

Development of student's worksheet based Bas-basan traditional game in rectangular and triangle

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ABSTRACT

Local culture is rarely known to today's children. The need for learning innovations related to culture is important to develop at this time, especially in schools. The ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) describes research development types. Data were collected through interviews and questionnaires. The outcomes of the interviews were assessed descriptively, followed by quantitative and qualitative analysis of the validity and practicality assessments. The study aims to (1) develop student worksheets (SW) based on ethnomathematics involving game bas-basan, on the material of quadrilaterals and triangles, (2) to test the validity and practicality of ethnomathematics-based SW involving bas-basan game on the material of quadrilaterals and triangles. The validity assessment findings show that the developed SW meet valid standards with a score of 3,11. The practicality assessment findings show that the developed SW meet the practical standards with a score of 3,085. It may be inferred from the validity and practical results that the ethnomathematics-based SW involving bas-basan game on the material of quadrilaterals and triangles is appropriate for use in learning

INTRODUCTION

Mathematics has an important role in the education of students, which can be seen from the number of lesson hours allocated to this subject compared to other subjects. In addition, ability in mathematics is also tested as one of the requirements to continue to higher school levels. This is in line with the views expressed by Kencanawaty et al., (2021) which states that mathematics is one of the subjects that has the most important role in the educational process in schools. According to Aprilia (2020) Learning mathematics is one of the basic sciences that has the ability to solve problems in everyday life. By studying mathematics, learners can develop the ability to solve problems independently and improve their thinking skills. In addition, mathematics learning can also be connected with the culture that exists around the community. As explained by Astuti et al., (2021) Mathematics has a strong relevance to everyday life, where almost everything around us, including the culture of society, can be related to mathematics.

One of the efforts in preserving local culture is to link the concept of culture with mathematics learning (Merliza, 2021). By integrating local culture into mathematics learning, learners can easily and enjoyably improve their understanding as well as develop a better understanding of the local culture and appreciate the diversity of existing cultures. As explained by (Naser et al., 2022) who argue that learning mathematics through culture or real activities experienced by students can help them understand and appreciate the existing culture. In fact, students with different cultural backgrounds can respect and appreciate each other's cultural differences. Culture can be interpreted as all human ideas and works that become the habits of the local people and are passed on to the next generation (Royani & Agustina, 2018). Culture is always evolving and guiding humans to adapt to the

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challenges of the times, from traditional times to modern times. The cultivation of cultural values in education can be developed with ethnomathematics (Agustin et al., 2018). Ethnomathematics is a mathematical concept that was born and developed in a community with its cultural characteristics and can be used as a source of learning (Ayuningtyas & Setiana, 2019). That view is in line with opinion Sulistyowati & Khotimah (2022) said that ethnomathematics is a learning strategy that connects cultural elements in mathematics teaching.

Local culture has various types, one of which is traditional games. According to the conclusion Naser et al., (2022) Traditional games have elements of learning mathematics and cultural values that are important to be preserved and recognized by children. One of the traditional games in Indonesia that is rarely known by the public, especially the younger generation, is the bas-basan game. The game involves a game arena and players represented by small objects such as sapodilla seeds, cape seeds, tamarind seeds, pebbles, paper cutouts, leaf shreds, and so on. Each player should be distinguished by shape, size, and color (Khamadi et al., 2015). In ethnomathematics learning teachers use an environment that is close, direct and can be imagined by students (Setiawan et al., 2021).

In studies conducted by Fairuz et al., (2020) It is revealed that learners have limited knowledge regarding the relationship between culture and mathematics, known as ethnomathematics. Therefore, innovation is needed to create learning activities that are meaningful and relevant to everyday life. One of the innovations that can be used in the application of ethnomathematics learning is through the use of Student Worksheets (LKPD). Based on the results of the study Rahmawati & Marsigit (2017) concluded that the development of ethnomathematics-based learning media, including LKPD, can increase student achievement and motivation in mathematics learning. LKPD is one type of learning media that helps introduce ethnomathematical concepts and facilitates understanding of the material taught. According to Astuti & Sari (2017) LKPD is a series of assignment sheets that must be done by students, usually containing instructions and steps to complete the task.

Some researchers have developed teaching materials based on ethnomathematics for use in mathematics learning. One example is research conducted by Silvia (2019). who developed ethnomathematics-based Student Worksheets (LKPD) for line and angle material. The research produced teaching materials in the form of LKPD that used an ethnomathematical approach in teaching line and angle material. Moreover, Dewi et al., (2022), also conducts research that focuses on the development of ethnomathematics-based geometry LKPD by considering critical thinking skills. The results of the research are teaching materials in the form of ethnomathematics-based LKPD developed specifically for learning geometry material.

