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Development of LKPD Based on Ethnomathematics of Kediri Local Culture on Two-Dimentional Figure

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Abstract:
Many students who consider mathematics to be one of the subjects that are difficult to master. This is due to the lack of learning resource facilities and learning activities that focus on teachers. Students do not understand the local culture in their region and the potential of their region of origin also. So, in this research will examine how to develop LKPD based on ethnomathematics of Kediri local on mathematic studies. The objectives of this study are to describe the development process, media suitability, and the effectiveness of LKPD based on ethnomathematics of Kediri local culture on the understanding of the concept of two-dimentional figure in grade IV. The development uses the type of R&D research with the ADDIE development model. This research obtained results, they get a very decent level, namely 96.67% by material expert 1 and 83.33% by material expert. From the teaching material expert, the level is very feasible, namely 98.75% by the teaching material expert 1 and 87.5% by the teaching material expert. The effectiveness of the product is seen from the t-test using paired sample t-test 0,004 in small group and 0,000 in large group. *N-Gain* test In the small group trial, *the N-Gain Score* of 0.56 was included in the medium category. Meanwhile, in the large group trial, *the N-Gain Score* of 0.64 is included in the medium category. The conclusion is that this development research is able to increase understanding of the concept of two-dimentional figure.

Keywords: *Development, LKPD, Ethnomathematics, Concept Understanding, Two-Dimentional Figure*.

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Introduction

Learning activities are often some students who consider math one of the difficult and boring subjects to master. This is due to the lack of varied learning resource facilities and teaching and learning activities that focus on the teacher, students also often do not pay attention to the teacher during learning, such as playing or talking with their classmates, and other mischief, namely disturbing friends who are paying attention to the teacher explaining the material. In addition, students' knowledge of Kediri's local culture is still lacking, one of which is that students have never visited or know if there is a museum in Kediri City called Airlangga Kediri Museum. This is because the school does not introduce the kinds of local cultures that exist in Kediri, resulting in a lack of knowledge among students. Students need to know the local culture that exists in Kediri, especially the relics of the Kingdom of Kediri in Airlangga Kediri Museum to help students know the cultural heritage and strengthen students' sense of appreciation for the cultural heritage that has been built by previous generations.

To overcome the problems described above, teachers need to develop teaching materials that are tailored to the needs and character of students, varied teaching materials, can increase student activity and creativity. So that it can train and motivate students when studying mathematics, especially two-dimentional figure. Researchers have an alternative to solving problems by using teaching materials for two-dimentional figure, namely student worksheets (LKPD) based on ethnomathematics of Kediri local culture.

According to Lintang, a student worksheet (LKPD) is a guide for students that contains sheets of summarized material and student activity sheets that are guided by Learning Outcomes (CP) that are in accordance with the needs of students during direct teaching and learning activities which aim to have students carry out problem solving activities (Lintang et al., 2023). As for the advantages of LKPD, namely students can be active during teaching and learning activities because students are trained to be skilled, seek knowledge independently, students can increase their understanding of the learning material taught, teachers are given convenience when explaining material in teaching and learning activities because the material in LKPD has been summarized, and learning time becomes effective (Apreasta et al., 2023). While the other advantages of LKPD, namely the teacher can design learning materials in such a way that it can adjust the needs of students, the teacher becomes easy when managing the class, and the teacher does not need to provide directions that are so complicated because the directions are already contained in the LKPD instructions (Mudrikah et al., 2021).

Meanwhile, ethnomathematics is the study of mathematics related to cultural contexts. In other words, ethnomathematics is a learning approach that is implemented through learning mathematics by connecting the culture of a nation and involving the needs and lives of its people (Rafiah et al., 2023). The theory of ethnomathematics originated from the term “ethnomathematics” which was introduced by Ubiratan D'Ambrosio, a mathematician from Brazil, in 1977. Ethnomathematics originated from a combination of two words, namely “ethno” which means culture or habit, and “mathematics” which refers to the science related to numbers, quantity and space. Ethnomathematics refers to the specific ways that a particular social group or culture utilizes mathematical activities. In this case, ethnomathematics includes the process of abstracting from people's life experiences into mathematics or vice versa (Fitri et al., 2023). Ethnomathematics also means an innovation that can be used to integrate mathematical concepts into culture because it serves as a bridge between mathematics

and culture (Saputra & Wiryanto, 2023). It can be concluded that ethnomathematics is a concept that combines mathematics and culture.

Local culture encompasses many aspects of community life, such as language, customs, art, music, dance, clothing, food and more. Local culture is often passed down over time and is an important part of the identity of a community or group. Local culture can also influence the way people view and behave towards their surroundings and can be a source of inspiration and creativity in various fields, such as art, design and architecture. In terms of education, introducing or understanding local culture can help students understand and appreciate the diversity of cultures that exist in Indonesia, such as the local culture of Kediri, East Java. Kediri is a city/district located in the province of East Java. Kediri has a long history as one of the centers of culture and trade in East Java in the past. The city holds relics of the Kediri Kingdom in the Airlangga Kediri Museum.

