

## Developing Student Worskshet Based on *Open Ended Problem* to Improve Mathematical Problem Solving Abilities

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### Abstract

This research focuses on developing student worksheets based *open ended problem* on the topic of dividing whole numbers. The aim of this development is to produce feasible and effective student worksheets. The research method used is research and development with the ASSURE development model. Data collection techniques include questionnaires and tests. The subjects of this research were 29 class III Madrasah Ibtidaiyah students. The research results showed that the media expert's score was 3.75 (very valid), the language expert's score was 3.44 (very valid), and the material expert's score was 3.56 (very valid). Based on the test scores for problem solving ability for dividing whole numbers, average results were obtained *pretest* 55.38 and *posttest* 70.14 there is an increase of 0.30 with moderate criteria. As well as from test results *paired sample t-test* obtained sig value. (2-tailed) is  $0.000 < 0.05$ , so it can be concluded that open-ended problem-



based student worksheets media is declared effective in improving students' problem-solving abilities. So that student worksheets media is based *open ended problem* This has met the valid and effective criteria so it can be used in the learning process.

**Keywords:** Student Worksheets; Problem Solving Ability

#### A. Introduction

Mathematics is a means of science and technology and its functional role, the role of mathematics is very diverse in relation to science and technology, there are no fields of science, technology and others that do not use mathematics (Ali et al., 2010). Mathematics is a means to find ways to solve a problem and also a means to train thinking processes (Telaumbanua & Waruwu, 2022). Mathematics is a mandatory subject in the world of education, namely formal education and also has an important role in education (Simamora et al., 2017). Learning mathematics is a way of developing logical, systematic and consistent thinking in determining and developing science and technology aimed at what will happen in the future globally or comprehensively.

At elementary school level, whole numbers are taught, especially division. This material has an abstract object of study, in solving everyday life problems. Therefore, it is not surprising that student learning outcomes on this material are generally still low. This division material is very important for students to learn to face the problems they encounter in everyday life.

Based on the results of research conducted by other researchers in their journals, it states that elementary school students have difficulty solving open-ended problems because they have never been given open-ended questions or *open ended problem*, but are more often given questions that are closed in the mathematics book they are studying (Nurbaiti & Marbun, 2019). Then, according to Roazah (2020), in his thesis, he stated that elementary school students have difficulty solving open or open problems *open ended problem* because they are generally always given closed questions, the practice questions in their mathematics books are in the form of closed questions. Then, according to Wulandari (2020), in his journal, he stated that elementary school students had difficulty answering questions *open ended problem* simple because teachers rarely give non-routine questions/*open ended*.

The results of this research are in line with the results of observations and interviews conducted by researchers, stating that in one of the madrasas in Cirebon Regency, namely MI Assalafiyah Bodelor, Plumbon, Kab. Cirebon has never provided an open question, using STUDENT WORKSHEETS in mathematics learning and students still have difficulty in whole number material, especially division.



One solution to solve this problem is to develop a work-based student worksheets *Open ended problem*. This is in line with the opinion of Setiawan (2007) that teaching materials are considered materials that can be utilized by both teachers and students in the learning process and aim to improve and increase the effectiveness of students' learning in the classroom. *Open ended problem* is a learning approach by presenting a problem that has more than one answer and/or solution method (open problem). Becker argues that *Open ended approach* is a learning approach that has enormous potential to improve the quality of mathematics learning by presenting a problem that has more than one correct method or solution (Karimah et al., 2021).

Development of student worksheets -based teaching materials *open ended problem* has been researched previously by other researchers in their thesis which produced student worksheets based *open ended problem* which is valid and practical, and has a potential effect on student learning outcomes (Apertha et al., 2022). Likewise, it was researched by Purwasi & Fitriyana (2019) in their journal which produced LKS based *open ended problem* which is valid, practical and effective in training the mathematical problem solving abilities of class VIII students.

This research is different from previous research, in this research the researcher developed a work-based worksheet *open ended problem* to improve problem solving abilities. Apart from that, in the student worksheets students must answer the questions in the student worksheets . therefore, the researcher's aim is to describe the feasibility of student worksheets -based learning media *open ended problem*.

## B. Research methods

The research method used is method *Research and Development (R&D)*. R&D research is a method used to create and design a product, as well as see the effectiveness of the product by testing it. It can easily be interpreted as research in which a new product is created or an existing product is developed which is then improved and validated by several teams of experts and then tested in the field. This research follows the ASSURE development model which includes six stages, namely (1)*Analyze Learners* (Student analysis) aims to find out information about the general characteristics, competencies possessed and learning styles of students as well as the learning media used through observation. (2)*State Objectives*(Formulating learning objectives) namely learning standards that focus on KI and KD as well as appropriate learning indicators. (3)*Select methods, media and materials* (Choosing methods, media and teaching materials) namely choosing a method, namely a method *open ended problem* because this is in accordance with the characteristics of students who currently must have open and broad thinking to overcome existing problems. Choose learning media, namely student worksheets -based *Open ended problem*. Selection of teaching materials, namely teaching materials to teach students in class. (4)*Utilize materials* (Using methods, media and teaching



materials) namely before implementing the product, you must validate or validate the product first. There are three product validation experts who are competent in their fields. The media expert is a mathematics lecturer at UIN Cyber Syekh Nurjati Cirebon, the language expert is a language lecturer at the Madrasah Ibtidaiyah Teacher Education (PGMI) study program at UIN Cyber Syekh Nurjati Cirebon and the material expert is the class III teacher at MI Assalafiyah Bode Lor. (5) *Requires learner participation* (Students' participation) is the involvement of students in the learning process. and (6) *Evaluate and revise* (Assess and improve) namely assessing and improving the media that has been developed. (Oktarisma, 2019).

