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DEVELOPMENT OF ETHNOMATHEMATICS-BASED STUDENT WORKSHEETS TO IMPROVE THE UNDERSTANDING OF CONCEPTS FOR JUNIOR HIGH SCHOOL GRADE IX STUDENTS

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ABSTRACT

Pembelajaran matematika memerlukan bahan ajar yang inovatif dan kontekstual agar siswa lebih mudah memahami konsep. Namun, ketersediaan bahan ajar masih terbatas disekolah. Sering kali guru hanya menggunakan buku paket sebagai satu-satunya bahan ajar yang digunakan. Penelitian ini bertujuan untuk mengembangkan Lembar Kerja Peserta Didik (LKPD) berbasis etnomatematika dengan mengintegrasikan motif Gorga Batak pada materi translasi dan refleksi kelas IX SMP. Model penelitian yang digunakan adalah *Research and Development (R&D)* dengan mengadaptasi langkah Borg and Gall hingga tahap revisi produk akhir. Instrumen penelitian mencakup validasi ahli, angket respons guru dan siswa, serta tes pemahaman konsep yang dilakukan melalui *pre-test* dan *post-test*. Hasil penelitian menunjukkan bahwa rata-rata penilaian dari ahli materi dan media berada pada kategori sangat valid. Respon guru dan siswa memberikan rata-rata penilaian dengan kategori sangat praktis. Selain itu, rata-rata hasil tes pemahaman konsep siswa menunjukkan adanya peningkatan dari *pre-test* ke *post-test*, sehingga efektivitas LKPD berada pada kategori sedang. Integrasi motif Gorga Batak dalam LKPD mampu membantu siswa dalam memahami konsep translasi dan refleksi dengan lebih mudah. LKPD ini juga dapat dimanfaatkan guru sebagai bahan ajar berbasis budaya lokal untuk meningkatkan efektivitas pembelajaran matematika.

Mathematics learning requires innovative and contextual teaching materials so that students can more easily understand concepts. However, the availability of teaching materials is still limited in schools. Often teachers only use package books as the only teaching materials used. This research aims to develop ethnomathematics-based Student Worksheets by integrating the Batak Gorga motif in the translation and reflection materials of grade IX of junior high school. The research model used is Research and Development (R&D) by adapting Borg and Gall's steps to the final product revision stage. The research instruments include expert validation, teacher and student response questionnaires, and concept understanding tests conducted through pre-tests and post-tests. The results of the study show that the average assessment from material and media experts is in the category of very valid. The responses of teachers and students gave an average assessment with a very practical category. In addition, the average results of the students' concept understanding test showed an increase from pre-test to post-test, so that the effectiveness of Student Worksheets was in the medium category. The integration of Gorga Batak motifs in the Student

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Worksheet is able to help students understand the concepts of translation and reflection more easily. This Student Worksheet can also be used by teachers as teaching materials based on local culture to increase the effectiveness of mathematics learning.

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INTRODUCTION

Mathematics is a discipline that has a fundamental role in various fields, such as science, engineering, economics, and technology. Its ability to provide analytical tools and support decision-making makes mathematics a universal language that bridges various disciplines (Susanti, 2024). Along with the times, mathematics also continues to innovate by integrating new theories and technologies that expand their relevance in various contexts (Hakim et al., 2020). Despite this, learning mathematics in schools still faces various challenges. Many students consider mathematics to be a difficult and boring subject (Lumbantoruan & Uly, 2022). Its abstract nature makes it difficult for students to understand the concepts being taught, especially if the learning is not linked to their real experience (Sugiarti et al., 2024). Therefore, learning is needed that relates mathematical concepts to real situations so that they are easy to understand by students.

The results of interviews with grade IX mathematics teachers at Junior High School IRA showed that students were less enthusiastic in participating in learning because the material was only delivered using school package books. The package book is practical, containing a summary of the material and practice questions, but does not present any real context or relevance to daily life. In addition, teachers also do not design other teaching materials that help learning, making it difficult for students to get the appropriate learning experience (Azmi & Ummah, 2024). The lack of variety of teaching materials and the irrelevance of the material to students' lives causes them to only learn mechanically, students' understanding of mathematical concepts becomes superficial and limited to memorizing formulas without understanding their meaning.