Airlangga Kediri Museum is a museum owned by the Kediri City Government that houses hundreds of archaeological and ethnographic collections. The museum was established on November 30, 1991 and is located on Jalan Mastrip Number 1, Gunung Klotok area near Goa Selomangleng, Pojok Village, Mojoroto District, Kediri City with an area of 6,670 square meters. The museum houses archaeological collections from the heyday of the Kediri Kingdom. Some archaeological collections in Airlangga Kediri Museum are connected to the questions in the ethnomathematics-based LKPD of Kediri local culture which is expected to help students easily understand the two-dimentional figure.

Two-dimentional figure are one part of the geometry field. Two-dimentional figure are shapes that have two dimensions, namely length and width but do not have height and thickness (Alam et al., 2023). Two-dimentional figure also means the science involved in introducing shapes and measurements. A two-dimentional figure that has four sides is a rectangle, while a two-dimentional figure that has three sides is a triangle (Fianti & Sari, 2023). It can be concluded that a two-dimentional figure is a two-dimensional geometric object consisting of points and lines that have a certain two-dimentional figure.

The selection of teaching materials in the form of LKPD is in line with research conducted by Erika Wulandari and Meita Fitrianawati, which concluded that based on the results of expert assessments, ethnomathematics-based LKPDs were declared very good with an average of 87.5. Therefore, it is recommended for teachers to use this ethnomathematics-based LKPD in the learning process in the classroom (Wulandari & Fitrianawati, 2021). Another study conducted by Meyrawati, Hera Heru Sri Suryanti, and Ema Butsi Prihastari, in their research showed that ethnomathematics-based LKPD was declared effective in increasing student learning motivation in the new normal era (Meyrawati et al., 2023). Similar research conducted by Rozita Apriliyani states that the development of LKPD with an ethnomathematics approach to Javanese jarik cloth motifs on two-dimentional figure is declared valid, practical, and effective (Apriliyani, 2023).

The selection of teaching materials based on Kediri local culture is in line with research conducted by Silvi Dziniatul Ilmiah entitled "Exploration of Ethnomathematics at Airlangga Museum for Mathematics Learning at School". The results of the study were conducted in order to find out the mathematical concepts that exist in the Airlangga Museum Kediri which are then associated with learning mathematics at school (Ilmiah, 2023).

Based on the description above, the researcher is interested in conducting research at NU Al-Haadi Elementary School, Kunjang Village, Ngancar District, Kediri

Regency with the title **"Development of LKPD Based on Ethnomathematics of Kediri Local Culture on Two-Dimentional Figure"**.

The objectives of this study are: 1) to describe the process of developing LKPD based on ethnomathematics of Kediri local culture grade IV; 2) to determine the feasibility of LKPD based on ethnomathematics of Kediri local culture for grade IV students; and 3) to determine the effectiveness of LKPD based on ethnomathematics of Kediri local culture on understanding the concept of two-dimentional figure grade IV.

Methods

The development of LKPD based on ethnomathematics of Kediri local culture in grade IV mathematics learning two-dimentional figure is a research on the R&D (Research & Development) research method. The ADDIE development model consists of five stages or phases including: analyze, design, development, implementation, and evaluation (Anggraini et al., 2023). This type of research aims to develop a product that has previously existed or create a product that does not yet exist that is adjusted to the needs analysis aimed at achieving the learning objectives that have been set.

Data collection techniques are carried out by observation, interviews, and questionnaires. According to Sugiyono, data collection techniques using observation can be used if the research is related to individual behavior, activity steps, natural phenomena, and if the respondents observed are not so many (Sugiyono, 2016). According to Sugiyono, interviews are used for data collection techniques if researchers want to carry out preliminary studies aimed at getting problems that must be studied, and if researchers want to get things from respondents in depth and there are not many respondents (Sugiyono, 2016). According to Sugiyono, a questionnaire is a data collection technique that is carried out by giving several written statements or questions to respondents to be answered (Sugiyono, 2016).

Data analysis techniques were carried out by feasibility test, t-test, and N-Gain test. The feasibility test is used to determine whether the product that has been developed is classified as feasible or not from a questionnaire distributed to validators (Ma'aniyah & Mintohari, 2019). The paired sample t-test is one of the hypothesis testing methods in which the data utilized are paired or not free (Montolalu & Langi, 2018). N-Gain Score is used to see the percentage of effectiveness of the product that has been developed (Farell et al., 2021).

