AKSIOMA: Jurnal Program Studi Pendidikan Matematika
Volume 14, No. 3, 2025, 687–701

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v14i3.9779

INTEGRATED DEVELOPMENT OF MALAY ETHNOMATHEMATICS: DESIGNING STUDENT WORKSHEETS ON ADDITION AND SUBTRACTION OF INTEGERS

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Received 29 February 2024; Received in revised form 13 February 2025; Accepted 15 July 2025

Abstract

The use of unengaging and decontextualized worksheets has been identified as a significant barrier to the effective learning of mathematical concepts in elementary schools, leading to diminished student interests and understanding. This study aims to address this issue by developing interactive student worksheets grounded in Malay ethnomathematics, specifically tailored for teaching addition and subtraction to second-grade elementary students. An ethnographic approach was adopted to integrate ethnomathematical concepts with local cultural contexts, thereby enhancing the relevance and engagement of the learning experience. The research employed a Research and Development (R&D) methodology, utilizing the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) as the framework for development. Data collection was collected through interviews, observations, and questionnaires, with a sample size of sixteen students. The findings of the study revealed the following: (1) The quality of the developed student worksheets was categorized as valid, based on evaluations by three validators specializing in language, content, and media. The validation scores were 93% for language, 93% for content, and 100% for media. (2) The practicality of the worksheets was assessed by both teachers and students, with teachers rating the practicality at 82% and students at 81%. In conclusion, the developed student worksheets were found to be both valid and practical, making them suitable for implementation in elementary school settings. This study underscores the potential of culturally contextualized educational materials to enhance students' engagement and understanding in mathematics.

Keywords: Addition and subtraction; Malay ethnomathematics; whole number operations; worksheets

Abstrak

Penggunaan lembar kerja yang tidak menarik dan tidak sesuai konteks telah diidentifikasi sebagai hambatan signifikan terhadap pembelajaran konsep matematika yang efektif di sekolah dasar, yang menyebabkan berkurangnya minat dan pemahaman siswa. Penelitian ini bertujuan untuk mengatasi masalah ini dengan mengembangkan lembar kerja siswa interaktif yang didasarkan pada etnomatematika Melayu, yang secara khusus dirancang untuk mengajarkan penjumlahan dan pengurangan kepada siswa kelas II sekolah dasar. Pendekatan etnografi diadopsi untuk mengintegrasikan konsep etnomatematika dengan konteks budaya lokal, sehingga meningkatkan relevansi dan keterlibatan pengalaman belajar. Penelitian ini menggunakan metodologi Research and Development (R&D), dengan memanfaatkan model ADDIE (Analisis, Desain, Pengembangan, Implementasi, dan Evaluasi) sebagai kerangka kerja pengembangan. Pengumpulan data dilakukan melalui wawancara, observasi, dan kuesioner, dengan subjek 16 siswa. Temuan penelitian mengungkapkan hal berikut: (1) Kualitas lembar kerja siswa yang dikembangkan dikategorikan valid, berdasarkan evaluasi oleh tiga validator yang mengkhususkan diri dalam bahasa, konten, dan media. Nilai validasi untuk bahasa adalah 93%, konten 93%, dan media

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100%. (2) Kepraktisan lembar kerja dinilai oleh guru dan siswa, dengan guru menilai kepraktisan sebesar 82% dan siswa sebesar 81%. Sebagai kesimpulan, lembar kerja siswa yang dikembangkan terbukti valid dan praktis, sehingga cocok untuk diterapkan di lingkungan sekolah dasar. Studi ini menggarisbawahi potensi materi pendidikan yang dikontekstualisasikan secara budaya untuk meningkatkan keterlibatan dan pemahaman siswa dalam matematika.

Kata kunci: *Penjumlahan dan pengurangan; etnomatematika Melayu; operasi bilangan cacah; lembar kerja*

INTRODUCTION

Mastery of addition and subtraction, as foundational mathematical operations, is critical for students to acquire at an early age. A lack of proficiency in these basic concepts can hinder students' ability to understand and engage with more advanced mathematical topics (Aragón-Mendizábal et al., 2017). Consequently, ensuring a strong grasp of these fundamental operations is essential for long-term academic success in mathematics. Despite the apparent simplicity of addition and subtraction, many students encounter significant challenges in understanding and applying these concepts (Siegler & Lortie-Forgues, 2017). Common issues include difficulties in grasping the underlying principles of addition and subtraction, reliance on conventional and often unengaging worksheets, and struggles with numerical operations (Carpenter et al., 2015). These challenges highlight the need for innovative instructional tools that can address these gaps effectively.

