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Development of LKPD in the Context of Tabut Culture with a STEAM Approach to Facilitate Numeracy Literacy

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ABSTRACT

Numeracy literacy skills are basic competencies that need to be developed in junior high school (SMP) students in the 21st century. However, mathematics learning in schools has not yet linked the concept of mathematics to the cultural context in daily life. This research aims to develop Student Worksheets (LKPD) in the Context of Tabut Culture with a valid and practical STEAM approach to facilitate students' numeracy literacy. This research uses *the Research and Development* (R&D) method with a 4D development model comprising define, design, and develop stages, while the disseminate stage is not carried out. The research subjects included 31 students and 1 mathematics teacher in grade VII of SMPN 1 Kepahiang. The research instrument consists of validation sheets and questionnaires on the practicality of students and teachers. The study's results showed that the LKPD developed had a validity rate of 87.83% in the very valid category. The results of the practicality test showed that 80.67% of students were in the practical category, and 82.27% of teachers were in the very practical category. These findings show that LKPD, in the context of Ark Culture with a STEAM approach, is suitable as innovative teaching materials to support contextual mathematics learning and improve students' numeracy literacy.

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1. INTRODUCTION

Literacy and numeracy skills of junior high school students are basic competencies that form the foundation of learning in the 21st century; however, Indonesian students' achievement in both areas remains a serious challenge in the national education system [1]. Numeracy literacy is not only about the ability to count but also about applying mathematical concepts in daily life to analyze information, make decisions, and solve problems [2]. However, the results *of the Programme for International Student Assessment* (PISA) 2022 show that the numeracy literacy of Indonesian students remains below the

OECD average, with a score of 366 out of 472 [3]. This condition underscores the need for innovative approaches to mathematics learning to improve students' numeracy literacy.

The Student Worksheet (LKPD) is one of the teaching materials that can be a solution to improve students' numeracy literacy [4]. Based on observations at SMPN 1 Kepahiang, the teaching materials used do not facilitate numeracy literacy but instead focus on understanding procedural concepts. The available LKPD is still general and focuses on practice routine questions rather than linking the material to students' real experiences [5]. LKPD is a teaching material that includes activities and exercises to facilitate and improve students' understanding of the learning materials, designed and developed according to students' conditions and situations [6]. LKPD serves as an efficient teaching tool to guide students' learning process in a structured manner [7]. LKPD is a collection of activity sheets designed to help students engage in real-world activities related to the problem being studied, thereby facilitating learning and fostering more interactive interactions between teachers and students [8]. Therefore, the problem this research addresses is the lack of contextually and innovatively designed mathematics LKPD to facilitate numeracy literacy among junior high school students.

The STEAM (*Science, Technology, Engineering, Arts, Mathematics*) approach is a relevant methodological strategy for developing LKPD that can facilitate students' literacy and numeracy in an integrated manner with the local cultural context [9]. The STEAM approach encompasses scientific, technological, engineering, artistic, and mathematical aspects in integrated learning activities that encourage students to think critically and creatively and to solve everyday problems [10]. With the STEAM approach used in LKPD in the context of Tabut Culture, students will be required to be able to analyze, define, or make a product from the activities contained in the LKPD [11]. The Tabut is a religious and cultural ceremony held annually in the month of Muharram in Bengkulu, featuring various cultural elements, including art, architecture, and mathematics [12], [13]. The majestic structure of the Tabut, with various geometric shapes such as squares, triangles, rectangles, and other three-dimensional shapes, makes the Tabut culture a highly relevant context for learning mathematics, especially geometry, for junior high school students [14], [15]. In the study [16], six mathematical concepts found in the structure of the Ark were identified, including square, measurement, rectangle, confluence, coherence, and reflection.

Several previous studies have discussed the development of LKPD based on numeracy literacy and the STEAM approach [3], [8], [17], as well as exploring ethnomathematics in the culture of the Tabut [14]-[16]. However, these studies still have limitations. Ethnomathematical research on the Tabut culture generally stops at the exploration stage of mathematical concepts. In contrast, STEAM-based LKPD development research has not specifically integrated the Tabut culture as the main context for mathematics learning, focusing instead on numeracy literacy among junior high school students. Based on the identified research gap, this study is a follow-up to the previous research recommendations [16] by developing LKPD within the Tabut culture using a STEAM approach. The novelty of this research lies in the development of LKPD, which makes the Tabut culture the center of mathematics learning activities through the STEAM

approach and is specifically designed to facilitate numeracy literacy among junior high school students in square materials.