Results and Discussion

This study aims to develop a product in the form of LKPD based on ethnomathematics of Kediri local culture. The research and development model used by researchers is the ADDIE research and development model to create a teaching material. ADDIE consists of five stages including: Analyze, Design, Development, Implementation, and Evaluation.

1. *Analyze*

a. Needs analysis

The first step in research and development is a needs analysis conducted through observations in class IV of SD NU Al-Haadi Kunjang Ngancar.

b. Curriculum analysis

The Merdeka Curriculum is a benchmark in this teaching and learning activity. Curriculum analysis is carried out by determining the Learning Outcomes and Learning Objectives in the curriculum used, namely the Merdeka Curriculum.

2. *Design*

a. Material review

From the results of the analysis, the material used in developing LKPD is the material on the properties of two-dimentional figure in Chapter 2 "Two-Dimentional Figure" for class IV SD / MI even semester.

b. Initial design

LKPD based on ethnomathematics of Kediri local culture is printed using paper on a size of 21 cm × 29.7 cm (A4). The first step in making LKPD is by loading the design of the front and back cover and the design of the LKPD content. The first teaching and learning implementation by presenting a little summary of the material in the material of the properties of two-dimentional figure then continued on a variety of activities that can be done by students which are expected to increase understanding of the concept of two-dimentional figure in students.

c. Tool for making LKPD based on ethnomathematics of Kediri local culture

LKPD development utilizes software and hardware devices. The software device is the Canva application and the hardware is a printer to print LKPD based on ethnomathematics of Kediri local culture.

d. Instrument planning

LKPD based on ethnomathematics of Kediri local culture that has been made is then evaluated in utilizing an instrument, namely a questionnaire that has been made.

e. Test instrument

The test instrument uses a pre-test and post-test, these activities are carried out in determining whether there is an increase in learning outcomes before and after using LKPD based on ethnomathematics of Kediri local culture.

3. *Development*

a. Creation of LKPD

LKPD based on ethnomathematics of Kediri local culture contains instructions for using LKPD, a summary of the material, systematically arranged questions, and LKPD assessment sheets.

b. Validation stage

Validation of LKPD based on ethnomathematics of Kediri local culture was carried out twice, namely material expert validation and teaching material expert validation.

4. *Implementation*

After the teaching materials have passed the validation stage and are declared suitable for implementation to students, so the next stage is trial activities.

5. *Evaluation*

In the evaluation stage, researchers carry out an evaluation of the LKPD that has been made and validated to teaching material experts and material experts in carrying out revisions and follow-up according to suggestions.

Analysis

1. Analysis of material expert validation data

The results of the material expert validation determine the feasibility of the material in the LKPD made. Furthermore, data from the questionnaire that has been filled in can be used to determine the level of material feasibility. The data obtained is quantitative data. Quantitative data comes from the results of the questionnaire assessment.

Through the results of the material expert assessment of the LKPD based on ethnomathematics of Kediri local culture, the percentage level of feasibility of LKPD can be calculated as follows:

a. Material expert validator 1

$$P = \frac{\text{number of scores obtained}}{\text{sum of the highest scores}} \times 100\%$$

$$P = \frac{58}{60} \times 100\% = 96{,}67\%$$

It can be concluded that the resulting Kediri local culture ethnomathematics-based LKPD has a very feasible level based on validation data from material expert 1. This is indicated by the overall score in the questionnaire given by the validator to the Kediri local culture ethnomathematics-based LKPD has a feasibility level of 96.67%.

b. Material expert validator 2

$$P = \frac{\text{number of scores obtained}}{\text{sum of the highest scores}} \times 100\%$$

$$P = \frac{50}{60} \times 100\% = 83{,}33\%$$

It can be concluded that the resulting Kediri local culture ethnomathematics-based LKPD has a very feasible level of feasibility based on validation data from material expert 2. This is indicated by the overall score in the questionnaire given by the validator to the Kediri local culture ethnomathematics-based LKPD has a feasibility level of 83.33%.

2. Analysis of teaching material expert validation data

The results of the teaching material expert validation determine the feasibility of teaching materials in the LKPD made. Furthermore, data from the questionnaire that has been filled in can be used to determine the feasibility level of teaching materials. The data obtained is quantitative data. Quantitative data comes from the results of the questionnaire assessment.

Through the results of the teaching material expert assessment of the LKPD based on ethnomathematics of Kediri local culture, the percentage level of feasibility of LKPD can be calculated as follows:

a. Teaching material expert validator 1

$$P = \frac{\text{number of scores obtained}}{\text{sum of the highest scores}} \times 100\%$$

$$P = \frac{79}{80} \times 100\% = 98{,}75\%$$

It can be concluded that the resulting Kediri local culture ethnomathematics-based LKPD has a very feasible level of feasibility based on validation data from teaching material experts 1. This is indicated by the overall score in the questionnaire given by the validator to the Kediri local culture ethnomathematics-based LKPD has a feasibility level of 98.75%.

b. Teaching material expert validator 2

$$P = \frac{\text{number of scores obtained}}{\text{sum of the highest scores}} \times 100\%$$

$$P = \frac{70}{80} \times 100\% = 87{,}5\%$$

It can be concluded that the resulting Kediri local culture ethnomathematics-based LKPD has a very feasible level of feasibility based on

validation data from teaching material experts 2. This is indicated by the overall score in the questionnaire given by the validator to the Kediri local culture ethnomathematics-based LKPD has a feasibility level of 87.5%.