Concept understanding not only includes students' ability to remember or solve problems, but also in explaining the meaning of concepts, relating them to other concepts, and using them to solve problems in various contexts (Wismanto et al., 2024). Students who have an understanding of concepts will be better able to think logically, flexibly, and critically. However, in classroom learning practice, many students simply pursue correct answers without understanding the process and meaning behind the concept (Sutra et al., 2024). As a result, they have difficulty applying the concepts they have learned in different situations.

To overcome this, teaching materials are needed that can encourage students to actively build their understanding through contextual learning experiences. One of the media that can support this process is the Student Worksheet. A well-designed Learner Worksheet can help students learn actively, increase their engagement in the learning process, and encourage them to discover the meaning of independently learned concepts (Dhena et al., 2024). The Learner Worksheet also has the ability to incorporate a variety of innovative and adaptive learning approaches. This allows the preparation of Student Worksheets that are not only based on the standard curriculum, but also tailored to the individual characteristics and needs of students.

One approach that can be integrated into the Student Worksheet is ethnomathematics, which is the study of how various cultures understand, apply, and develop mathematical concepts in daily life (Kehi et al., 2022). This approach not only recognizes the diversity of mathematical ways

of thinking that exist in different cultures, but also integrates local and traditional knowledge into the mathematics learning process (Noviani et al., 2021). However, in schools, Student Worksheets are often found that only contain practice questions without considering the cultural context or interests of students (Adrillian et al., 2024). Although the cultural approach is very relevant to learning mathematics, especially material on geometry transformation, students learn geometry concepts through traditional motif design in arts and crafts (Sulisawati et al., 2023). With an ethnomathematical approach, students not only learn mathematics, but also recognize their cultural heritage.

One of the cultural heritage that can be used as a learning context is Gorga Batak. Gorga Batak is one of the typical cultural heritage of the Toba Batak people in North Sumatra in the form of traditional ornaments on traditional houses, wood carvings, and other art objects. These Gorga motifs are arranged based on very rich geometric patterns, which explicitly reflect the symmetry characteristics in a flat plane (Ditasona, 2018). In addition, ethnographic analysis showed the existence of seven types of symmetry that can be found in Gorga motifs, including translation, *glide-reflection*, vertical symmetry, 180° rotation, as well as a combination of vertical and horizontal symmetry (Ditasona, 2023). This mathematical character is in line with the concept of geometric transformation, especially translation and reflection, making the Gorga motif very suitable for use as a learning context in the classroom. The integration of Gorga Batak motifs into the Student Worksheet can help students understand the concept of transformation more concretely.

Geometry transformation is one of the important materials in mathematics, translation and reflection are two of the four forms of geometry transformation that have an important role in the development of students' visual and spatial abilities (Bustan et al., 2022). Translational and reflection learning should be designed with a systematic approach, the use of innovative media, and relevant contexts so that students can easily relate abstract concepts to tangible forms (Hindarto & Sulistyani, 2024). However, there are still many students who experience difficulties in learning translation and reflection, especially translation and reflection, not optimal understanding of basic concepts and the inability to identify information, these difficulties hinder students' ability to apply translation and reflection appropriately and accurately (Maulani & Zanthy, 2020). Therefore, it is necessary to have innovative teaching materials that not only present visual and interactive approaches, but also relate the concepts of translation and reflection to real situations.

Several previous studies have shown the use of ethnomathematics-based Learner Worksheets in mathematics learning. Ainiyah & Loviana (2024) developed a Student Worksheet for ethnomathematics-based geometric transformation material on Lampung batik motifs and the results were valid and practical, but only limited trials did not assess effectiveness. In addition, the research of Luthfi & Rakhmawati (2023) developed a Worksheet for Students to build a curved side space based on market snacks that is declared valid and practical. Finally, the research of Mahlina et al. (2022) developed a floating market ethnomathematics-based Student Worksheet on social arithmetic material for grade VII students that only reached the validation stage. Based on the results of the research, it can be seen that there has been no development of ethnomathematics-based student worksheets that use the cultural context of Gorga Batak motifs for translation and reflection materials and has not been comprehensively assessed from all aspects: validity, practicality, and effectiveness.

