

Development Of Ethnomathematics-Based Mathematics Workbooks To Improve Numeracy Literacy

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Abstract *This study aimed to develop an ethnomathematics-based mathematics worksheet to enhance students' numeracy literacy skills. The research applied a Research and Development (R&D) approach using the 4D model, consisting of the stages of define, design, develop, and disseminate. The findings from the define stage revealed that students' numeracy abilities were still relatively low, while the teaching materials used in schools had not incorporated local cultural elements into mathematics learning. During the design stage, the worksheet was created by integrating mathematical concepts with local cultural contexts to provide more meaningful and engaging learning experiences. In the develop stage, the worksheet was evaluated by subject experts, media experts, and educational practitioners. The validation results indicated that the product achieved a highly valid category in terms of content, language, presentation, and visual design. Classroom trials demonstrated that the ethnomathematics-based worksheet improved students' abilities to interpret numerical information, solve contextual mathematical problems, and relate mathematics to everyday situations. In addition, students showed greater participation, enthusiasm, and motivation during learning activities. Therefore, the developed worksheet can serve as an innovative learning resource to support the improvement of students' numeracy literacy.*

Keyword: Ethnomathematics; Literacy; Numeracy; worksheet

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Abstrak Penelitian ini bertujuan mengembangkan LKPD matematika berbasis Ethnomatematika untuk meningkatkan kemampuan literasi numerasi siswa. Metode yang digunakan adalah *Research and Development* (R&D) dengan model pengembangan 4D yang terdiri atas tahap *define*, *design*, *develop*, dan *disseminate*. Tahap *define* menunjukkan bahwa kemampuan numerasi siswa masih rendah dan bahan ajar yang digunakan belum memanfaatkan budaya lokal dalam pembelajaran matematika. Pada tahap *design*, LKPD dirancang dengan mengintegrasikan konsep matematika dan budaya lokal agar pembelajaran lebih kontekstual serta mudah dipahami siswa. Selanjutnya, tahap *develop* dilakukan melalui validasi oleh ahli materi, ahli media, dan praktisi pendidikan. Hasil validasi menunjukkan bahwa LKPD berada pada kategori sangat valid dari aspek isi, bahasa, penyajian, dan tampilan. Hasil uji coba juga menunjukkan bahwa penggunaan LKPD berbasis ethnomathematika mampu meningkatkan kemampuan siswa dalam memahami informasi numerik, menyelesaikan masalah kontekstual, serta mengaitkan matematika dengan kehidupan sehari-hari. Selain itu, siswa terlihat lebih aktif dan antusias selama proses pembelajaran berlangsung. Dengan demikian, LKPD matematika berbasis ethnomathematika layak digunakan sebagai bahan ajar inovatif untuk mendukung peningkatan literasi numerasi siswa.

Kata Kunci: LKPD; Ethnomatematika; Literasi; Numerasi

A. INTRODUCTION

Numeracy literacy is an essential skill that helps students understand, process, and apply numerical concepts to solve problems in everyday life (Winata et al., 2021);(Angelelli et al., 2023). Numeracy literacy encompasses the ability to understand numerical information, analyze data, and solve problems logically and accurately. Mathematics instruction in schools still tends to focus on memorizing formulas and solving routine exercises, making it difficult for students to apply mathematical concepts in real-life situations. As a result, students' numeracy skills in

solving contextual problems remain low. Evaluation results indicate that many students still struggle to understand and apply mathematical concepts effectively (Lubis et al., 2024);(Saleh, 2013). The ethnomathematics-based student worksheet was developed using the 4D model, beginning with an analysis phase that revealed students' low numeracy skills.

The ethnomathematics approach can serve as an alternative learning strategy that connects mathematics with students' local culture. This approach utilizes cultural activities, traditions, and community environments as sources of mathematical learning, making the learning process more relevant and closely related to students' real-life experiences (Manik, 2021);(Ramadhani et al., 2023);(Hayati, et al., 2026);(Aflah & Andhany, 2022). Numerous studies have shown that ethnomathematics is effective in enhancing students' critical thinking, problem-solving abilities, and numeracy literacy skills (Serepinah & Nurhasanah, 2023);(Yuliana et al., 2022). In addition, this approach helps students understand that mathematics is embedded in various cultural activities and practices within the community (Aflah & Andhany, 2022). Therefore, the implementation of ethnomathematics can create mathematics learning experiences that are more engaging, relevant, and meaningful for students.

Student worksheets support active learning in ethnomathematics; however, their use in schools is often monotonous and lacks connections to culture and everyday life, resulting in lower student motivation. Therefore, ethnomathematics-based *worksheet* is needed to make learning more contextual, interactive, and closely related to students' environments. Several studies have shown that local culture-based *worksheet* is effective in enhancing learning activities, conceptual understanding, and students' numeracy skills more effectively than conventional instructional materials.