This research was conducted in class III A MI Assalafiyah Bode Lor located on Jl. Kisabalanang, No. 71, Bodelor Village, District. Plumbon, Kab. Cirebon, West Java 45155. Participants or research subjects were class III A students, totaling 29 students. The focus of this research is student worksheets -based learning media *open ended problem*. the tools used include a feasibility test questionnaire sheet. the feasibility test questionnaire sheet is used to assess the suitability of the student worksheets learning media.

The method used to analyze the data is a questionnaire data analysis technique with qualitative and quantitative descriptive analysis. Qualitative descriptive data processing is used to find out parts and suggestions for improvements from validators in the validation process. Then analyze quantitative descriptive data to analyze the data. So look for the product validity category. The validation instrument categories are >3.25 to 4 (Very valid), >2.5 to 2.35 (Valid), >1.75 to 2.5 (Less valid) and 1 to 1.75 (Not valid).

### C. Results and Discussion

The results of the development research that has been carried out are Student worksheets based *open ended problem* to improve students' problem solving abilities in whole number division material. This research and development uses the ASSURE development method.

#### 1. Feasibility of student worksheets -based media *open ended problem*

##### a. Members of the media

The development research data resulting from validation by media experts on the development of student worksheets carried out by researchers was 3.75 which was categorized as "very valid". The conclusion is that the assessment of the media expert feasibility test questionnaire is worthy of a field trial.

##### b. Linguist

The development research data resulting from validation by language experts was 3.44 which was categorized as "Very Valid". The conclusion is that the assessment of the linguist eligibility test questionnaire is suitable for field testing.

##### c. Material expert

The development research data resulting from material expert validation was 3.56 which was categorized as "very valid". The conclusion is that the material



expert feasibility test questionnaire assessment is suitable for field trials.

The results of this research indicate that student worksheets learning media is based *open ended problem* meets the very valid category. the products developed by researchers were declared valid based on assessments carried out by media experts, language experts and material experts. in line with research conducted by karimah et al., (2021) that student worksheets is approach-based *open ended* got a validation score of 4.167. so it is stated that the student worksheets is approach-based *open ended* valid for use. apart from that, other research results state that student worksheets is based on *open ended* the problem of obtaining validation results in the valid category so that they can be used as an alternative for learning mathematics (Telaumbanua & Waruwu, 2022). In line with other research, it is stated that the quality of student worksheets gets a score with a very good predicate with an ideal percentage of 85.0378% so that mathematics LKS material on fractions uses the fractional approach. *open ended* This can be said to be valid according to the assessors and can be used for learning (Ngasimurrohman & Suparni, 2022). The same thing is the case with research that has been conducted by other researchers, namely that the textbook material for class IV ordinary fractions is approach-based *open ended* acceptable and suitable for use as a textbook in the mathematics learning process in class IV with the material expert validation assessment at stage 2 of 90.5% in the very good category, while the media expert's assessment at stage 2 was 91.5% in the very good category ( Pujiasih et al., 2020).

Based on the results of the teacher's practicality response questionnaire and students' responses, the product that the researchers developed was very practical because in the teacher's practicality response questionnaire, the result was 3.78, while the student's response questionnaire obtained a result of 3.25. This is due to the use of student worksheets based on *open ended problem* which has been developed is easy to use and understand by students (Apertha et al., 2022). In line with previous research, the results of this research show that the product developed, namely student worksheets , meets the very practical category, as shown by the average percentage score on the practicality questionnaire of 84.74% with the LKS category being stated as practical, while the average percentage of practicality questionnaire results from the teacher's point of view was 86.3% with the LKS category stated to be very practical for use in learning (Nurbaiti & Marbun, 2019).

One of the functions of student worksheets as stated by Prastowo (2014) is that student worksheets functions as a learning guide. Therefore, student worksheets *open ended problem* that researchers have developed is feasible and practical for use as learning media.

#### D. Conclusion

Development of student worksheets -based learning media *open ended problem* to improve students' problem solving abilities, the results of the feasibility test conducted by media experts were 3.75, language experts 3.44, and material experts



3.56, showing that the feasibility results were categorized as very valid. As well as level of practicality of student worksheets -based products *open ended problem* determined by the teacher's practicality response questionnaire which had a score of 3.78 in the very practical category and the student response questionnaire was 3.25 in the very practical category. in this way, the learning media is student worksheets based *open ended problem* This meets the valid and practical categories so it can be used in the learning process. The following are research recommendations, namely (1) For students, it is hoped that they can use student worksheets -based *open ended problem* in this material for dividing whole numbers as an alternative in learning so that it can be used to train your ability to solve problems in mathematics. (2) for teachers, they can use student worksheets -based student worksheets *open ended problem* this is a learning medium for students in the learning process. (3) for other researchers, so that it can be used as a reference for those who wish to carry out research and development based on student worksheets *open ended problem*.

#### E. Thank You Note

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#### F. Author Contribution Statement

This research was conducted by SA as the first author who was directly involved in conducting this thesis research by developing student worksheets based on *open ended problem* to improve students' problem solving abilities in elementary schools. AA as supervisor lecturer 1 who has directed the author in writing this article and WA as supervisor lecturer 2 who always provides direction and solutions to the learning media that has been developed as well as improvements in writing articles.

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