To this end, there is a pressing demand for alternative learning resources that can provide students with clearer guidance and more effective strategies for solving mathematical problems. Such tools should aim to enhance conceptual understanding, foster engagement, and facilitate the practical application of addition and subtraction in diverse contexts. By addressing these challenges, educators can better support students in building a solid mathematical foundation, thereby promoting greater confidence and competence in their mathematical abilities.

Mathematics learning that integrates culture is still not optimal because many educators perceive mathematics and culture as distinct and unrelated domains (Putri et al., 2023a). However, mathematics is deeply embedded in various aspects of human daily life, reflecting its origins in human thought and cultural practices (Anriana et al., 2023). Education and culture are inherently interconnected, forming a comprehensive framework that shapes societal development. Education, as a fundamental need for every individual, is inseparable from cultural contexts, which permeate everyday life and provide a holistic foundation for learning (Bishop, 2020; D'Ambrosio & Rosa, 2017).

In this context, culturally integrated mathematics learning is known as ethnomathematics. Ethno-mathematics refers to the mathematical practices of various cultural groups, including urban and rural communities, labor groups, children of certain ages,

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

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and indigenous peoples (D'Ambrosio & Rossa, 2017). Ethnomathematics has significant potential to be developed into classroom mathematics learning. This aligns with the perspective of Ayuningtyas and Setiana (2019), who argue that the integration of ethnomathematics in learning can be achieved through the development of teaching materials infused with ethnomathematical elements.

Based on interviews with teachers at State Elementary School 099 and Raudhaturrahma Integrated Islamic Elementary School, as well as observations conducted at these schools, several interrelated issues have been identified. The student worksheets currently in use lack integration with local cultural wisdom and primarily consist of repetitive practice questions. This has negatively impacted the mathematics learning process, as students often struggle to concentrate and remain focused during assignments. Observations revealed that students rely heavily on teacher explanations and lack the ability to independently engage in critical thinking. Learning tends to be procedural rather than conceptual, limiting students' ability to grasp underlying mathematical principles (Devi & Amir, 2021; Sari et al., 2020). To address these challenges, teachers require specific techniques to facilitate student understanding, particularly through the use of ethnomathematics-based student worksheets.

Therefore, the development of ethnomathematics-based student work-sheets for elementary school students necessitates the integration of local cultural concepts, such as Malay culture in the Riau Province (Anriana et al., 2023; Putra et al., 2024). Several previous studies have successfully developed ethnomathematics-based student worksheets, demonstrating their validity and practicality. For instance, Riyanto et al. (2020) developed ethnomathematics-based worksheet with the context of Borobudur temple, which were found suitable for elementary students. Similarly, Dewi and Agustika (2022) created interactive worksheets using the Predict-Observe-Explain (POE) model, which enhanced student motivation and engagement. Astuti et al. (2022) also developed ethnomathematics-based worksheets for to facilitate student mathematical representation, which proved effective in facilitating student learning.

The problems identified at State Elementary School 099 Pekanbaru align with these findings, highlighting the need for culturally contextualized learning tools. This study aims to develop valid and practical Malay ethnomathematics-based student worksheets for teaching addition and subtraction to second-grade elementary students. By integrating local cultural elements into the learning process, this research seeks to enhance students' conceptual understanding, engagement, and problem-solving abilities, ultimately contributing to their long-term mathematical proficiency.

METHODS

This study employed a Research and Development (R&D) design. This study developed integrated Malay Ethnomathematics worksheets for addition and subtraction in second grade Elementary School. The R&D research used in this study was the ADDIE model (Branch, 2009). Which consists of the stages of anlysis, design, develop, implementation, and evaluation (Figure1).

ISSN 2089-8703 (Print)
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This research began with a needs analysis through preliminary testing at Public Elementary School 099 Pekanbaru with 6 students. The results of the validation and student assesment were then validation and student assessment were then implemented by conducting small group testing at Raudahaturrahma Integrated Islamic Elementary School in Pekanbaru with 10 students.

