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Developing Student's Worksheet on Two-Dimensional Figures Based on Ethnomathematics for V Grade of Elementary School

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ABSTRACT

The purpose of this study is to describe the process, validity, practicality, and effectiveness of Student Worksheets (LKPD) on two-dimensional figures based on Ethnomathematics. This study employed the ADDIE development model with five stages, namely: Analysis, Design, Development, Implementation, and Evaluation. The subject of the trial was the fifth graders of elementary school. Data collection instruments used were validation assessment questionnaires for content experts, linguists, media experts, and practitioners (teachers), and the documentation. The data analysis technique employed descriptive qualitative and quantitative. The results of the study indicated that the Student Worksheet is feasible with a percentage acquisition of 90.9%; in terms of practicality, the acquisition of a percentage was 96.4% and 93%; in terms of effectiveness, the acquisition of an average value was 80. Based on the results of the study, the Student Worksheet (LKPD) on two-dimensional figures based on Ethnomathematics can be used in learning because it meets the criteria of feasible, practical, and effective. Thus, Student Worksheet (LKPD) on two-dimensional figures based on Ethnomathematics can be useful and make it easier for the fifth graders of Elementary School to learn Mathematics that contains cultural information and can be used as a teacher's reference in developing instructional materials especially Student Worksheet.

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INTRODUCTION

Mathematical concepts and activities can be explored in cultural groups within society. Mathematical concepts such as two-dimensional figures, geometrical shapes, transformational geometries or numbers can be used to construct cultural outcomes. Likewise, mathematical activities such as measuring, calculating, determining and designing can be applied in a cultural context. This can be shown in studies that explore *tapis lampung* crafts. In the research, *tapis lampung* craft uses the concept of the geometry of rotation and reflection transformation [1]. The culture of Sundanese rural communities also uses units of measurement, mathematical modeling, and the use of the symbol of the clock [2]. Likewise, Narulita's research [3] states that traditional puppet art performances in Surakarta contain mathematical concepts, namely the modulo nine concept, geometry of space, odd numbers, rectangles, and circles. Maryati et al's research also show that the design of *Kebaya Kartini* has mathematical concepts, such as angles, measurements, and integers [4].

Culture is a complex whole element encompassing knowledge, beliefs, arts, morals, laws, customs, abilities, and habits obtained by humans as members of society. Culture includes behavioral patterns that are manifested in a symbol system and are historically transmitted to others. The cultural system is a legacy of innate concepts that are also expressed through meaningful symbols so they can be communicated. Culture is something that influences the knowledge and ideas contained in the abstract human mindset. Culture itself has many aspects, one of which is Ethnomatematics [5]. While mathematics as an abstract science can be related to cultural elements [6]. This is because studying mathematics can be seen from the philosophical, historical and anthropological aspects [7].

Most cultures are learned through history, arts and culture and social sciences. Culture can also be learned through mathematics. Mathematics and culture are two things that can be related to one another. The mathematics that is learned from a culture is developed further so it is known as Ethnomatematics. The term ethnic describes the elements that make up a group's identity: language, code, values, beliefs, community, class, food and clothing, habits, and physical properties [8]. Ethnomatematics is defined as specific ways used by a particular cultural group or society in mathematical activities [9]. Ethnomatematics is mathematics learning that can be learned from a cultural perspective. Ethnomatematics can also be used as material to teach about culture, particularly culture in Indonesia. Through learning mathematics based on Ethnomatematics, teachers can learn the culture that exists in the student environment and then examine the values that exist in a certain cultural community. Thus, in the near future, it is hoped that students will not only understand Mathematics but will comprehend their culture deeper and be able to take values that affect the formation of national character which is currently degraded by the influence of modernization [10].

Mathematics learning can use instructional materials based on Ethnomatematics. Mathematics instructional materials based on Ethnomatematics are proven to be effective in improving mathematical skills and critical thinking as well as increasing student's participation and activity

[11]. This teaching material is also effective in developing students' literacy skills [10]. These instructional materials can be designed and arranged in the form of Student Worksheets. Furthermore, it is expected that the developed student's worksheet could improve and enhance student's understanding of two different aspects, Mathematics and Culture. Therefore, it could cultivate a strong character in the very beginning. In addition, it is expected that the developed Mathematics student's worksheet could offer proper implementation of Ethnomathematics in the learning process [12].