Based on this research, this study aims to develop an Ethnomathematics-Based Student Worksheet on Translation and Reflection Materials for Grade IX Junior High School. Ethnomathematics-based Student Worksheets that are valid, practical and effective and relevant to translation and reflection materials are expected to provide a learning experience and a positive impact on students, improve their understanding of concepts and their involvement in the learning process.

METHOD

This research uses the research and development is a research method used to develop a product and to validate the product by testing the quality of the product (Sugiyono, 2020). The product developed in this study is an ethnomathematics-based Student Worksheet on translation and reflection materials. The development procedure for the Student Worksheet used adapts from the development model of Borg and Gall (1989). The development procedure in this study using the method according to Sugiono has ten stages. However, in this study, the stages are limited to the final product revision after product trials only due to limited time and cost of researchers. The development steps used are presented in Figure 1:

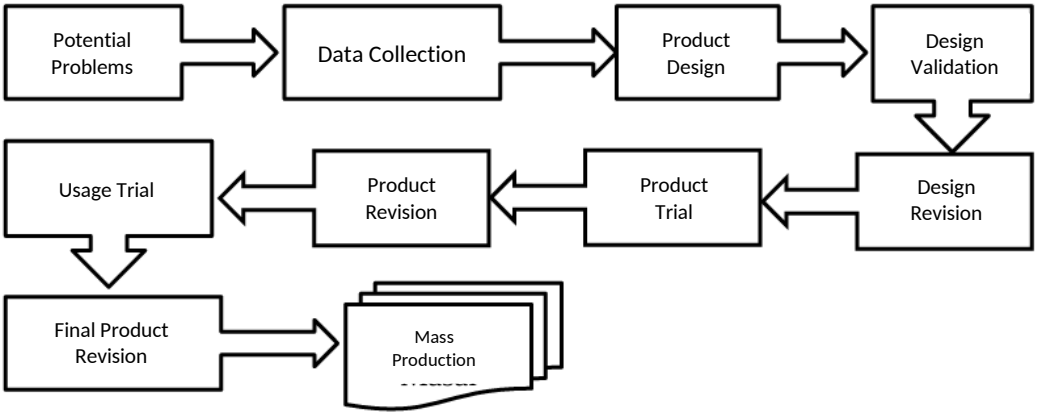

Figure 1. Steps Of Development

The research subjects for the development of ethnomathematics-based student worksheets for translation and reflection materials for grade IX of junior high school are 4 Mathematics Education Lecturers Universitas Islam Negeri Sumatera Utara, 2 as a material expert validator and 2 as a media expert validator. Then the product trial subjects were 1 mathematics teacher and 15 students SMP IRA Medan. The subjects of the trial were 27 students of SMP IRA Medan.

The validity test of students' worksheets is carried out by filling out an assessment questionnaire by a material expert validator and a media expert validator. To calculate the percentage of the validity results of the student worksheet, it is done using the formula:

$$V = \frac{TS}{Smax} \times 100\% \quad [1]$$

V = Validation

TS = Total score obtained

Smax = Maximum score

Table 1. Validity Percentage Criteria

Presentase	Category
75,01% - 100.00%	Highly Valid
50,01% - 75,00%	Valid
25,01% - 50,00%	Invalid
< 25.00%	Highly Invalid

The Practicality Test was carried out to mathematics teachers and small groups of students by providing a response questionnaire that had been provided. The calculation of the percentage of practicality is carried out using the formula:

$$P = \frac{TS}{Smax} \times 100\% \quad [2]$$

P = Practical

TS = Total score obtained

Smax = Maximum score

Table 2. Practicality Percantage Criteria

Presentase	Category
75,01% - 100.00%	Very Practical
50,01% - 75,00%	Practical
25,01% - 50,00%	Impractical
< 25.00%	Very Impractical