The development of ethnomathematics-based mathematics worksheets also plays an important role in introducing and preserving local culture through education. Various cultural elements, such as weaving patterns, traditional houses, traditional games, and community economic activities, can be utilized as contexts for

mathematics learning (Kamal et al., 2025). In addition to improving mathematical understanding, culture-based learning can also foster students' sense of pride in and appreciation for their local cultural heritage (Wahyuni et al., 2013). Previous studies have shown that the integration of culture into mathematics learning can significantly enhance students' mathematical communication skills and numeracy literacy (Hayati, et al., 2026). Therefore, the development of ethnomathematics-based student worksheets represents an important innovation in creating mathematics learning that is both effective and character-building. Based on these issues, it is necessary to develop ethnomathematics-based worksheets to enhance students' numeracy literacy skills.

B. METODE

This study employed a Research and Development (R&D) method using the 4D model. In the define stage, a needs analysis of students, curriculum analysis, and identification of local cultural elements that could be integrated into mathematics learning were conducted. The design stage involved developing the structure of the worksheets, preparing ethnomathematics-based materials and learning activities, and designing the worksheets layout to make it more engaging and contextual for students. In the develop stage, the worksheets was validated by experts and practitioners and subsequently tested to evaluate its practicality and effectiveness in improving students' numeracy literacy. The disseminate stage was carried out through limited distribution to teachers and schools. The study was conducted at SD Negeri 6 Juli, Bireuen Regency, Indonesia.

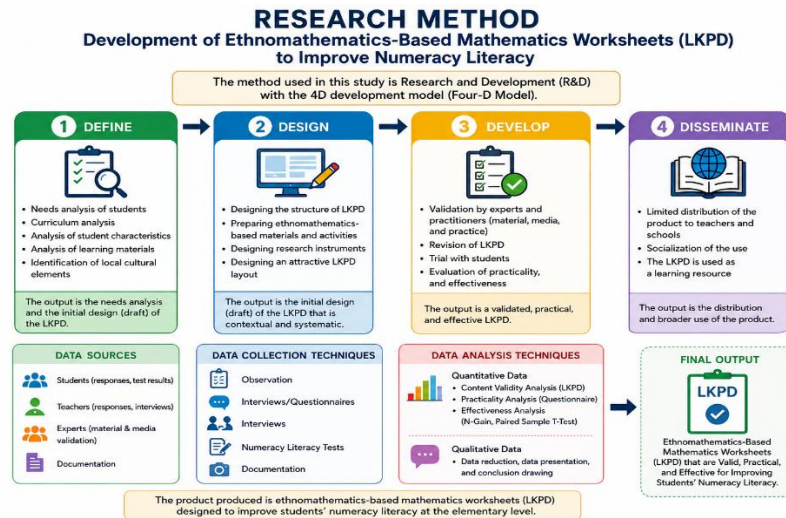


Figure 1. Research Method

C. RESULTS AND DISCUSSION

The development of the ethnomathematics-based worksheets was carried out using the 4D model. The initial analysis revealed that students' numeracy skills were still relatively low, particularly in solving problems related to real-life situations. In addition, the learning process was still dominated by the use of conventional teaching materials and had not yet incorporated local culture as a learning context.

Table 1. Results of Students' Needs Analysis

Analysis Aspect	Percentage	Category
Difficulty in understanding contextual problems	78%	High
Difficulty in relating mathematics to everyday life	74%	High
Interest in culture-based learning	86%	Very High
Use of conventional LKPD in schools	82%	High

The results of the needs analysis indicated that many students still experienced difficulties in understanding abstract mathematical concepts. During the design stage, the worksheets was developed by integrating local cultural elements into mathematics learning materials to support students' numeracy literacy. The cultural contexts incorporated in the worksheets included weaving patterns, traditional houses, traditional trading activities, and local games. The worksheets was designed to be engaging through the use of illustrations, colors, and exploratory activities, encouraging students to participate more actively in the learning process.



Figure 2. Development of the worksheet

The develop stage was carried out through an evaluation process involving subject matter experts, media experts, and educational practitioners to assess the quality of the developed worksheets. The validation results indicated that the worksheets met the criteria for content accuracy, presentation, language, and visual design. In addition, the incorporation of local cultural elements in the worksheets was considered effective in making mathematics learning more engaging and in increasing students' interest in learning

Table 2. Results of worksheet Validation

Assessed Aspect	Mean Score	Category
Content Feasibility	4.65	Very Valid
Language	4.50	Very Valid
Presentation	4.58	Very Valid
Media Appearance	4.62	Very Valid
Integration of Local Culture	4.70	Very Valid
Average	4.61	Very Valid

Based on the validation results, the *worksheet* obtained an average score of 4.61, which falls into the *very valid* category, indicating that it is suitable for implementation in mathematics learning. These findings suggest that teaching materials based on local culture effectively support contextual learning experiences. After revisions were made according to the validators' suggestions, the *worksheet* was tested with students. The trial results showed that students became more active during the learning process, found it easier to understand numeracy-related problems, and demonstrated greater enthusiasm and motivation toward learning mathematics.