From the explanation above, the purpose of this study is to find out (1) the process of developing Ethnomatematics Based Student Worksheet (LKPD), and (2) the feasibility, effectiveness, and practicality of Student Worksheet (LKPD) based on Ethnomathematics. The material in the Student Worksheet (LKPD) is the material around the area and the width of a flat triangle and circle. In this research, the authors developed student's worksheets on the area and perimeter of the circle and triangle

METHODOLOGY

This research was a research and development study which adapted an ADDIE research model. The stages conducted by the authors were the analysis stage, designing stage, development stage, implementation stage, and evaluation stage. This research and development involved three validators, content expert validator, language expert (linguist) validator, and media expert validator. The target users of this product are the fifth graders of elementary school. In this research, two types of data, qualitative and quantitative, were obtained from media expert validator, content expert validator, classroom teacher response, and questionnaires distributed to students on the developed instructional media. On the other hand, the quantitative data were obtained through student's learning outcomes (by administering post-test).

The first stage was the analysis phase. This stage aimed at finding out and identifying the problems or needs that exist based on the initial observation. This stage is the initial stage of planning. In this stage, the researchers consider new products to be developed. The analysis conducted was the analysis of the curriculum and character of students in the school of the research setting. The second stage was the designing stage. In this stage, the researchers prepared and composed a Student Worksheet (LKPD) that will be developed. This Student Worksheet (LKPD) was created by providing cultural images related to mathematics learning, and compiled with lesson plans in accordance with the curriculum used. The third stage is the third stage of development. In this stage, the researchers performed a process in producing and developing a Student Worksheet (LKPD) design that is ready to be implemented to students in the classroom. At this stage, the researcher also validated the instructional media to the media expert, material expert, linguist, and practitioner (fifth graders teacher). Comments and suggestions given by the experts were used to make improvements to the Student Worksheet (LKPD) based on Ethnomathematics. After validating and it was stated that the Student Worksheet (LKPD) based on Ethnomathematics is

feasible to be used in the field (classroom setting), then a trial phase was conducted for fifth-grade students through the stages of implementation.

The fourth stage was the implementation stage. In this stage, the researchers conducted a trial on the Student Worksheet (LKPD) based on Ethnomathematics to the fifth graders of elementary school as the target users. This stage was conducted to determine the practicality and effectiveness or students' responses to the Student Worksheet (LKPD) based on Ethnomathematics that has been developed. The fifth stage was the last stage. It was one of the important stages in the development where the researcher evaluated the developed instructional media based on the student response questionnaire and the results of the researchers' observations by the teacher. The response was obtained after the fifth-grade students filled out the response questionnaire given by the researcher. The questionnaire was used to measure the practicality of the developed Student Worksheet (LKPD) based on Ethnomathematics. While the effectiveness of Student Worksheet (LKPD) based on Ethnomathematics was measured based on student test scores. Based on the results of these measurements, the developed Student Worksheet (LKPD) based on Ethnomathematics is feasible.

The instrument used in this study was a questionnaire for the validation of content experts, linguists, media experts, and practitioners (teachers). These instruments were used to determine the feasibility of the Student Worksheet (LKPD) based on Ethnomathematics. While measuring the practicality of Student Worksheet (LKPD) based on Ethnomathematics, the researchers used the teacher and student response questionnaire. Meanwhile, to determine the effectiveness of the Student Worksheet (LKPD) based on Ethnomathematics, the instrument used was a test item given to students.