The effectiveness test was carried out on 27 students from class IX by providing pre-tests and post-tests. This test was conducted to evaluate the effectiveness of student worksheets developed based on improving students' understanding of concepts before and after learning using student worksheets. To find out the improvement of students' understanding of concepts, it can be analyzed using N-GAIN as follows:

$$N - Gain = \frac{Score\ post\ test - Scoer\ Pretest}{Score\ ideal - Score\ Pretest} \times 100\% \quad [3]$$

The value and interpretation of the N-Gain score can be seen in table 3:

Table 3. N-Gain Criteria

N-Gain Value	Category
g ≥ 0.7	High
0.3 ≤ g ≤ 0.7	Moderate
g < 0.3	Low

If the interpretation of N-Gain ≥ 0.3, it can be said that the student worksheet developed is effective to be used based on improving the understanding of students' concepts in the material presented.

RESULTS

1. Potential Problems

The potential and problems in this study were obtained through the analysis of needs in Junior high school IRA by conducting interviews with mathematics teachers about the problems faced when carrying out learning at school. The results of the interview can be found that the package book is the only source of teaching materials used in the learning process, this package book only contains short material and practice questions, then the pictures used are less interesting and do not relate to daily life making students not enthusiastic about learning and having difficulty understanding the material, especially translation and reflection materials. Teachers also never use

other teaching materials such as Student Worksheets or Modules that attract students to be more active in learning and easily understand the material being taught.

2. Data Collection

After the potential problem stage is completed, the researcher then collects various supporting information to find out the learning needs of students in the formation of the developed product. The information collected includes reference sources related to potential problems such as mathematics journals, mathematics books, translation and reflection materials, and other relevant sources. In addition, the school where the research is conducted uses the Independent Curriculum, so that product development is adjusted to the learning outcomes contained in the curriculum. The material that will be developed into the Student Worksheet is the transformation of geometry, especially translation and reflection, in grade IX students of Junior High School, by utilizing an ethnomathematical approach. The ethnomathematical context used is the Gorga Batak motif, which has geometric and symmetrical patterns so that it is relevant to be associated with the concept of translation and reflection in mathematics learning.

3. Product Design

After the data collection stage, the next product design was carried out using the Canva and Microsoft Word applications, to make it easier for researchers to design media. The Student Worksheets based on ethnomathematics, translation and reflection materials for grade IX of Junior High School are prepared in accordance with the systematics of writing Student Worksheets in order. Starting from the front page, the identity of the Student Worksheet, foreword, table of contents, general information, contents, reflections, bibliography and closing. Initial design of the product in Figure 2:

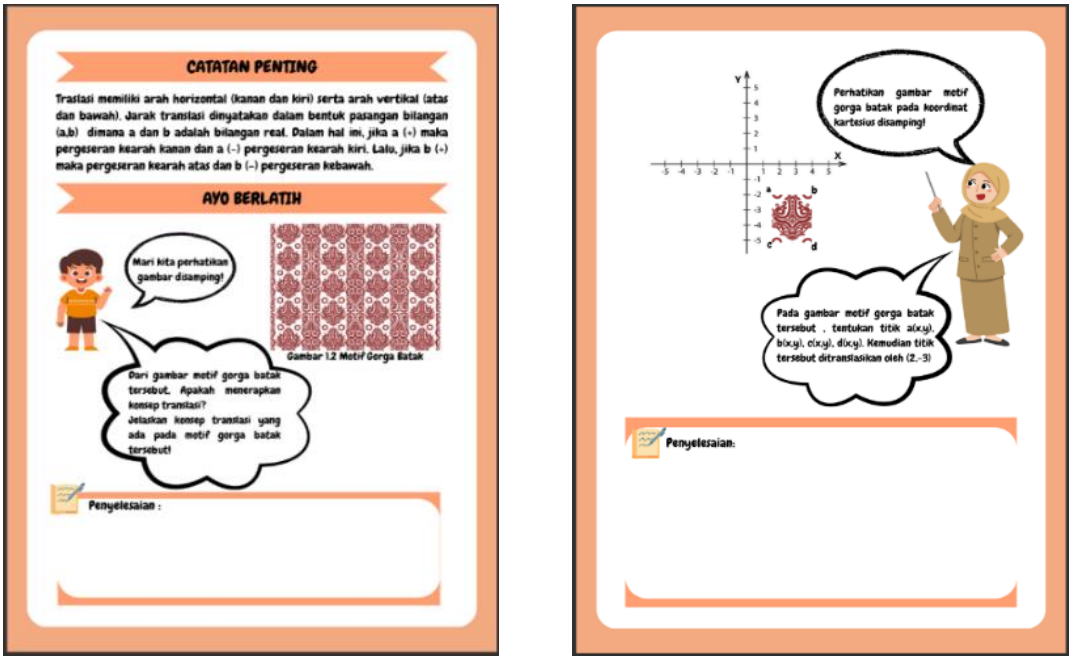

Figure 2. Product Design

4. Design Validation

Design validation is carried out by providing assessment sheets to validators or experts who are experienced in the field of education to assess the products that have been developed. The validators at this stage consist of two subject matter expert validators and two media expert validators. The results of the validation from the experts are as follows:

1. Subject Matter Expert Validation

The validation was carried out by two experts, namely lecturers of Mathematics Education at the State Islamic University of North Sumatra. The results of the assessment on the material expert validation sheet are presented in Table 4:

Table 4. Material Expert Validation Results

Information	Validator 1	Validator 2
Assessment Score	70	67
Overall Score	137	
Percentage	85,62%	
Eligibility Criteria	Highly Valid	

2. Media Expert Validation

The validation was carried out by two experts, namely lecturers of Mathematics Education at the State Islamic University of North Sumatra. The results of the assessment on the media expert validation sheet are presented in Table 5:

Table 5. Media Expert Validation Results

Information	Validator 1	Validator 2
Assessment Score	60	64
Overall Score	124	
Percentage	86%	
Eligibility Criteria	Highly Valid	

Based on the results of validation conducted by material experts and media experts, an average percentage of 85.62% of material experts and 86% of media experts with a very valid category was obtained. These results show that the Student Worksheets developed have met the validity criteria so that they can support the learning process effectively. However, the validators still provide some suggestions and inputs that need to be considered by researchers for further refinement so that the products produced become more optimal and of high quality. Suggestions and inputs from the validators will be explained at the next stage as a reference in the product revision.

5. Product Revision

After validation by material experts and media experts, the next stage is product revision. This revision is carried out based on suggestions and criticisms given by validators to improve the Student Worksheet to be better and in accordance with learning needs. The summary of suggestions and criticisms from validators is shown in Table 6:

Table 6. Suggestions and Criticisms of validators, material experts and media experts

Validator	Suggestions and Criticisms
Subject Matter 1	1. Fix sentences so they are not ambiguous. 2. Fix blurry images.
Subject Matter 2	1. Fix the spacing on the Student Worksheet to make the Student Worksheet look more attractive and easy to understand.
Subject Media 1	1. Student Worksheet Cover adjusts and must describe the material described in the Student Worksheet. 2. Make a bibliography (reference knowledge taken for the material) in this Student Worksheet.
Subject Media 2	3. Improve the layout of the text and images.

