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DEVELOPMENT OF *OPEN-ENDED* STUDENT WORKSHEETS BASED ON MATHEMATICAL CREATIVE THINKING SKILLS IN REVIVAL MATERIALS

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ABSTRACT

This study aimed to 1) create students' worksheets (LKPD) for mathematics learning based on Open-Ended Problems on students' mathematical creative thinking skills that meet the validity aspect. 2) create students' worksheets (LKPD) for mathematics learning based on Open-Ended Problems on students' mathematical creative thinking skills that meet practical Aspects. 3) create students' worksheets (LKPD) for mathematics learning based on Open-Ended Problems on students' mathematical creative thinking skills that meet the aspect of effectiveness. This research used 4D development, modified into three stages, namely Define, Design, and Develop. The trial was carried out in MTs. Wathoniyah Islamiyah Kebarongan with research subjects of 9 students in Grade IXA. The research found that the mathematics learning worksheets that had been developed met the validity aspects as measured by the assessment of the validation results of experts with an average score of 4.1. The practicality of the LKPD was measured based on the observation of the implementation of the LKPD which was shown to be fulfilled in the fully implemented category. The teacher's response indicated an average score of 4.0 meaning that the mathematics worksheets are practical for learning activities. The effectiveness of the LKPD was shown by the fulfilment of the established effectiveness indicators, namely the average N-Gain normality test, the results of which were carried out through the results of the pretest and posttest. The N-Gain normality test got an average score of 0.5130 which was interpreted as moderate. Thus, the development of mathematics worksheets effectively affects students' creative thinking abilities. It can be concluded that the LKPD developed is valid, practical, and effective.

***Keywords**: LKPD, Open-Ended Problem, Mathematical Creative*

INTRODUCTION

Mathematical creative thinking skills are one of the high-level abilities that need to be developed by students. Permendikbud No. 20 of 2016 on Standards of Competence of Elementary and Secondary Education Graduates states that MTs / Junior High students must possess thinking skills, creative, productive, critical, independent, and communicative (Kemendikbud, 2016). Creative thinking skills are part of skills that need to be developed in facing the information era and competing more and more fiercely (Nurdin et al, 2019). Kosasih and Mulyana (2013) state that creative individuals can show a productive, innovative, and optimistic work ethic to deal with things. Every learner must own the ability to think creatively to face the future.

According to Moma (2016) the next generation of students must have the ability to think creatively in order to compete in the present and the future . Based on interviews with school teachers , students' creative thinking skills are still low and students are still confused in solving contextual problems. Mathematics until now has become a thing that is worried by students because the material is considered difficult. It is not the difficult material, but the ability to think creatively students are still low. The problem in learning is that shiva is less encouraged to develop the ability to think creatively (Juwita et al,

2019). This is where the task as an educator affects students so that students' creative thinking skills are growing and overcome the student's assumption that mathematics is difficult. According to Meika & Sujana (2017), in line with this opinion explained that creative thinking cannot arise by itself because of the ability to think creatively. Requires an exercise so that an educator must be able to explore the creative thinking skills of his students. To achieve creativity one of them with the development of LKPD

The development of LKPD carried out by an educator is as one of the means to improve student learning and skills (Juwita et al, 2019). The development of LKPD that involves students being active and increasing the spirit of student creativity in every learning activity is still very rarely found in schools (Anwar et al. , 2015). LKPD is one of the teaching materials that can encourage learning activities, the goal is to facilitate. Educators in learning activities, students can learn on their own and understand and complete their work.

Math teachers say that the supporting aspects in school learning activities are still less attractive. Some schools only use written learning facilities such as package books and LKS made by companies and consumed in general by schools are not necessarily appropriate. with the condition of the students. The language used is standard, monotonous problems and exercises so that it has not been maximal to develop student skills.

LKPD which is developed independently by an educator by using his own language, contains materials that are in accordance with the competencies must be mastered by learners and problems and Exercise exercises to develop their creative thinking. Based on these conditions, the LKPD made by educators must be innovative and creative by looking at the circumstances or conditions of the students who can be much more appropriate. LKPD based *open-endd* problems that are created and compiled see the factors needed today and can develop students' creativity and be arranged in a variety so that it is expected. Can make the learning process more enjoyable for learners.

The development of LKPD based on *open-ended problems* hopes of making it easier for learners to develop their thinking skills. It is expected that *the open-ended problem* approach of learners will be more active, creative and innovative. Delivery of material with an open-ended problem approach will be much more effectively applied to the 2013 curriculum.

In developing LKPD , we use the appropriate approach to improve students' creative thinking skills. One of them is by using the *Open-Ended Problem* approach. This is in line with the opinion of Gatzel and Jackson as quoted by Fardah (2012) that to measure the ability of creative thinking using tasks that have many answers. Alternatively, many ways of solving it. According to Novtiar & Aripin (2017), the open-ended approach allows students to develop a mindset and determine how to complete a problem. The *open-ended* approach focuses not on many answers, but on solving problems using more than one method. Use of LKPD (Student Worksheet) based *Open-ended* is expected to improve and improve the quality of learning. This is in line with Sariningsih & Herdiman (2017) opinion that with open-ended learning, students can develop reasoning skills and mathematical creative thinking skills in students. .