Data analysis was performed after all the data has been collected. The data analysis techniques used in Student Worksheet (LKPD) based on Ethnomathematics assessments were carried out quantitatively and qualitatively. Quantitative analysis was to assess the validity and practicality and effectiveness of the Student Worksheet (LKPD) based on Ethnomathematics. Validity and practicality data obtained were analyzed using a percentage. While the test result data to measure effectiveness were analyzed in accordance with the Minimum Completion Criteria. Qualitative analysis in this research was in the form of responsiveness and suggestions from content experts, linguists, media experts, and teachers. It was in the form of a descriptive assessment and was employed as the basis for revising and refining the Student Worksheet (LKPD) by researchers. According to Miles and Huberman, data analysis is done interactively through data reduction, data display, and verification. The reduction of research data summarized and retrieved important data from the results obtained in the field, then the presentation of data at this stage was done in the form of a brief description or in chart form. With this presentation, the data were organized in order to provide easy-to-understand data presentation. It was also dealing with conclusion drawing and offered an answer to problem formulation stated beforehand.

RESULT AND DISCUSSION

The results of this development research were in the form of procedures for developing a Student Worksheet (LKPD) based on Ethnomathematics using the ADDIE research method. The developed Student Worksheet provides lessons and exercises about two-dimensional figures, triangle, and circle in which the lessons are combined with the cultural information regarding the two-dimensional figures. The detail of the Student Worksheet can be seen in the following figure.

Development Results

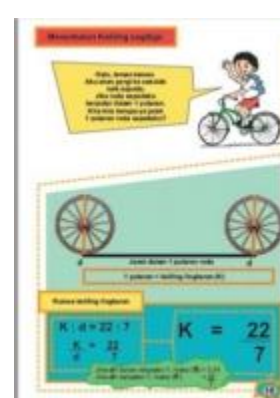
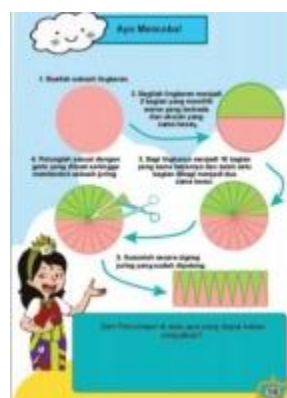
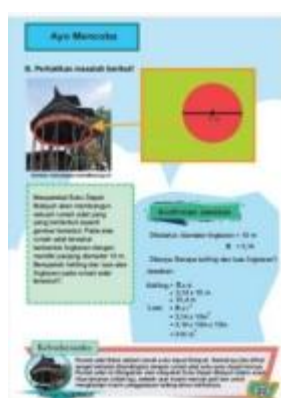


Figure 1. Cover Figure 2. Exercises Figure 3. Formulas Figure 4. Topic

The developed product was assessed and validated by a content expert, linguist, media expert, practitioner, and students. The assessment and validation aimed at determining the quality of the instructional media. The results of the assessment and validation are presented in the following table.

Table 1. The Results of Validation, Teacher's Assessment, and Students' Response

No	Validator	Percentage	Remarks
1	Content expert	87,5%	Feasible
2	Media expert	91,7%	Very feasible
3	Linguist	93,75%	Very feasible
4	Practitioner	96,4%	Very feasible
Average Percentage		92,33%	

Source: data processed by the researchers

The results of Student Worksheet (LKPD) based on Ethnomathematics validation by content experts obtained a validity score of 87.5%, and the validity assessment of Student Worksheet (LKPD) based on Ethnomathematics by media experts obtained a validity score of 91.5%, while the results of the Student Worksheet (LKPD) based on Ethnomathematics assessment by linguists obtained a validity score of 93.75%, and the results of the validity assessment of Student Worksheet (LKPD) based on Ethnomathematics by

practitioners obtained a validity score of 96.4%. Therefore, the assessment results of the Student Worksheet (LKPD) based on Ethnomathematics by three validators and practitioners obtained an average score of 92.33%. The results of the Student Worksheet (LKPD) based on Ethnomathematics can be categorized as "valid" and deserve to be tested by revision. The practicality of Student Worksheet (LKPD) based on Ethnomathematics obtained from student responses received a percentage of 93% with the category "Very Practical". Therefore, this media is considered very practical. The practicality test results of the Student Worksheet (LKPD) based on Ethnomathematics obtained an average value of 80. In this category, the Student Worksheet (LKPD) based on Ethnomathematics is good.