Table 3. Improvement in Students' Numeracy Literacy

Indicator	Pretest	Posttest	N-Gain	Category
Understanding numerical information	58.00	83.00	0.59	Moderate
Solving contextual problems	55.00	81.00	0.57	Moderate
Applying mathematical concepts	60.00	85.00	0.62	Moderate
Interpreting data	57.00	82.00	0.58	Moderate
Average	57.50	82.75	0.59	Moderate

The results showed that the students' average score increased from 57.50 on the pretest to 82.75 on the posttest, with an N-Gain score of 0.59, which falls into the moderate category. These findings indicate that local culture-based learning helps students understand mathematical concepts more concretely and meaningfully. Through contexts that are closely related to their daily lives, students

become more capable of analyzing problems, understanding numerical information, and determining appropriate solutions.

Based on the findings of this study, the ethnomathematics-based mathematics *worksheet* was found to be both feasible and effective for improving students' numeracy literacy skills. Furthermore, the use of this *worksheet* encouraged students to become more active and motivated throughout the learning process, creating a more engaging and meaningful mathematics learning experience.

D. DISCUSSION

This discussion explains the results of the development of an ethnomathematics-based mathematics worksheet in improving students' numeracy literacy. The discussion focuses on the students' needs analysis, the validation results of the *worksheet*, and the improvement in numeracy skills following the implementation of the *worksheet* in the learning process. The development of local culture-based teaching materials was intended to create mathematics learning experiences that are more contextual, engaging, and closely related to students' daily lives. Furthermore, the findings of this study are linked to previous research to strengthen the evidence regarding the effectiveness of ethnomathematics-based learning in enhancing the quality of mathematics instruction and students' numeracy literacy skills (Hayati, et al., 2026).

These findings indicate the need for innovative teaching materials to make mathematics learning more concrete and meaningful for students. This is in line with the view that (Hairumini et al., 2017) These findings indicate the need for innovative teaching materials to make mathematics learning more concrete and meaningful for students. This is consistent with the view that mathematics is inseparable from culture and community activities; therefore, learning becomes easier to understand when it is connected to students' real-life contexts.

The validation results showed that the ethnomathematics-based *worksheet* was categorized as *very valid* in terms of content, language, presentation, and visual

design. The materials were also considered to be well aligned with the curriculum and the objectives of numeracy learning. The integration of local cultural elements made the learning process more engaging, while the systematic and contextual presentation helped students understand the material more easily and participate more actively in learning activities. These findings support previous studies which reported that local culture-based teaching materials can enhance students' learning motivation, classroom participation, and understanding of mathematical concepts more effectively than conventional instructional materials (Siregar et al., 2024). Dengan demikian, *worksheet* berbasis ethnomatematika layak digunakan sebagai bahan ajar inovatif dalam pembelajaran matematika.

After participating in learning activities using the *worksheet*, students demonstrated a greater ability to understand numerical information, analyze contextual problems, and determine appropriate problem-solving strategies. This improvement occurred because the learning materials were presented through local cultural contexts that were closely related to students' daily lives, making mathematical concepts more concrete and easier to understand. Learning activities that incorporated local culture also encouraged students to become more active in discussions, ask questions, and express their opinions throughout the learning process. In addition to improving numeracy skills, the use of culture-based *worksheet* helped students understand that mathematics is closely connected to everyday life (Lubis et al., 2024). Therefore, ethnomathematics-based mathematics worksheets can serve as an effective alternative learning resource for improving the quality of mathematics education in schools. By integrating local cultural contexts into the learning process, these worksheets not only enhance students' numeracy literacy skills but also create more meaningful, engaging, and relevant learning experiences.

E. CONCLUSION

The results of this study indicate that the ethnomathematics-based mathematics worksheet *worksheet* is valid, practical, and effective in improving students' numeracy literacy skills. The integration of local cultural elements makes learning more contextual, enabling students to understand and apply mathematical concepts more easily in their daily lives. The *worksheet* also enhances students' numeracy abilities, learning motivation, and active participation in the learning process. Therefore, ethnomathematics-based *worksheet* can be used as an innovative instructional material that makes mathematics learning more engaging, meaningful, and relevant to students' experiences.