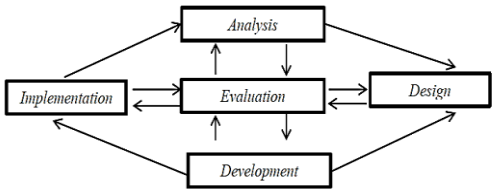

Figure 1. ADDIE development flow diagram (Branch, 2009)

According to figure 1, the prcedure for developing the ADDIE model can be described as follows :

1) Analysis stage

This stage consists of three steps. First, the needs of students are analyzed so that the media developed is in line with learning needs and can be used as a medium to fosfer students interest in literacy. Second, curriculum analysis is conducted to determine learning topics, competency outcomes, and kearning objectives. Third, student needs analysis is conducted to understand student characteristics based on their environment, skills, and development.

2) Design and Development

This stage consists of the process of designing and developing media, namely Malay Etnomathematics-Based Student Worksheets on Addition and Subtraction. The design and develop-ment stage is carrried out after the analysis of students, curriculum, and material. Once the product has been produced, it will be validated by experts to ensure that i tis suitable for use. Validation is carried out by three experts, namely media experts, material experts, and language experts, with the aim of making revisions to obtain a valid product.

3) Implementation and Evaluation

At this stage, the product is tested by students and teachers to assess its practically. The results of the practically test can be seen from the responses of teachers and students regarding the use, appeal, and benefits of the developed product. At this stage, interviews were also conducted with students to obtain further feedback on the stundent worksheet that han been developed.

This research was conducted in the odd semester of the 2023/2024 academic year at Public Elementary School 099 Pekanbaru and Raudhaturrahma Integrated Islamic Elementary School. The data sources were obtained from classroom teachers and 16 students using pre-research quistionnaires, expert validation sheets, teacher assesment sheet, student response sheet and interview section. The aspects observed by the media experts validators were related to media design and content display. The expert material validator focused on the content, language presentation, and alignment with ethnomathematics-based learning. Additionally, the language validator assessed the language level.

The percentage of product validity is calculated using the following formula :

$$\bar{x} = \frac{Score\ achieved}{Total\ score} \times 100\% \quad (1)$$

The validation criteria and test result intervals are converted in Table 1.

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

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Table 1. Average interval of validator asssesment scores.

Average score (%)	Percentage	Validity category
4	81-100	Very valid
3	61-80	Valid
2	41-60	Quite valid
1	≤ 40	Invalid

(Sugiyono, 2019)

For the practically test category for media given to teachers and students, it's converted in Table 2.

Table 2. Average interval of media practicality test

Average score (%)	Percentage	Validity category
1	≤ 40	Invalid
2	41-60	Valid
3	61-80	Quite valid
4	81-100	Very Valid

(Sugiyono, 2019)

RESULTS AND DISCUSSION

The product resulting from the design of developing student worksheets based on Malay ethnomathematics can be used by students to learn and practice questions independently. In learning to develop student worksheets based on Malay ethnomathematics, it consists of 5 stages which are explained in detail as follows:

Analysis

At the analysis stage, researchers conducted several activities to collect information about student worksheets in learning mathematics in elementary schools. Collecting information data by conducting interviews with one of the grade II teachers at SDN 099 Pekanbaru and SDIT Raudhaturrahma, observe the implementation of learning activities.

The results of the analysis show that the curriculum used is *Merdeka* curriculum. Apart from that, students' mathematical reasoning abilities also need to be improved, this is caused by several factors, one of which is that the worksheets used by students are less effective. Therefore, teaching materials are needed in the form of student worksheets that are interesting and make it easier for students to answer questions interactively.

Based on the results of the interview, the learning process activities use student worksheets developed by the teacher. Based on the results of observations, the student worksheets used did not link the material to local Malay wisdom in Riau, so students only knew the material without knowing the local wisdom that existed where they lived. Apart from that, students' worksheets contain practice questions so this causes several problems, one of which is that students become less independent because they have difficulty understanding the questions so students depend on the teacher, lack of mathematical problem-solving abilities so students have to be given explanations as to what problems are occurring. in the question, what is asked in the question, what are the steps in solving the question. This solution is carried out procedurally, so that students understand how to solve math problems.

Second grade students are currently entering the concrete stage, namely 8-11 years old. According to Piaget (1976) at the age of 6-12 years children are in the concrete operational development phase. Children tend to like learning that is fun and not too rigid. This has also been conveyed by one of the teachers in research at SDN 099 Pekanbaru and SDIT Raudha-turrahma class II through interviews, that students like fun learning such as media with lots of pictures and colors so that students are very motivated to start learning.