Student Worksheet (LKPD) based on Ethnomathematics combines cultural elements and mathematical concepts. For example, Figure 2 presents the traditional house of the Dayak community which contains the concept of a circle. From Figure 2, students can calculate the diameter or radius of a circle. The shape of the circle on the roof of the house can be used as a means to find the concept of the area of the circle. The image of the rooftop of the traditional house is presented at Student Worksheet (LKPD). The students are asked to make a circle that resembles it with colored paper. Students can also design colored circular paper to find the circular area formula, as presented in Figure 3.

Furthermore, students learn the area and circumference of the circle. Thus, students can connect mathematical concepts with culture and their daily experiences. In this context, students can improve their ability to decipher meaningful connections and deepen their understanding [13]. The activity in Figure 3 also integrates art in the elements of culture and science related to mathematical concepts. The combination of art and science will help students in their mathematical creative thinking [14].

The forms contained in cultural elements can also help students determine or localize in solving mathematical problems. In figure 5, a Yogya palace umbrella is presented which resembles an isosceles triangle shape.



Figure 5. Triangle Lesson



Figure 6. Traditional Games

Figure 5 helps students determine the length of the triangle elements requested in the lesson. With this picture, students are more easily to solve the problems given. In this settlement process, an integration occurs between cultural knowledge and mathematical knowledge. The integration of this two knowledge can improve students' mathematical problem solving [15].

Figure 6 presents mathematical problems through the game called *dam-daman*. The integration of the game in the Ethnomathematics element in Mathematics instruction can build students' mathematical thinking [9]. Ethnomathematics traditional games can also motivate students to solve systems of equations, arithmetic, and geometry by using the game technique [16]. Aside from being in the form of games, the existence of traditional *dam-daman* and learning media also motivates student learning.

Learning with the Ethnomathematics approach can develop learner's cognitive aspects in elementary schools. By linking cultural and mathematical elements, students can deepen their understanding of mathematics since they are able to decipher meaningful connections in mathematical concepts. Thus, the Ethnomathematics approach helps develop student intellectuals [13]. Thus students' understanding of mathematical concepts increases and is more meaningful for them. In accordance with the research of Iluno, C and Taylor, J.I which states that the Ethnomathematics approach can make students have higher performance [17].

Application of learning with the Ethnomathematics approach trains students to learn mathematics with their own experiences, particularly the experiences in their cultural environment. This will foster the interest of students in learning Mathematics since the Ethnomathematics approach aims to utilize cultural experiences and practices of students from individual learners, the community, and society in general [18]. Aside from being a medium to facilitate understanding of mathematical concepts, students will have confidence in their culture. Students will respect all ethnic and cultural groups and help them adapt to their environment [19].

The ethnomathematics approach also trains students to be skilled in identifying and understanding the role of mathematics in the daily-life context and using a mathematical calculation to daily-life problems. Students are also trained in formulating, using, and interpreting Mathematics in various contexts of daily life. Thus the Ethnomathematics approach helps students improve mathematics literacy. The results of research by Deni F.F and Masrukan report an increase in mathematical literacy skills through the Ethnomathematics approach [10]

CONCLUSION

This research and development resulted in a product in the form of a Student Worksheet (LKPD) based on Ethnomathematics. The steps are taken to produce this instructional media product were: a) the analysis stage; b) the design stage; c) development stage; d) implementation stage; and e) the evaluation stage. This research developed Student Worksheet (LKPD) based on Ethnomathematics for two-dimensional figures lesson, particularly triangle and circle. This Student Worksheet (LKPD) provides students a piece of cultural information, thus students are not only taught Mathematics lessons but can also learn culture through Mathematics.

Student Worksheet (LKPD) based on Ethnomathematics is "very valid" to be used. This is shown in the results of the average evaluation by the validation from the three experts: content experts, linguists, and media experts which obtained an average score of 90.9%. The assessment by the teacher received a percentage of 96.4% and the results of the student questionnaire received an average score of 93%. Therefore, the Student Worksheet (LKPD) based on Ethnomathematics was categorized as "very valid". While the value of effectiveness by students obtained an average value of 80 and it is considered as good to be used.

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