REFERENCES

- Aflah, H., & Andhany, E. (2022). Etnomatematika dalam Budaya Suku Alas di Kabupaten Aceh Tenggara. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 6(3), 2376–2390. <https://doi.org/10.31004/cendekia.v6i3.1466>
- Angelelli, C. V., Ribeiro, G. M. de C., Severino, M. R., Johnstone, E., Borzenkova, G., & da Silva, D. C. O. (2023). Developing critical thinking skills through gamification. *Thinking Skills and Creativity*, 49(September), 1–37. <https://doi.org/10.1016/j.tsc.2023.101354>
- Hairumini, Setyowati, D. L., & Sanjoto, T. B. (2017). Kearifan lokal rumah tradisional Aceh sebagai warisan budaya untuk mitigasi bencana gempa dan tsunami. *Journal of Educational Social Studies*, 6(1), 37–44. <http://journal.unnes.ac.id/sju/index.php/jess>
- Hayati, R., Husnidar, H., & Novianti, N. (2024). *Dampak Pembelajaran Berbasis Budaya Di Sekolah Dasar* (pp. 1–8). <https://doi.org/https://doi.org/10.23969/jp.v9i04.19910>
- Hayati, R., Syahputra, E., & Surya, E. (2026). *Realistic Mathematic Education Grounded In Deliberative Culture: Fostering Problemsolving Skills In Primary Education*. 12(1), 616–628. <https://doi.org/10.5281/zenodo.12126119>
- Hayati, R., Zulfikri, Z., Husnidar, H., Rohantizani, R., & Kartika, Y. (2026). Efektivitas Model RME-Budaya Aceh Berbantuan Artificial Intelligence dalam Konteks Pascabencana di Sekolah Dasar. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 11(2), 220–233. <https://journal.unpas.ac.id/index.php/pendas/article/view/44206>
- Kamal, M., Damopolii, M., & Datunsolang, R. (2025). Integrasi Nilai-Nilai Kearifan Lokal

Dengan Pendekatan Contextual Teaching And Learning Dalam Pembelajaran Seni Budaya Di SDN 8 Kwandang. *JEMARI: Jurnal Edukasi Madrasah Ibtidaiyah*, 7(1), 59–67.

Lubis, A. P., Sirait, C. D., Mailani, E., May, L. C., Ketaren, M. A., & Maharaja, S. (2024). *Efektivitas Pembelajaran Matematika Berbasis Etnomatematika Untuk Penguatan Nilai Budaya*. 2(5).

Manik, E. (2021). Ethnomatematika and realistic mathematics education. *Proceedings of the Ethnomatematika Webinar*.
https://www.easychair.org/publications/preprint_download/JI1f

Ramadhani, R., Syahputra, E., & Simamora, E. (2023). Ethnomatematika approach integrated flipped classroom model: Culturally contextualized meaningful learning and flexibility. *Jurnal Elemen*, 9(2), 371–387. <https://doi.org/10.29408/jel.v9i2.7871>

Saleh, M. (2013). Meningkatkan Pemahaman Siswa tentang Konsep Pecahan melalui Benda Manipulatif. *Jurnal Serambi Ilmu*, 14(2).
<https://doi.org/http://dx.doi.org/10.32672/si.v17i2.544>

Serepinah, M., & Nurhasanah, N. (2023). Kajian Etnomatematika Berbasis Budaya Lokal Tradisional Ditinjau Dari Perspektif Pendidikan Multikultural. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, 2, 148–157.
<https://doi.org/10.24246/j.js.2023.v13.i2.p148-157>

Siregar, A. R., Fitri, A., Pakpahan, H., Siregar, E. B., Mahmud, J., Nadya, S., Matondang, N. H., Hidayah, N., Karo, B., Sonia, P., Simarmata, B., & Hasibuan, R. P. (2024). Etnomatematika Sebagai Sarana Penguatan Budaya Lokal Melalui Kurikulum Merdeka Belajar. *Prosiding MAHASENDIKA III*, 44–57.

Wahyuni, A., Aji, A., Tias, W., & Sani, B. (2013). Peran Etnomatematika dalam Membangun Karakter Bangsa: *Penguatan Peran Matematika Dan Pendidikan Matematika Untuk Indonesia Yang Lebih Baik*, 1, 111–118.

Winata, A., Widiyanti, I. S. R., & Sri Cacik. (2021). Analisis Kemampuan Numerasi dalam Pengembangan Soal Asesmen Kemampuan Minimal pada Siswa Kelas XI SMA untuk Menyelesaikan Permasalahan Science. *Jurnal Educatio FKIP UNMA*, 7(2).
<https://doi.org/10.31949/educatio.v7i2.1090>

Yuliana, Y., Usodo, B., & Riyadi, R. (2022). The New Way Improve Mathematical Literacy in Elementary School: Ethnomatematika Module with Realistic Mathematics Education. *AL-ISHLAH: Jurnal Pendidikan*, 15(1), 33–44.
<https://doi.org/10.35445/alishlah.v15i1.2591>