ISSN 2089-8703 (Print)
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Design

The design stage is carried out by designing a Malay ethnomathematics-based learner worksheet on the material of addition and subtraction of whole number operations. The steps to be taken are to determine the flow of the learner worksheet starting with learning objectives, designing scenarios, designing learning materials for addition and subtraction of whole number operations. At this design stage there are 2 stages carried out including the following:

a. Initial design

The process of designing learner worksheets is adjusted to the steps of preparing learner worksheets that have been determined.

1) The title of the learner worksheet developed is a Malay ethnomathematics-based learner worksheet on the material of addition and substraction of whole number operations.
2) Instructions for using learner worksheets that can facilitate users
3) Competencies to be achieved are allocated in the learning objectives
4) Supporting information is a concept map of the material that will be described in the learner worksheet
5) Practice questions combined in the form of student activities that are included with guidelines for answering practice questions.

b. Learning worksheet elaboration

The main points in the learning worksheet elaboration are to design the contents of the learning materials. The development of learner worksheets refers to student mathematics activity texbooks as well as several references both from books and the internet that are relevant to learner worksheets (Figure 2).

Figure 2. The process of drawing a design on Canva

Development

The development stage is the stage of product validation and revision. These stage include the following steps:

a. Developing Malay-ethnomathematics-based student worksheet products on addition and subtraction of whole number operations.

1) The front cover

The front cover of the student worksheet contains the title "Malay ethnomathematics-based student worksheet on the material of addition and subtraction of whole number operations". There is a picture of students playing a traditional game. The appearance of the learner worksheet can be seen in Figure 3.

Figure 3. Front cover of the worksheet

2) Foreword and table of contents

The preface in the learner worksheet contains an expression of gratitude from the author who has completed the developed the worksheet.

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The table of contents is part of the learners' worksheet which contains chapters and each sub-chapter of the worksheet which includes pages. Display of the preface and table of contents in Figure 4.

Figure 4. Preface and table of contents

3) Learning outcomes, learning objectives and student profile of Pancasila

Learning outcomes are a number of abilities that students must master in a particular subject. Learning objectives are the goals that must be achieved in carrying out learning activities. Pancasila profile is one of the student behaviors shown by students when carrying out learning (Figure 5).

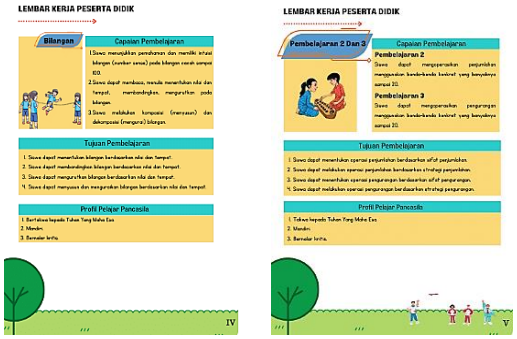

Figure 5. The display of learning outcomes, learning objectives and Pancasila profile

4) Learner worksheet concept and Instructions for use

The concept in the student worksheet presents information in the form of concepts that are interrelated in a series according to the material in the worksheet. The instructions for using the worksheet are useful to facilitate readers in using it. The concept display of the worksheet and instructions for using it can be seen in Figure 6.

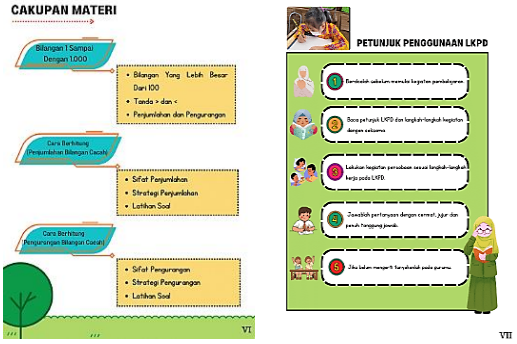

Figure 6. Display of concept maps and Instructions for using learner worksheet

5) Learning materials and Exercises

Learning materials are a form of learning substance to assist teachers in teaching and learning activities that are systematically arranged in order to meet established competency standards. The learning material for the worksheet outline contains conversation dialog, history of traditional games, student activities. Exercises are useful for solidifying learners' understanding of the topics that have been studied. The display of learning materials and exercises can be seen in Figure 7.