Providing teaching materials is important to achieve the desired competence from the description. One of the teaching materials used is LKPD. The guidelines presented in the LKPD must be carefully prepared so that students can develop their creative thinking skills, namely in the form of mathematical LKPD Needed a suitable approach to Developing student creativity is with LKPD which is structured based on *open-ended problems* where the problems presented are open and have diverse solutions. Therefore , this research aims to develop LKPD based on *open-ended problems* with students'

mathematical creative thinking skills in revival materials.

METHOD

The research location that will be used is MTs.WI Kebarongan which is located at Buntu Sumpyuh highway, Kemranjen, Banyumas. This research will be conducted in the first semester of the 2021/2022 school year on December 9 , 2021.

This research uses a type of development research with *a Research and Development* model. According to Sugiyono in Kreano (2019) development research is a research method to produce a particular product and test its effectiveness. In implementing LKPD research and development, researchers will use two types of data collected, including Quantitative Data . Quantitative data is data that is processed using the formulation of numbers. The data is obtained from the assessment score of validators, educators, and learners. Qualitative data is data in the form of descriptive sentences. The data is in criticism and advice from material experts, media, teacher responses and student responses to product development. The subject of this research and development is the building and partnership material presented in LKPD form mathematics based *on open ended problems* for students of class IX MTs.WI Kebarongan. This research uses research design model *Research and Development* 4-D according to Thiagrajan in Trianto (2010: 189) which consists of four stages namely *define* (defining), *design* (design).), *develop* (development), *disseminate* (spread). LKPD learning to be developed is qualified if it meets three criteria: validity, practicality, and effectiveness (Rochmad, 2012). The validity aspect of LKPD is the quality criteria of LKPD seen from the content and material contained in LKPD. Validity refers to two things, namely whether the learning device is developed according to its theoretical and there is an internal consistency in each component. The validity of LKPD is said to be valid if it is declared fit for use with revisions /without revision (Rochmad, 2012). LKPD is practical if the practitioner or expert states that the LKPD developed can be applied on the ground. The effectiveness of LKPD can be measured from student achievement by the indicators used, the effectiveness of this LKPD is determined by the student's learning outcomes using pretest and postetst (Rochmad, 2012).

RESULTS AND DISCUSSIONS

Development of *Open-Ended* Problem-Based LKPD that meets the **aspect of validity**

Mathematics lecturers of Muhammadiyah Purwokerto University carry out validation of LKPD. This mathematical LKPD developed using Thiagrajhhan's 4D model (1974). The results of this study state that this mathematical LKPD is valid for use in mathematical learning for revival and partnership materials. Based on research by experts get by looking at the revised results and a total of 128 out of the number of scores 155 or produce an average of 4.1 so that it is categorized "**Valid"** . Furthermore , referring to Widyoko (2011) this product is categorized as very valid if the average of "$4.00 < \bar{x} \leq 5.00$" so that based on validation results Overall , it can be concluded that LKPD mathematics based on *Open-Ended Problem* in Revival and Partnership materials is categorized as **valid** for use in learning.

Development of LKPD Based *Open-Ended Problem* that meets the practical aspects.

From the validity results obtained, researchers tested the practicality of LKPD resulting from the educator's response. The educator is a class IX guu. Responses from educators got a total score of 127 out of a total score of 155 or resulted in an average of 4.0 so categorized as very practical. Referring to Widyoko (2011) the product is said to be practical if the overall average result gets an average value of "$3.00 <\bar{x}4{,}00$ " sehingga berdasarkan hasil dari pendidik dapat disimpulkan Bahwa LKPD mathematics based on

Open-Ended Problem in Revival and Partnership materials categorized as very practical to use during the learning process.

The development of LKPD based on *Open-Ended Problem* meets the aspect of effectiveness.

Based on the results of validity and practicality, then researchers conduct the last stage with effectiveness tests to determine whether LKPD can improve mathematical creative thinking skills in students or students. No. Based on a trial that 9 IXA class learners have conducted on the ability to think creatively calculation of N-Gain normality test of 0.531 with improved interpretation medium. Refers to Hake (1999) where the product is moderately interpreted if the N-Gain test results get an average of "$0.3 \leq g \leq 0.7$. So it can be concluded that "The development of LKPD based on *Open-Ended Problem* is effective in the ability to think mathematically before and after using LKPD.

CONCLUSION

Based on the results of research and discussions that have been outlined, it can be concluded that the LKPD Validity conducted by UMP lecturers by getting an average score of 4.1. The score is categorized as valid. The practicality of the module shows that the practicality criteria carried out get a result of 4.0. So that it can be concluded that LKPD is practically used in learning activities. The results of the LKPD effectiveness test from the pretest problem and the post test problem using that the results of the N-Gain test were concluded that the development of LKPD based on *Open-Ended Problem* on creative thinking skills students with a result of 0.5130 with an interpretation of the current is moderate. So that it can be concluded that the development of LKPD mathematics based on *open-ended problems* in the ability to think mathematically mathematical material revival and support has fulfilled all three aspects. That is, validity, practicality, and effectiveness.

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