Worksheet (LKPD) that is feasible to be applied in real learning in schools. While quantitative analysis is used to describe the assessment of product quality based on the validity and influence of the developed LKPD on learning activities and students' critical thinking skills.

4 Research Results and Discussion

This study achieved a Percentage of Agreement (PA) obtained at 99.19% , it shows that the perceptions between assessors are almost the same so that this product can be used for research. Based on the data obtained from the research results, there are results validation carried out by lecturers and mathematics teachers on the developed LKPD. The summary of the results of the POE-based LKPD feasibility analysis is presented in the following table.

Table 4.1. POE-based LKPD Feasibility Analysis Results

No	aspect	score		$\bar{X}$	$\bar{x}_i$	SB_i	PA (%)	category
		expert	practitioner					
1	contents	4,00	4,00	4,00	7,50	1,50	100,00	very good
2	language	3,75	4,00	3,88	10,00	2,00	96,77	very good
3	presentation	4,00	4,00	4,00	12,50	2,50	100,00	very good
4	graphic	4,00	4,00	4,00	10,00	2,00	100,00	very good
Total Average		3,94	4,00	3,97	10,00	2,00	99,19	very good

5 Conclusion

Based on the results of research and discussion, it can be concluded as follows.
1. POE-based LKPD has been produced with a very good category and is suitable to be used to improve learning activities and critical thinking skills of junior high school students.
2. POE-based worksheets can increase student learning activities with a standard gain value of 0.726 in the high category
3. POE-based LKPD can improve students' high-level critical thinking skills who obtain a standard gain value of 0.445 in the moderate category.

Suggestion

From the results of the research, obtaining validation that has been observed by lecturers and mathematics teachers on the developed LKPD
1. Produced in a very good category and we can see the improvement in the learning process for students' high-level critical thinking skills

2. Work on LKPD should be done by each individual, not a group so that the learning activities of each individual student are clearly visible.

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