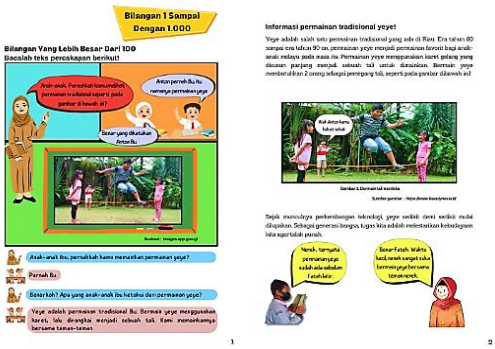

Figure 7. Display of learning

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v14i3.9779

b. Validation of learner worksheets by validators

Malay ethnomathematics-based learner worksheets on the material of addition and subtraction of integer operations were validated by three lecturers who are experts in the fields of material, media and language.

1) Media Experts

The media validation assessment of Malay ethnomathematics-based learner worksheets on the material for the operations of addition and subtraction of small numbers analyzes 2 aspects, namely cover design and display design. The results of the validation of the learner worksheet can be seen in graphical form in Table 3.

Table 3. Media validation test results

Aspect	Percentage	Category
Cover Design	100%	Very valid
Display Design	100%	Very valid
Average	**100%**	**Very valid**

Based on the results of the media validation test presented in Table 3, seeing the final results of the media validation test that has been carried out, it can be concluded that the Malay ethnomathematics-based student worksheet on the material of addition and subtraction of whole number operations is feasible and can be implemented to students.

2) Material Experts

The material validation assessment of the Malay ethnomathematics-based student worksheet on the material of addition and subtraction of integer operations analyzed 3 aspects, namely content feasibility, presentation and language feasibility, suitability for ethnomathematics-based learning. The validator information is presented in Table 4.

Table 4. Material validation results

Result assessment	Aspect		Validity category
	Stage I	Stage II	
Content eligibility	96%	100%	Very valid
Appropriateness of presentation and language	94%	97%	Very valid
Conformity with ethnomathematics-based learning	75%	81%	Very valid
Average category	**88%**	**89%**	
Category	**Very valid**	**Very valid**	

3) Linguist Experts

Language validation assessment of Malay ethnomathematics-based student worksheets on the material of addition and subtraction of numerical operations is validation of students' worksheets by linguists can be seen in Table 5.

Table 5. Language validation results

Result assessment	Aspect	
	Stage I	Stage II
Language appropriateness	50%	93%
Category	**Invalid**	**Very valid**

Implementation

After validation and improvement, the was carried out one-on-one evaluation on 6 second grade student of

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

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SDN 099 Pekanbaru and limited trial on 10 second grade students of SDIT Raudhaturrahma. In the one-on-one evaluation, it was gives one by one to 6 grade II students. Then, after the leaners saw reading and filling in the questions contained in the leaner worksheet, the first researcher conducted interviews with 6 leaners. In the limited trial on 10 grade II leaners, the leaner worksheet was given by one to 10 leaners. After giving the leaner worksheet, the researcher explained some parts of the contents of the leaner worksheet, after that, the researcher distributed a teacher and student response questionnaire to get a response to the leaner worksheet that had been given.

a. Practically test of Malay ethnomathematics-based student worksheet product.

Practical test results of worksheets for grade II elementary school students get very good level of practicality. The aspects assessed by the teacher are related to attractiveness, ease of use and benefits. It can be concluded that, the product of Malay ethnomathematics-based student worksheets is very feasible to use. The following is a display of the practicality test results in Table 6.

Table 6. Practicality results

Aspect	Percentage	Category
Attractiveness	79%	Very Valid
Ease of use	95%	Very Valid
Benefits	87,5%	Very Valid
Average	**87%**	**Very Valid**

b. Individual trials

After the validation stage, then individual trials were carried out on 6 students. The trial activity began with the researcher demonstrating the product of the student worksheet to 6 students, then directing them to see and use it themselves. If there is something that is not understood, then students can ask the researcher. After the learners finished using the learner worksheet, then the researcher conducted interviews with 6 students individually such as "have you ever used the Malay ethnomathematics learner worksheet before?", "do you like the appearance of the Malay ethnomathematics learner worksheet?", "what do you think you like about the Malay ethnomathematics learner worksheet?", "does the learning contained in the Malay ethnomathematics learner worksheet make you feel difficult both when understanding the material and answering the questions presented?", as long as you study, what makes you feel difficult when answering addition and subtraction questions?, "by using Malay ethnomathematics, do you feel a change in the way you learn from not understanding to understanding?".