The purpose of this study is to develop LKPD in the context of the Tabut culture using a STEAM approach through a 4D development model, test the validity of LKPD through expert assessment, and test its practicality through teacher and student responses during classroom implementation. This research is expected to contribute to the provision of innovative teaching materials that integrate local culture with the STEAM approach.

2. METHOD

This research uses *the Research and Development (*R&D) method, aiming to produce a valid and practical Student Worksheet (LKPD). The development model used is the *four-D* or 4D model developed by Thiagarajan, consisting of four stages of development, namely *define*, *design*, *develop*, and *disseminate* [18], [19]. This model was chosen because it is systematic and suitable for the development of teaching materials such as LKPD. The following are the stages in 4D development research:

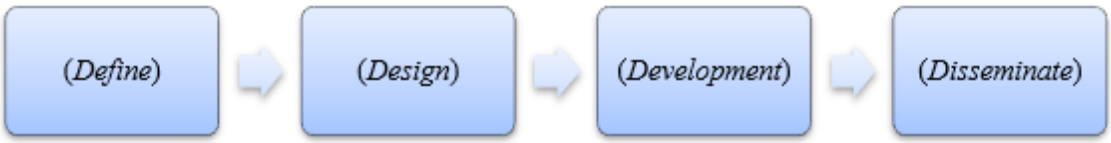


Figure 1. 4D development model by Thiagarajan [20]

This research was carried out until the *development* stage. The Disseminate stage was not carried out because the research focused on testing the validity and practicality of the LKPD developed. The following is a detailed explanation of each stage carried out: The first stage is the *define* stage. It is carried out to determine and analyze learning needs and to collect various information related to the product under development. This stage consists of several steps: namely, initial analysis, student analysis, and concept analysis. The second stage is the *design* stage, which aims to develop the LKPD. Based on initial observations, it was found that innovative product development is needed to support classroom learning. At this stage, starting with preparation, determine the product to be developed: the LKPD in the Context of Tabut Culture with the STEAM Approach.

The third stage is the *development* stage, which is carried out to determine the feasibility of LKPD through a validation process and a practicality test. The assessment is carried out by providing LKPD to validators. The instrument used is in the form of expert validation questionnaire sheets. Validation was conducted to assess the feasibility of LKPD across content, presentation, language, graphic design, display, and application, using a STEAM approach in the context of Tabut culture. Validators are also asked to provide comments and suggestions for improving the columns provided. The validation data were analyzed using [21], [22]:

$$\text{Validity rate (\%)} = \frac{total\ score}{maximum\ score} \times 100\ \%$$

The validity percentage is obtained using this formula, then interpreted against the validity criteria to determine the feasibility of the validated product. Here is a table. 1 Validity percentage criteria:

Table 1. Validity Percentage Criteria

Percentage	Criteria
81% - 100%	Highly Valid
61% - 80%	Valid
41% - 60%	Quite Valid
21% - 40%	Less Valid
0% - 20%	Invalid

The results of the student and teacher response questionnaire to find out the practicality of LKPD with the STEAM approach based on assessments from students and teachers, validation data were analyzed using a formula [21], [22]:

$$\text{Percentage of Practicality (\%)} = \frac{total\ score}{maximum\ score} \times 100\ \%$$

The formula obtains the value of the percentage of practicality, then interprets based on Table 2, as follows:

Table 2. Practicality Percentage Criteria

Percentage	Criteria
81% - 100%	Very Practical
61% - 80%	Practical
41% - 60%	Quite Practical
21% - 40%	Less Practical
0% - 20%	Impractical

3. RESULTS AND DISCUSSION

This research examines the development of LKPD in the context of Tabut Culture, using a STEAM approach through a 4D model. This research begins with the definition stage, which aims to determine the type of product to be developed. Initial data were collected through observation of teaching and learning activities in grade VII at SMPN 1 Kepahiang. Based on the observations, the learning process is still focused on students' understanding of the material concepts. The results of the observation showed that the practice questions students solved mostly focused on training students' understanding of concepts, and the teaching materials used were limited to printed books. During the learning process, the teacher always involves students in discussion by asking questions and asking them to answer in writing or orally. Students also gave good responses during the question-and-answer process. This indicates that students are committed to following the learning process. However, this enthusiasm has not been optimal for developing numeracy literacy skills due to the limited availability of contextual and engaging teaching materials [23].

