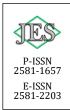


Journal of Educational Sciences

Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES



Development of Mathematics Learning Tools in the Context of Riau Malay Culture to Improve Students Mathematical Problem Solving Ability

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ARTICLE INFO

Article history:

Received: 09 Aug 2019 Revised: 14 Nov 2019 Accepted: 05 Jan 2020 Published online: 24 Jan 2020

Keywords:

Learning Tools Scientific Approaches Story Questions Mathematical Problem Solving Abilities

ABSTRACT

This research was motivated by the lack of learning devices that are considered to be able to train students mathematical problem solving abilities. The purpose of this study was to develop mathematical learning tools that meet the valid, practical, and effective requirements to improve the mathematical problem solving abilities of students in grade VIII SMP on flat side space. The development model used was the 4D model. Based on the results of the validation data analysis, it was concluded that the learning device developed was valid. The results of the syllabus validation were 80.56%, RPP 81.43%, LKPD 87.34%, pretest questions 78.94%, posttest questions 79.86%. This learning tool fulfills the practical requirements in large group trials with an average performance result of 93.06% and an average questionnaire response of students 91.21%. The use of effective learning tools has improved the student learning outcomes. Development of learning tools can significantly improve students mathematical problem solving abilities at a significant level of 0,000 with $\alpha =$ 0.05. This shows that the learning tools that was developed already meet the valid, practical, and effective requirements and can improve students' mathematical problem solving abilities.

1. Introduction

Mathematics is one of the main subjects in the application of the 2013 curriculum. Permendikbud number 22 of 2016 states that the recommended learning in the 2013 curriculum is learning that produces work based on problem solving. Mathematical thinking is a mathematical process that includes five aspects, one of

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Doi: https://doi.org/10.31258/jes.4.1.p.73-82

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which is mathematical problem solving (Heleni et al., 2018). Mathematical problem-solving ability is a basic ability in learning mathematics. This shows that the ability to solve mathematical problems is an ability that must be possessed by students and is one of the factors that determine student learning outcomes in mathematics (Guswinda et al, 2019). However, the results of the preliminary study related to the ability to solve mathematical problems in the material to build flat-sided space for students of class VIII at SMP Negeri 6 Siak Hulu are still low. In line with this, some previous research results show that students' mathematical problem solving abilities are still low (Faiziin, 2014; Daulay, 2017).

The ability to solve problems is a problem of applied mathematics, so one way to practice and improve it is to get students used to solving story problems. Nurjanatin et al. (2017) state that problem solving in school mathematics is usually realized through story problems. Developing students ability to solve story problems is one of the important goals of mathematics learning at school, because story problems can improve problem solving skills (Zulkarnain, 2011).

Ariawan et al. (2017) state that the question of the story is one of the mathematical problems associated with the daily lives of students. The first content that is close to the daily lives of students is Riau Malay culture. The beauty of mathematics can be found in the composition, patterns and aesthetics of nature, even culture (Hasanuddin, 2017). Therefore, mathematics lessons can be related to Riau Malay culture. Zulkifli et al. (2016) stated that various cultural products of our ancestral heritage revealed artistic creativity that contained mathematical elements. For example in songket motifs that contain two-dimensional geometry formations, carved ornaments and architectural shapes in traditional houses that contain three-dimensional geometry patterns.

Utilization of Malay cultural-based story problems Riau can be realized in the learning process. For this reason, teachers need to develop creative and innovative learning tools to improve students' mathematical problem solving abilities. Taufik (Yennita et al., 2018) stated that to run innovation in educational institutions, educators must also be innovative. Riau Malay culture-based stories can be designed in learning tools. Learning tools that can be developed in the form of syllabus, lesson plans, and LKPD that are in line with the 2013 curriculum. Learning tools that are in line with the 2013 curriculum are mathematical learning tools with a scientific approach that is learning devices that use objects of natural, social, artistic, and cultural phenomena (Dewi et al., 2014).

The reality shows that until now there are still many teachers who have not been optimal in developing learning in accordance with the curriculum used. One of them is LKPD which is one of the essential teaching materials needed by students in the learning process. Based on the results of interviews with mathematics teachers related to the development of tools in the form of syllabus, lesson plans and LKPD, information was obtained that teachers had difficulty developing tools in accordance with the 2013 curriculum. In addition, teachers also had difficulty developing LKPD that could encourage participants to find their own concepts

from the material being studied. as a vehicle to develop mathematical problem solving abilities.

In line with that, the researchers felt the need to design learning tools that began with giving story questions in the context of Malay Malay culture as a means to train and improve students' mathematical problem solving abilities. Nieveen (Novrini et al., 2015) states that learning devices are said to have good quality if they are valid, practical and effective. The learning device developed is expected to meet the validity criteria, that is, the device is based on an adequate theory and all components of the learning device used are consistently related to Nieven (Rochmad, 2012). The device that was developed fulfills the practicality criteria, namely mathematics education experts and education practitioners, states in theory that the device can be implemented in the field and the level of implementation is in the good category (Sari et al., 2016).