Then the researcher gave a questionnaire to students to fill in their responses to the learner worksheet which included 3 aspects of assessment, namely attractiveness, user-friendliness and benefits. Based on the results of interviews and filling out the questionnaire, it can be concluded that the Malay ethnomathematics-based student worksheet on the material of addition and subtraction of whole number operations is feasible to use without any suggestions or improvements from students. The following are the results of student responses related to filling out the one-on-one trial questionnaire displayed in Table 7.

Table 7. Recapitulation of students response assessments

Aspect	Percentage	Category
Attractiveness	80%	Very Valid
Ease of use	98%	Very Valid
Benefits	80%	Very Valid
Average	**89%**	**Very Valid**

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c. Limited trials (small group)

After conducting the validation stage and individual trials, then a limited trial was carried out with 10 grade II students at SDIT Raudhaturrahma, the implementation of this limited trial was carried out to ensure the use of the product and see the feasibility and responses of students to the Malay ethnomathematics-based student worksheet on the material of addition and subtraction of whole number operations.

The implementation of this limited trial, the researcher gave a student worksheet to each of the 10 grade II students. Furthermore, the researcher explained how to use the learner worksheet. then, the researcher teaches the material assisted by the grade II teacher on the learner worksheet. Furthermore, students are directed to work on questions, then giving a questionnaire assessing the response of students to the product developed to 10 students. Based on the results of filling out the questionnaire, it can be concluded that the Malay ethnomathematics-based learner work-sheet on the material of addition and subtraction of integer operations is considered practical and feasible to use without any suggestions or improve-ments from students. The results of the questionnaire response assessment of 10 grade II SDIT Raudhaturrahma students after being calculated and adjusted to the research scale are described in Table 8.

Table 8. Recapitulation of students response assessments

Aspect	Percentage	Category
Attractiveness	86%	Very Valid
Ease of use	79%	Very Valid
Benefits	79%	Very Valid
Average	**81%**	**Very Valid**

Evaluation

At this stage the formative method is used. The evaluation stage is carried out to assess the quality of the product being developed and the product development process itself. In the one-on-one evaluation, interviews were conducted with class II students regarding the product being developed. Through interviews, information was obtained that students were very happy when using this worksheet in the learning process. This worksheet also has an attractive appearance and the material contained can be understood well. This worksheet is interesting because it studies the addition and subtraction of integer operations, students also learn about the local wisdom in Riau. Apart from that, in the example material and practice questions there are guidelines in the form of steps to answer questions, counting strategies that students have never learned before so they seem interesting to learn.

The small group test was carried out on 10 class II students. At this stage a limited trial was carried out to obtain information regarding teacher and student responses to the product design being developed through providing a response questionnaire. The response questionnaire is given after the students have finished working on the worksheet. Through the teacher response questionnaire, it was disco-vered that the Malay ethnomathematics-based worksheets had an attractive appearance, thereby encouraging students to be actively involved and independent. Student worksheets are an effective, creative and innovative learning medium.

This research is a type of research and development that aims to develop products in the form of Malay

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

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ethnomathematics-based learner worksheets on the material of addition and subtraction of whole number operations in grade 2 elementary schools. The results showed that the developed learner worksheets not only helped students understand the concept of ethnomathematics, but also introduced the local wisdom of Malay Riau. This is in line with the research of Witri et al. (2019) which states that the use of learning resources that are relevant to the cultural context of students can improve understanding and learning outcomes. In this study, the researcher argues that the difficulty of students in understanding the addition and subtraction of integer operations is the counting strategy that is less interesting and not contextualized. By integrating Malay ethnomathematics, the learner worksheet provides a more meaningful and enjoyable learning approach for students.

The findings in this study are Malay ethnomathematics-based learner worksheets on the material of addition and subtraction of whole number operations in grade 2 elementary schools have been adjusted by considering needs analysis, learner analysis and curriculum analysis. The learner worksheets developed are effective in helping students understand the material of addition and subtraction of integers, as well as introducing Malay local wisdom. Students are enthusiastic in learning math after using this learner worksheet.