Improvements are made based on comments and suggestions from material experts and media experts. Some improvements can be seen in the following image. Student Worksheet Cover Describe the material in the Student Worksheet according to comments and suggestions from experts, as shown in Figure 3:

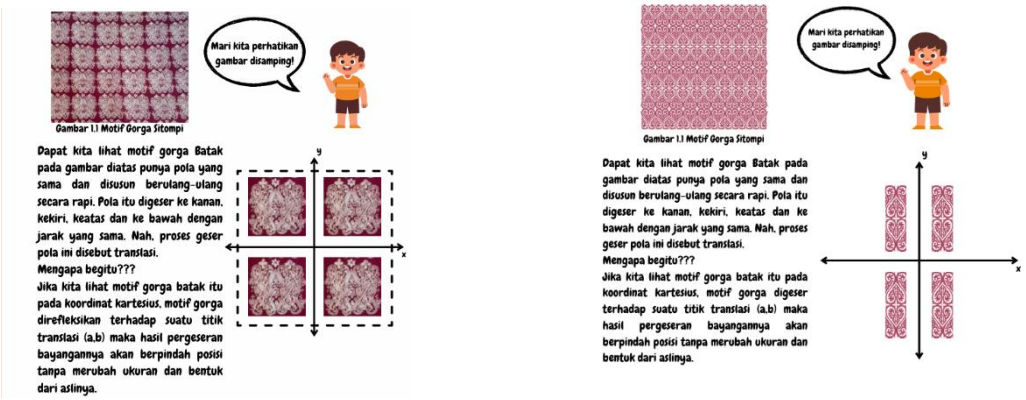

Figure 3. Before revision (left image) and after revision (right image)

Thus, the product revision stage, which is based on the suggestions and criticisms of validators, is expected to be able to improve the suitability of the Student Worksheet with learning

objectives and make it easier for students to understand the material presented. After this revision stage, the product is ready for testing at the next stage.

6. Product Trials

After the repair is completed, the next step is to test the product in learning. After that, the process of filling out the questionnaire for the response of the mathematics teacher and the response of the students was carried out with the aim of finding out the practicality of the product that had been developed. In the product trial stage, 1 mathematics teacher and 15 students were involved. The results of the product trials are shown in Table 7:

Table 7. Product Trial Results

Information	Math Teacher	Learners
Assessment Score	57	643
Percentage	95%	89,31%
Eligibility Criteria	Very Practical	

Based on the results of the product trials that have been carried out, it is obtained that the Student Worksheets developed show a high level of practicality. This can be seen from the assessment of mathematics teachers who obtained an average score of 95% in the very practical category, as well as the response of students who reached 89.31% in the very practical category. Thus, the Student Worksheets developed can be used in learning as practical teaching materials and help students in understanding the material presented. Because the test results show that the category is very practical, at this stage there is no revision of the product. Furthermore, the Student Worksheet is directly used at the trial stage to see the effectiveness of the product in learning.

7. Trial Use

The next stage is to conduct a trial of the use of Student Worksheets with the aim of determining the effectiveness of the ethnomathematics-based Student Worksheets that have been developed. The trial was carried out in one class consisting of 27 students using tests, namely pre-test and post-test as a measuring tool to determine the improvement of students' understanding of concepts after learning using the Student Worksheet. All activities carried out by students during learning are centered on the Student Worksheet. The following are the details of activities in classroom learning.

i. Opening of Learning and Distribution of Pre-test Questions.

The learning process begins with an opening activity, the researcher gives greetings, and conveys the learning objectives to be achieved. Furthermore, the researcher briefly explained the activities that will be carried out using ethnomathematics-based Student Worksheets. Before the core activity starts, students are given a pre-test to find out their initial understanding of the material to be studied. The opening of learning and filling in the pre-test questions are presented in Figure 4 and Figure 5:

Figure 4. Opening Of Learning

Figure 5. Filling in Pre-tet Questions

ii. Learning using student worksheets.

After the implementation of the pre-test, learning activities continued with the use of ethnomathematics-based Student Worksheets. The researcher distributes the Student Worksheet to each student, then provides directions on how to do it and the flow of activities contained in the Student Worksheet. Students are guided to read the instructions, understand the contextual problems presented, and complete the activities in the Student Worksheet individually. At this stage, the researcher plays the role of a facilitator, and provides guidance if there are difficulties. The learning process using the Student Worksheet is presented in Figure 6 and Figure 7:

Figure 6. Directing Learning Using Student Worksheets

Figure 7. Learning Takes Place

ii. Filling in Post-Test Questions After Learning and Reflection.