From the two studies that have been conducted, the results show that the teaching materials developed are ethnomathematics-based Student Worksheets (LKPD) for line and angle material and geometry. However, further development of existing teaching materials is necessary. Therefore, it is necessary to develop ethnomathematics-based Student Worksheets (LKPD) with bas-basan games on quadrangular and triangular material.

METHODS

This research is a type of development research also known as Research and Development (R&D). R&D methods are used to produce new products and test the effectiveness of those products (Sugiyono, 2013). In this study, the product developed was a learning media in the form of ethnomathematics-based Student Worksheets (LKPD) with bas-basan games on quadrangular and triangular material. The development of ethnomathematics-based LKPD with bas-basan games on quadrangular and triangular material is carried out by applying the ADDIE development model.

The selection of the ADDIE development model to develop ethnomathematics-based LKPD was chosen by the researcher. The ADDIE model has five stages of development, as described by Cahyadi (2019) as follows.

Analysis

The main activities in this stage are analyzing the development needs of new learning strategies and evaluating the feasibility and requirements of developing those strategies. The analysis carried out includes needs analysis and material analysis.

Design

The design of Student Worksheets (LKPD) is carried out based on information obtained from the analysis stage. Activities carried out at this stage include determining the elements needed in making LKPD, such as compiling the LKPD framework and compiling a map of LKPD needs. At this stage, researchers also compile instruments to evaluate the LKPD to be developed including the LKPD itself, validation questionnaires, and student response questionnaires.

Development or production

This stage involves the implementation of the LKPD creation plan. During the development stage, the conceptual framework is realized into a product that is ready for implementation. At this stage, an assessment of the validity of the product that has been developed is also carried out. The assessment is carried out by experts/validators through filling out validation sheets.

Implementation or delivery

The implementation stage is carried out after the test results by experts meet good criteria. According to Cheung (2016) The implementation stage can be carried out after the analysis, planning and development stages have matured. At this stage, Student Worksheets (LKPD) are tested on students in class. Field trials were conducted at SMP Muhammadiyah 1 Magetan which was the subject of research to test product quality.

Evaluation

The evaluation stage is carried out based on the results of the questionnaire that has been carried out. Data collection was carried out using validation questionnaires and student response questionnaire sheets. The instruments used in the development of ethnomathematics-based LKPD include validation instruments and instruments to measure practicality. Data analysis uses validation questionnaire analysis by experts and student response questionnaire analysis to evaluate practicality. The average score is generated from quantitative and qualitative descriptive analysis of the results of the validity and practicality assessment. The average value is converted into qualitative data to understand the meaning of each given value. This study used a closed type of questionnaire.

FINDINGS

The development of ethnomathematics-based Student Worksheets (LKPD) begins with the analysis stage, where analysis is carried out to design device designs that will be used as guidelines for developing devices (Ishartono et al., 2016), Especially on quadrangular and triangular materials. The next stage is the design of ethnomathematics-based LKPD. Before starting the design stage, relevant resources such as grade VII mathematics textbooks for the 2013 curriculum and the internet were collected as references in designing LKPD. After the LKPD design stage is complete, the next step in the development of ethnomathematics-based LKPD is development. The development phase is carried out by developing the product and will be validated by validators. This is in line with opinion Murtiyasa & Rahmawati (2021) which states that the development stage starts with developing the product to testing the product to validators. The final stage in the development of ethnomathematics-based LKPD is the implementation of LKPD to students and evaluation. The results of each ethnomathematics-based LKPD development process will be explained as follows:

Analysis

At the analysis stage, an interview was conducted with a mathematics teacher at SMP Muhammadiyah 1 Magetan. The interview aims to find out the problems faced by students in quadrangular and triangular materials, the learning media used, and the curriculum used in learning.

P : "Are ethnomath-based student worksheets previously available for students?"

G: "Nothing yet. After studying the material, students are usually given LKPD as practice questions, but the LKPD given is not ethnomathematics-based."

P : "If there is no ethnomathematics-based LKPD for students, do you think it is necessary to develop ethnomathematics-based LKPD?"

G: "Necessary. As it is known that ethnomathematics is a blend of culture and mathematics. Culture is something that exists in the surrounding environment in everyday life. With the existence of

ethnomathematics-based LKPD, it will make it easier for students to learn mathematics by involving cultures in Indonesia.

P: "What teaching materials and methods have been applied by you in the learning process in class?"

G: "I still use the mathematics textbook from the government, namely the 2013 curriculum package book"

P: "As long as you apply teaching materials and teaching methods in class, what difficulties do students face in learning, especially in quadrangular and triangular materials?"

G: "Students who have difficulty understanding the material that has been explained. Students who dare not ask questions when they encounter difficulties so that the teacher does not know if the students do not understand. Students who are lazy to learn mathematics, so when faced with math problems these students cannot answer them correctly."