Some of the factors that led to the results of the study are learner worksheets developed using the context of Malay culture of Riau in learner worksheets make learning more relevant and interesting for students. The material presented in the learner worksheets is related to everyday life, making it easier for students to understand. learner worksheets are designed with attractive visuals and systematic learning steps, adapted to the thinking ability of grade 2 elementary school students. The use of an independent curriculum allows researchers to develop learner worksheets that are flexible and student-centered.

Research in developing learner worksheets by providing innovative and contextual learning approaches. This research enriches mathematics learning resources by integrating local wisdom, especially Riau Malay. In the process of developing learner worksheets using the ADDIE model which is systematic, so that the results are structured and measurable. However, in the research there are still shortcomings, this research is limited to grade II elementary school classes in two schools. The validation process and trial of learner worksheets is still limited to a small scale, so it needs to be tested further to test its effectiveness widely.

This research is in line with Witri et al. (2019), that the use of culture-based learning resources can improve student learning outcomes. Winahyu et al. (2020) found that STEM based ethnomathematics is effective in increasing students' interest and conceptual understanding of mathematics. Chofifah et al. (2023) showed that the ethnomathematics learning has a positif effect towards students' learning achievments of geometry propoties. Besides, it can create a meaningful learning experience for students. However, this research is unique because it focuses on Malay Riau ethnomathematics, which has not been widely explored in previous studies. Thus, this research makes a new contribution to the development of culture-based mathematics learning resources.

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm.v14i3.9779

The findings of this study indicate that Malay Ethnomatematics integrated student worksheet is effective in enchanding second grede elementary student's understanding of whole number addition and subtraction. By embedding the local cultural context of Riau, the materials became more relevant to stundens everyday experiences, making abstract concepts easier to grasp ehile also boosting their motivation and learner autonomy.

The student worksheets present interactive activities with systematic step by step guidance, providing concrete examples of the development of contextual and culture based learning resources (Wonda, 2023). These findings are in line with Yulanda et al. (2022), who emhasize the importance of local culture in mathematics learning.

The integration of cultural wisdom into student worksheets results interactive and practical activities, encouraging students to be active and independent during learning. This significantly increases learning motiva-tion because students can directly see the coonection between mathematics and their culture (Putri et al., 2023; Prahmana, 2022).

By linking mathematical concepts to the Malay cultural context, students come to undertand their practical applications in real life. This finding opens up great opportunities for developing ethnomathematics leaning resources in other cultural contexts, while encouraging innovation in mathematics learning that is more meaningful and relevant.

This study has limitations that need to be considered. First, the research sample only involved two elementary schools and 16 second grade elemantay school students with a relatively short trial period. This condition limits the ability of the study to assess the stability and sustainability of the impact of using student worksheets over a long period of time. Second, the R&D methof applied was small scale, and the students had diverse bagrounds.

Based on these limitations, several recoomendations need to be considered. Forst, conduct further trials with broader coverage and longer observation periods to evaluate effectiveness and long term impact. Second, adopt a mixed research design and involve various cultural contexts and school levels to strengthen generalization and external validity. Third, encourage teachers to adapts and develo[athnomathematics based student workheet in accordance with their respective local cultures.

CONCLUSONS AND SUGGESTIONS

This research has developed Malay ethnomathematics-based learner worksheets on the material of addition and subtraction of integer operations for grade 2 elementary schools. The developed learner worksheets meet the valid and practical criteria. The validity can be seen from the appearance aspect, the suitability of the material with the learning objectives, and the use of language in accordance with the cognitive development of students. Meanwhile, the practicality of the learner worksheets is proven through the results of one-on-one trials and limited trials, where students can complete each stage in the learner worksheets well and give positive responses to the ease of use of the learner worksheets. In addition, the worksheets introduce the Malay culture of Riau through the integration of traditional games in mathematics

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

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learning. It is necessary to make improvements to the variation of writing in the learner worksheet so as not to cause confusion for students, a more consistent and easy-to-understand design will increase the effectiveness of the learner worksheet.

It is necessary to conduct a wider trial involving more students and schools to test the effectiveness of learner worksheets in various learning contexts. further research can develop Malay ethnomathematics-based learner worksheets for other materials to enrich student learning resources. it is necessary to conduct a long-term evaluation to see the impact of using learner worksheets on students' mathematical understanding and appreciation of local culture.

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