The learning device developed meets the criteria said to be effectiveness, namely the achievement of learning objectives after using the learning device developed (Putri et al., 2014). Based on the description above, the researcher intends to develop a Mathematics Learning Kit with a scientific approach that begins with a Story Problem in the Context of Riau Malay Culture which is valid, practical and effective to improve students' mathematical problem solving abilities.

2. Methodology

This research was a type of research and development, using a 4-D development model designed by Thiagarajan, Semmel, and Semmel which includes the define, design, develop, and disseminate stages. The subjects in this study were students of class VIII SMP Negeri 6 Siak Hulu. The data collection technique in this study was a questionnaire technique to collect validity and practicality data, while the data of students learning outcomes is the data of mathematical problem-solving abilities collected through tests.

Validity data was sourced from validator ratings related to the developed device. The evaluation category provided by the validator used the assessment category from Sugiyono (2014) which is modified to be Very Good, Good, Poor, and Very Poor. Validation data were analyzed using descriptive statistics. The results of the analysis of the validator, the percentage level can be adjusted to the category of validity. Akbar (2013) states that learning tools are said to be valid if the percentage of validity is more than 70% or in the category of valid or very valid.

Practicality data was obtained from observers and students, the assessment of observers was obtained from the observation sheet while the assessment of students was obtained from the questionnaire responses. The observation sheet for the implementation of the assessment category used was the assessment category from Sugiyono (2014) which was modified to be Very Good, Good, Poor, and Very Poor. In the questionnaire responses of students the assessment category used was the Guttman scale consisting of two alternative answers namely, yes and no. The results

of the ankalysis from observers and students, the level of percentage can be adjusted according to practical categories. Akbar (2013) stated that learning tools are said to be practical if the percentage of practicality is more than 70% or in the practical category or very practical.

Learning outcome data in this study were obtained from the test of students mathematical problem solving abilities after using the developed learning tools. Learning outcomes data were used to see the effectiveness and impact of the use of learning tools. The impact of the use of learning tools can be seen from the difference in the average mathematical problem solving ability of students in the experimental class and the control class obtained from the results of the pretest and posttest.

Analysis of the Effectiveness of Mathematics Learning Devices

The effectiveness of learning devices was obtained by looking at the achievement of learning objectives. In the 2013 curriculum, the standard measure of the achievement of learning objectives is the achievement of the KKM. In line with that, the effectiveness of learning tools is based on the KKM achievement. The learning device is said to be effective if the percentage of student learning outcomes tests reaches the classical learning completeness criteria that is ≥75% (Rahmadi, 2015).

Analysis of the average difference test

Average different test was done to see an increase in students' mathematical problem solving abilities as seen from the results of the pretest and posttest results. Pretest and posttest data analysis was performed to find out whether there were differences in students mathematical problem solving abilities before and after the use of the learning tools developed. Difference test was done by t-test. The learning device developed is said to be able to improve students' mathematical problem solving abilities if the value of $p < \alpha = 0.05$.

3. Results and Discussion

The learning tools produced in this study were in the form of syllabus, lesson plans, and LKPD on the material for constructing flat side rooms of grade VIII junior high school. The device that was developed was a mathematics learning tool that began with a story problem in the context of Riau Malay culture. The development of mathematics learning tools for grade VIII SMP was designed using the 4-D model. The stages of the 4D model are define, design, develop, disseminate.

At the defining stage, the initial analysis, students analysis, material analysis, task analysis, and formulation of learning objectives are carried out. In the initial analysis stage the researcher conducted interviews with several mathematics teachers. Based on the interview results, it was found that the equipment used by the teacher was not in accordance with the 2013 curriculum, the teacher was still

having difficulty in compiling learning tools that were in accordance with the 2013 curriculum, the model or method used had not been varied, the LKPD used had not been able to assist students in finding concepts from the material studied, and students mathematical problem solving abilities are still low.

At the student analysis stage a preliminary study of the students mathematical problem-solving ability tests is carried out on the material in the flat side space. Based on the results of the answers, it is known that the students have not been able to understand the questions given well and the students still have difficulty in solving the problem of mathematical problem solving ability.

Material analysis aims to identify and arrange systematically the important parts studied in the material of flat side space. In this study the learning tool was arranged for 6 meetings. The device was compiled using Riau Malay cultural content. The selected cultural content is adjusted to the material learned at each meeting.

Task analysis consists of analysis of Core Competencies (KI) and Basic Competencies (KD) related to the material to be developed. The KD is then elaborated in measurable indicators. This activity aims to identify academic skills that will be developed in learning. The results of the analysis of the material and assignments are used to formulate learning objectives on the material to build a flat side space.