3. Data analysis of student pre-test and post-test results

a. T-test

Hypothesis testing with the t-test formula, namely using the paired sample t-test. This is done to determine whether there is an increase in the results of pre-test and post-test scores before and after using LKPD based on ethnomathematics of Kediri local culture. Through the results of the pre-test and post-test in the small group trial and the large group trial, it was obtained:

Table 1. Paired Sample T-Test on Pre-Test and Post-Test of Small and Large Group Trials

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pretest Kelompok Kecil - Posttest Kelompok Kecil	-25,83333	12,41639	5,06897	-38,86353	-12,80313	-5,096	5	,004
Pair 2	Pretest Kelompok Besar - Posttest Kelompok Besar	-27,33333	11,50212	2,09999	-31,62830	-23,03837	-13,016	29	,000

Guidelines for decision making in the paired sample t-test based on the significance value with SPSS.

1) If the probability value or Sig. (2-tailed) <0.05, then there is a significant difference between the pre-test and post-test results, which means that there is an effect of using LKPD based on ethnomathematics of Kediri local culture on two-dimentional figure.
2) If the probability value or Sig. (2-tailed) > 0.05, then there is no significant difference between the pre-test and post-test results, which means that there is no effect of using LKPD based on Kediri local culture ethnomathematics on two-dimentional figure.

Through the results in the table above, it is known that the Sig. (2-tailed) value in the small group trial was 0.004 <0.05. So it can be concluded that the use of LKPD based on ethnomathematics of Kediri local culture can improve concept understanding for two-dimentional figure for grade IV students in the small group trial.

While in the large group trial it is known that the Sig. (2-tailed) of 0.000 <0.05. So it can be concluded that the use of LKPD based on ethnomathematics of Kediri local culture can improve concept understanding for two-dimentional figure for grade IV students in the large group trial.

b. N-Gain Test

Students' concept understanding in this study is seen based on the increase in pre-test and post-test scores. The results of the comparison between the pre-test and post-test using the N-Gain test are as follows.

1) Results of pre-test and post-test of small group trial

There is a difference in the pre-test and post-test results of students before and after implementing learning using LKPD based on ethnomathematics of Kediri local culture. This can be seen from the results of the average value of students in the pre-test which is 56 and has increased in the post-test

implementation of 82. And it can be seen from the results of the N-Gain Score test of 0.56 which is in the range of $0.3 \leq g \leq 0.7$ which is included in the moderate category. Therefore, LKPD based on ethnomathematics of Kediri local culture can be said to be quite effective in improving students' concept understanding on two-dimentional figure.

2) Results of pre-test and post-test of large group trials

There are differences in student pre-test and post-test results before and after carrying out learning using LKPD based on ethnomathematics of Kediri local culture. This can be seen from the results of the average student score on the implementation of the pre-test, which is 58 and has increased in the implementation of the post-test of 85. And can be seen from the results of the N-Gain Score test of 0.64 in the range of $0.3 \leq g \leq 0.7$ which is included in the moderate category. Therefore, LKPD based on ethnomathematics of Kediri local culture can be said to be quite effective in improving students' concept understanding on two-dimentional figure.

Conclusion

Based on the development process and the results of the trial of the LKPD based on ethnomathematics of Kediri local culture, several things can be concluded related to product review: 1) product development in this research and development refers to the ADDIE development model; 2) product feasibility is seen from the final results of validation. From the material expert, the percentage score of the feasibility level is 96.67% by material expert 1 and 83.33% by material expert 2, which means that it is at a very feasible level from the assessment by the material experts. From teaching material experts, the percentage score of the feasibility level is 98.75% by teaching material experts 1 and 87.5% by teaching material experts 2, which means that it is at a very feasible level from the assessment by teaching material experts; 3) the effectiveness of the product is seen from the results of analyzing the pre-test and post-test values using the N-Gain test. In the pre-test and post-test values of the small group trial, the N-Gain Score test results of 0.56 were included in the moderate category. While in the pre-test and post-test values of the large group trial the N-Gain Score test results of 0.64 were included in the moderate category. Therefore, LKPD based on ethnomathematics of Kediri local culture can be said to be quite effective in improving students' concept understanding on two-dimentional figure.

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