Based on the results of interviews with mathematics teachers, it was concluded that when learning mathematics, especially on quadrangular and triangular material, there has been LKPD on quadrangular and triangular material but not yet ethnomathematics-based.

Design

The design phase involves several processes, including: The Introduction section includes the front page (cover/title page), preface, and table of contents. The Content section covers basic competencies, indicators of competency achievement, learning objectives, an introduction to ethnomathematics, and an introduction covering bas-basan playing. There are also observations of the bas-basan game board so that students can observe them before proceeding to activities that lead them to discover the concepts of rectangles and triangles. There are also practice questions to train and strengthen students' understanding of the quadrangular and triangular material that has been learned. The Cover section includes the bibliography and the back cover of the LKPD. In addition, the display of images and varied context in worksheets can improve students' visualization skills (Zakaria Othman et al., 2015). Activities presented systematically and logically in LKPD have the potential to explore students' reasoning abilities (Suryaningsih et al., 2023).

Development or Production

At this stage, an LKPD design of quadrangular and triangular material has been designed in the form of ethnomathematics-based LKPD. The LKPD contains important components in each activity given, with the aim of helping and training students in the learning process.

Cover design is a major part in the development of printed teaching materials (Khotimah & Sari, 2020). Cover creation using Canva. On the front cover there are titles, materials, images of the baseboard, names of authors and supervisors, and target LKPD users. The slash board image used on the LKPD cover reflects ethnomathematical aspects of traditional games. The following is the image on the cover of ethnomathematics-based LKPD (Figure 1)

The introduction to ethnomathematics aims to make students know what is meant by ethnomathematics and the benefits that can be taken from learning ethnomathematics figure 2. In the introduction which contains the traditional game of bas - basan aims so that students can find out what the game is like, where the game comes from, the rules of the game and others. Here is an introductory picture, can view figure 3.

Activities 1 (figure 4) and 4 (figure 5) are part of LKPD which serves as a support in understanding quadrangular and triangular material. In this section, participants were asked to observe the image of the bass game board and were asked to fill in the table provided. Here are activity tables 1 (figure 6) and 4 (figure 7) . Activity tables 1 and 4 are where students can pour answers from activity 1 and activity 4 .

Then, after the product has been developed, product validation is carried out by validators. This analysis aims to see the validity of student worksheets developed following expert validation sheets (Nova et al., 2022) Validation is carried out by filling out a validation assessment sheet in the form of a questionnaire which includes several aspects that must be assessed by validators. The validators check the learning media developed based on the list provided and give a valid mark if the media has met the criteria for the points tested (Zamhari et al., 2021). The questionnaire sheet was assessed by two validators. The results of the first validator's assessment showed an average score of 3.00 with the "Valid" category, while the second validator gave an average score of 3.21 with the "Valid" category. After obtaining the average score from each validator, the overall average value of



Figure 1. LKPD Wrapping Parts (Cover)



Figure 2. Introduction to Ethnomathematics



Figure 3. Introduction (Bas Game – Basan)



Figure 5. Activity 4

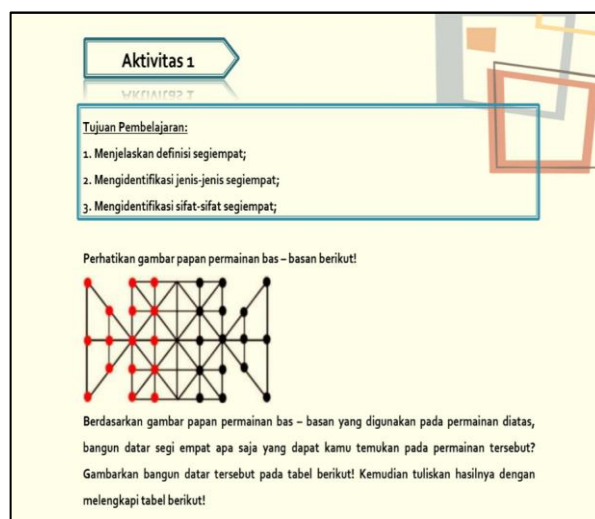


Figure 4. Activity 1

the validator's assessment of ethnomathematics-based LKPD is calculated. The overall average score obtained was 3.11. Based on these values, ethnomathematics-based LKPD gets the "Valid" category according to the validator's assessment. The results of the validity assessment can be seen in Table 1.

No.	Gambar Segi Empat	Penjelasan	Sifat - sifat
1.			•
			•
			•
2.			•
			•
			•
3.			•
			•

Figure 6. Activity Table 1

No.	Gambar Segitiga	Nama Segitiga	Perbedaan
1.			
2.			
3.			

Kesimpulan

Berdasarkan kegiatan diatas, apa yang kamu ketahui tentang segitiga? Jelaskan!

Figure 7. Activity Table 4

Table 1.