The design phase is to design the learning tools in the form of syllabus, lesson plans, LKPD as well as mathematical problem solving ability test instruments. The syllabus and RPP designs are adjusted to the syllabus and RPP components in Permendikbud No. 22 of 2016. Learning activities in the syllabus and RPP are prepared based on a scientific approach to the activities of observing, questioning, gathering information, reasoning or associating, and communicating. The draft LKPD is adjusted to the requirements of a proper LKPD. LKPD is compiled using problem solving steps with a scientific approach.

The draft LKPD consists of a cover, LKPD contents and practice questions. The contents of LKPD are adjusted to the problem solving step. The LKPD that was designed started from a matter of story in the context of Malay cultural Malay. The selected cultural content is adjusted to the material learned at each meeting. In this study the Malay Malay cultural content used is the Traditional House and the Malay traditional Malay food. The following are examples of LKPD that use traditional Malay traditional house content in Riau.

The LKPD design is presented in Figure 1. The figure shows the design of LKPD on the material surface area of cubes and beams with the content of a traditional Malay traditional house, Riau House, Lontiok and Lumbung Padi. The LKPD design in Figure 2 is the LKPD design on the prism surface area material with Riau's unique Malay food content namely Bolu Kemojo. Mathematical problem-solving ability test instrument is arranged based on indicators of competency achievement and indicators of mathematical problem-solving ability contained in

the test preparation grid. The questions given were in the form of pretest and posttest questions.



Figure 1. Cover and question story in the context of Malay Malay culture



Figure 2. Cover and question of the story in the context of Malay Malay culture

The develop phase is the stage of developing learning tools that have been prepared. This stage is the stage to produce product development through expert validation followed by product revisions and trials. The trials conducted were small group trials to see the readability of the developed LKPD, while the large group trials were to see the practicality and effectiveness of the learning tools developed.

Learning Device Validation Results

Validator assessment of learning tools developed in the form of syllabus, lesson plans and LKPD obtained an average score of validation results as in Table 1.

Table 1. Syllabus, RPP, and LKPD Validation Results

Average Validation	Syllabus	RPP	LKPD
Score	80,56%	81,43%	87,34%

The validator assessment of the developed syllabus is in the valid category with an average score of 80.56%. The validator assessment of the RPP developed was in the valid category with an average score of 81.43%. The validator assessment of LKPD was developed in the very valid category with an average score of 87.34%.

Pretest and Posttest Validation Results

The validator evaluation of the pretest and posttest questions includes all aspects of material, construction and language. The results of the validation of the pretest and posttest questions are shown in Table 2. The validator's assessment of the pretest and posttest questions developed was in the valid category with an average score of 78.94% pretest results and 79.86% posttest questions.

Table 2. Results of Validation Instruments for Pretest and Posttest

Average Validation	Pretes	Postes
Score	78,94%	79,86%

Readability Test Results

The results of the readability trial conducted on 8 students. Based on the results of the questionnaire responses of students to the developed LKPD obtained that the average total from LKPD-1 to LKPD-6 was 96.73%.

Practical Trial Results

Practicality trials are carried out after the device is revised. Practicality trials were conducted on 30 students. The practicality of the device was assessed from the observation sheet of the feasibility and student questionnaire responses. The results of the observation sheet carried out during the 6 meetings obtained an average total of 93, 06% means that the device developed is very good for use. The results of the questionnaire responses of students after using the learning device is 91.21% meaning the device used is very practical

Effectiveness Test Results

The effectiveness test was carried out on 32 students. The effectiveness of the learning device in terms of classical student learning outcomes completeness. In

this study there were 24 completed students based on the KKM set at school which was 75. Thus the percentage of students who reached the KKM was 75%. This shows that effective learning tools to improve student learning outcomes.

Difference Test Results of Mathematical Problem Solving Ability

The learning tools can also improve students mathematical problem solving abilities, this is obtained from the t-test. Based on the t-test conducted for pretest data obtained significance level of $0.43 > \alpha = 0.05$ so that it can be concluded that H_0 is accepted or there is no difference in the results of the experimental class and the control class.

The results of the pretest data show that there is no significant difference between the pretest scores of the experimental class and the control class, so the posttest data is used. Based on the t-test conducted for posttest data obtained significance level of $0.00 < \infty = 0.05$ so it can be concluded that H0 is rejected or there are differences in the results of the experimental class and the control class posttes. Thus there are differences in the ability to solve mathematical problems between students who use learning tools that are developed with students who do not use learning tools that are developed. This means that the developed learning device can improve the mathematical problem solving ability of students in class VIII on the material to build flat side spaces.

4. Conclusion

Through this development research, it has produced learning tools, namely syllabus, lesson plans, and LKPD. All the products were considered valid by three validators. After going through the validation process by the validator, then two trials tests are conducted, namely the small group test (readability test) and the large group test (practicality test and effectiveness test). In addition, the developed device can improve students' mathematical problem solving abilities.

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How to cite this article:

Rianti, R., Saragih, S. & Zulkarnain. (2020). Development of Mathematics Learning Tools in the Context of Riau Malay Culture to Improve Students' Mathematical Problem Solving Ability. *Journal of Educational Sciences*, *4*(1), 73-82.