At the end of the lesson, the researcher gave post-test questions to students to measure the understanding of concepts obtained after participating in the activity using ethnomathematics-based Student Worksheets. This post-test serves as a comparison to the results of the pre-test that has been done at the beginning of learning. After completing the post-

test, the researcher directs students to reflect by conveying impressions, experiences, and understandings gained during learning activities. The activity was then closed by giving appreciation to students for their active participation during the learning process. The filling of the post-test and reflection questions is presented in Figure 8 and Figure 9:

Figure 8. Feilling Post-Test Questions

Figure 9. Reflection and Closure

After the completion of the learning process, the next step is for the researcher to analyze the results of the pre-test and post-test that have been given. This analysis aims to find out the extent to which students' understanding of concepts is improved after using ethnomathematics-based Student Worksheets. The test result data is then processed to obtain average scores, improvement differences, and student learning completeness. The results of this analysis are the basis for assessing the effectiveness of the Student Worksheets that have been developed. The results of the use trial are presented in Table 8:

Table 8. Usage Test Results

Information	Pre-test scores	Post-test scores
Average Score of Educators	41,3	73,3
N-Gain	0,54	
Effectiveness Criteria	Moderete	

Based on the results of the use trial, there was an increase in students' understanding of concepts after using ethnomathematics-based Student Worksheets on translation and reflection materials. This can be seen from the average pre-test score of 41.3 which increased to 73.3 in the post-test with an N-Gain of 0.54 which is in the medium category. Thus, the use of ethnomathematics-based Student Worksheets on translation and reflection materials can make a positive contribution to improving students' understanding of concepts.

DISCUSSION

Based on the results of the research that has been carried out, a development product in the form of an ethnomathematics-based Student Worksheet on translation and reflection materials,

for grade IX students of Junior High School. The development of this Student Worksheet aims to provide an interesting, contextual, and learning media that can improve students' understanding of concepts through a local cultural approach. According to Miftah et al. (2025), contextual teaching materials help students relate the material to their real-life situations and experiences, which contributes to a deeper meaning in the learning process. This is in line with the purpose of ethnomathematics, students can identify and understand the mathematical elements contained in their culture, including in symbols in daily life (Ugi, 2021). Thus, ethnomathematics-based Student Worksheets have the potential to be a good learning tool for students to use.

The initial stage of development began with the identification of potentials and problems in IRA Junior High School schools, the results of observations showed that teachers only used package books as the only teaching materials. This condition makes learning tend to be monotonous and less varied. In fact, according to Kurniawan et al. (2022), teaching materials that are meaningful and relevant to daily life can help relate the theory taught to real practice, which supports an active and participatory learning atmosphere. The absence of real context in the package book makes it difficult for students to understand abstract concepts, especially in translation and reflection materials. This finding is also in line with Nurmaya's (2021) research which states that students are more likely to understand geometric concepts when the material is presented through the context of local culture. Therefore, the development of ethnomathematics-based Student Worksheets is seen as necessary as a solution to improve the quality of learning.

The design stage is carried out by compiling a Student Worksheet using the Canva and Microsoft Word applications. The use of the Canva application in the Student Worksheet design process has proven to make it easier for teachers to create attractive and professional teaching materials, as Canva provides a variety of user-friendly templates and interesting features to modify existing content. The Student Worksheet is systematically prepared starting from the identity page, foreword, table of contents, general information, brief material, learning activities, evaluation, to the conclusion. Preparation steps carried out from introduction to evaluation are also needed to ensure that the Student Worksheet is not only informative but also in accordance with the needs and expectations of learning (Oktaviara, 2024). The use of ethnomathematical elements in the design is adjusted to the material described in the Student Worksheet (Hasibuan & Hasanah, 2022). After the design is completed, validation of the Student Worksheet is carried out to determine the feasibility of the content and appearance of the Student Worksheet.