LKPD validity results

No	Assessed Aspects	Number of Items	Average	Valuation
1	Content Compatibility	6	3,08	Good
2	Conformity of Construction Requirements	4	3,125	Good
3	conformity of Technical Requirements	4	3,125	Good
conclusion		14	3,11	Good

Table 2.

Results of the practicality assessment

Indicator Achievement	Aspects	Number of Items	Average	Criterion
Practicality of Student Worksheets	Ease of use	3	2,94	Good
	Presentation	3	3,17	Good
	Language	1	3,17	Good
	Benefits in learning	3	3,06	Good
Conclusion		12	3,085	Good

Implementation or delivery

The product trial phase in this study was carried out with limited trials. The limited trial was carried out by testing ethnomathematics-based LKPD to grade VII students of SMP Muhammadiyah 1 Magetan. The trial involved 6 students, consisting of 2 students with a high level of knowledge, 2 students with a medium level of knowledge, and 2 students with a low level of knowledge. After conducting trials on 6 students, students were given a practicality questionnaire to assess whether the LKPD developed had met the practical requirements or not. This is in line with Ranti & Usmeldi's (2019) research which states that student practicality questionnaires are used to see whether or not LKPD is practical. Practicality assessments based on questionnaires filled out by 6 students are presented in Table 2.

Based on the results of the practicality assessment above, an average questionnaire value of 3,085 was obtained. With the average value of the questionnaire, it can be concluded that the practical assessment of LKPD developed is included in the good category. Therefore, it can be said that the LKPD has met the practicality test well.

Evaluation

The discussion that needs to be emphasized on ethnomathematics-based LKPD with bas-basan games on quadrangular and triangular material that has been developed shows that the product meets the validity criteria based on the validation process of two validators. Based on the validation

process, validator 1 gets an overall average of 3.00 and validator 2 gets an overall average of 3.21, both of which fall into the valid category. Validity in the development of ethnomathematics-based LKPD means that the LKPD prepared meets the standards for the preparation of LKPD including the feasibility of material or content, language suitability, the appearance of LKPD, and the presence of cultural elements that can improve the knowledge and quality of LKPD.

Based on the results of the assessment of student response questionnaires conducted to 6 respondents to ethnomathematics-based LKPD that had been developed, an overall average of 3.085 was obtained and met practical criteria. Practicality in the development of LKPD includes clarity of LKPD content, attractiveness of LKPD display, student response, and ease of reading LKPD.

DISCUSSION

The existence of innovation in mathematics learning in schools is needed to support the effectiveness and activeness of students in the process of understanding the material that has been given by the teacher, this is in line with research conducted by Deda & maifa (2021) concluded that LKPD Mathematics Using the Context of Local Wisdom has a potential effect on improving junior high school mathematics learning outcomes. This is relevant to the research conducted Sholihah et al (2022) It was revealed that learning using ethnomathematics-based LKPD can help students find the concepts of the material being learned is one way that can help mathematics learning become meaningful for students.

Research on ethnomathematics-based student worksheets with bas-basan games on quadrangular and triangular material developed with the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) was declared valid and practical by researchers because it obtained a validity value of 3.11 and a practicality value of 3.085. The results of this study are similar to the e-LKPD development research on learning ethnomathematics-based flat geometry material mathematics conducted by Liesandra & Nurafni (2022). From the results of the analysis, it is shown that the data validated by media experts is very valid and material experts with valid criteria. In the product practicality test by SDN 08 Lubang Buaya teachers obtained very practical criteria and by students very practical. Other research conducted by Novriani et al (2021). The results showed that the validation carried out by validators had very valid criteria and practicality by students showed a very practical category. In line research conducted by Novferma et al (2021), the results showed that the assessment of the validity of LKPD from expert validators with an average validity of 79.3% of the Valid category to use. The LKPD Practicality Assessment from trials on students and teachers with an average percentage of 96% of the category is very practical to use. Another research conducted by Mursalina et al (2021) on the development of LKS uses an ethnomathematics-based CTL approach on class X SLETV material, the results of which are reviewed from the feasibility aspect where it is explained that the results of the expert validity test have good criteria. Another research conducted by Husna et al (2021) on the development of ethnomathematics-based trigonometric LKS through a project-based learning model, the results of research reviewed from the aspect of validity obtained valid criteria from all validators.

CONCLUSIONS

The development of ethnomathematics-based student worksheets by applying the ADDIE development model in this study has been successful. The LKPD that has been developed has fulfilled the aspects of validity and practicality, so that the LKPD is suitable for use in mathematics learning. The implementation phase of LKPD is developed only in limited trials on a small scale due to limited time and cost constraints. As a suggestion for future research, it is recommended to develop ethnomathematics-based student worksheets on different materials to create new, more interesting products. In addition, it is also recommended to carry out the implementation stage until trials on a wide scale or more widespread.

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