The next stage was validated by two material experts and two media experts. The validation results showed that the ethnomathematics-based Student Worksheet obtained an average score of 85.62% from material experts and 86% from media experts with the "Very Valid" category. This high validity is in line with previous research which shows that Student Worksheets developed based on ethnomathematical approaches are able to meet the validity criteria. Research by Shabira & Andhany (2023) ethnomathematics-based Learner Worksheets obtained a validity score of 87.3%, which shows that the application of ethnomathematics in the design of teaching materials can improve the relevance and quality of education. Another study also noted that validated Student Worksheets were categorized as "very valid" with an average score above 85%, reflecting the importance of evaluations conducted by experts as an important step in the process of developing learning tools (Anggraini et al., 2022). This validation not only serves to assess the material and media aspects, but also ensures that the content of the Student Worksheet is in accordance with the student's learning needs.

The practicality of the Student Worksheet was then tested through a questionnaire given to teachers and students. The results showed an average practicality of 95% of teachers and 89.31% of students, both in the category of "Very Practical". This high score proves that the Student Worksheet is easy to use, attractive, and helps teachers and students in the learning process. Some

studies show that materials that are easy for teachers to use and interesting to students tend to result in a better learning experience and have a positive impact on student learning outcomes (Said, 2021 ; Bai et al., 2023). Additionally, in the ethnomathematics context, the use of well-designed Learner Worksheets can support learning that is culturally relevant to students, thereby allowing them to be more engaged with the material being delivered (Nst & Batubara, 2024). The importance of practicality in the development of Learner Worksheets in increasing learning effectiveness and facilitating better interaction between teachers and students.

The effectiveness test of the Student Worksheet was carried out through pretest and posttest tests for 27 students. The results showed an increase in the average score from 41.3 in the pretest to 73.3 in the posttest, with an N-gain of 0.54 which was in the medium category. This increase in grades not only shows an improvement in material comprehension, but also reflects the effectiveness of the use of Student Worksheets in the learning process (Khafida & Ismono, 2021). The increase in pretest and posttest scores can be interpreted as an indication that the Student Worksheet developed is able to stimulate more active and interactive learning. This is in line with research on the application of Worksheet-based learning techniques which states that this approach can focus on helping students understand concepts better (Purwasi & Fitriyana, 2020). Furthermore, the N-gain obtained, which is 0.54, indicates moderate achievement, meaning that there is potential for improvement in the future. This is also supported by other research that shows that educational products validated with relevant N-gain scores tend to have a positive impact on student learning outcomes (Ramadhana & Hadi, 2021). From these results, it is suggested that the Learner Worksheet be continuously developed and tested in a broader context, to ensure its effectiveness and applicability in a wide range of learning situations and for different levels of student understanding.

Thus, based on the results of validation, practicality tests, and effectiveness tests, the ethnomathematics-based Student Worksheet developed has met the criteria as valid, practical, and effective teaching materials. In addition to helping students understand the concepts of translation and reflection, this Learner Worksheet also contributes to preserving local culture in mathematics learning.

CONCLUSION

Based on the results of the research and development that has been carried out, it can be concluded that the ethnomathematics-based LKPD with the context of the Batak Gorga motif in translation and reflection materials is declared valid, practical, and effective. The results of validation by two material experts and two media experts showed an average score of 85.62% and 86%, respectively, which were included in the very valid category, so that LKPD was suitable for use as innovative teaching materials. From the practical aspect, the assessment of teachers of 95% and students of 89.31% shows a very practical category, indicating that LKPD is easy to use, attractive, and in accordance with student characteristics.

Furthermore, the results of the effectiveness test showed an increase in the average score of students from 41.29 to 73.33, with the number of students who reached the Minimum Completeness Criteria (KKM) increasing from 2 students to 16 students. The N-Gain value of 0.54 is in the medium category, which shows that ethnomathematics-based LKPD is able to improve students' understanding of concepts through contextual and meaningful learning.

These findings confirm that the integration of local cultural elements such as Gorga Batak motifs can be an alternative approach in the development of mathematics teaching materials that are more relevant and interesting for students. In addition to contributing to contextual learning, the results of this study also open up opportunities for further research to test the implementation of culture-based LKPD at different materials and levels.

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