At the concept analysis stage, the square material was chosen because it was very relevant to the main structure of the product being developed, which is the miniature

Tabut. This square material is closely linked to daily life and local culture, and the Tabut generally resembles a tower with a level arrangement dominated by square shapes. The STEAM approach makes it easier for students to connect the concept of a square flat building to real-life processes, from designing a frame to calculating material needs. The integration of STEAM into mathematics learning has been shown to improve students' conceptual understanding and thinking skills [24]. After the concept analysis stage, the next step is to prepare learning objectives. The learning objectives are that students can identify the geometric shape of the square in the Tabut's structure, can explain and apply the properties of the square in designing the appropriate pattern, and can design and make miniatures systematically using the STEAM approach as a form of cultural preservation.

The second stage, namely the Design stage, based on initial observations, found that developing teaching materials for teachers is needed to support classroom learning. One form of learning innovation that can be developed is LKPD. The LKPD developed is an LKPD in the Context of Tabut Culture with a STEAM approach. The design arrangement of all components of the LKPD made by the researcher is as follows :

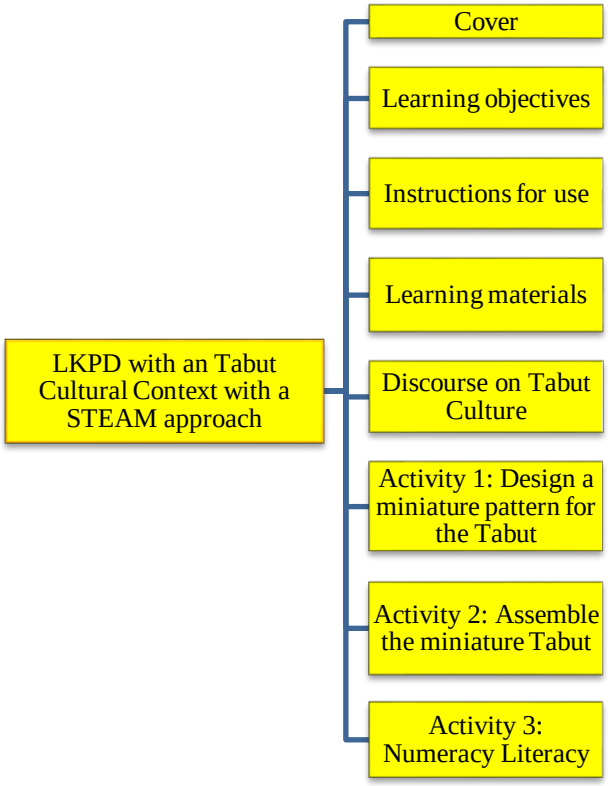


Figure 2. LKPD Design Design

Figure 2 shows the design of all components of the LKPD, arranged in a structured manner for the Square material learning process. The first page of the LKPD; this cover is designed as attractively as possible to display elements of the Arts through the visual design of Tabut culture. The second page contains learning objectives that range from understanding the history of the Ark to designing miniatures systematically. The third page contains instructions for using LKPD so that students can work through it step by step. The fourth page contains learning materials that integrate STEAM elements into project creation. The fifth page presents an informational discourse on the Bengkulu Tabut culture,

incorporating STEAM elements. Pages six and seven contain a guide to project activities, starting with the steps of pattern making and design. In this activity, students integrate *Mathematics* through the calculation of sizes and the creation of proportional square patterns, *Engineering* through the design of stable structures, and *Arts* through the design and coloring of a miniature Tabut. Aspect *Technology* is applied through simple tools such as rulers, scissors, and glue during the manufacturing process. The eighth page is a miniature assembly process in which students apply the principles of Engineering to assemble miniature components into a sturdy, stable structure, and the last page contains numeracy and literacy questions based on the activities they have done. After the STEAM-based LKPD design stage, the next step is to test the LKPD's feasibility through a validation process conducted by validators. After the validation process is complete, a field trial will be conducted to assess how LKPD users respond.

The third stage is the development stage, which is carried out to determine the feasibility of LKPD. This process involves validators to determine their eligibility score. The assessment results, suggestions, and input from the validators are then used as the primary basis for revising and improving the quality of the LKPD. The assessment instrument uses a design validation questionnaire sheet. The LKPD validation activity, using the Tabut Culture STEAM approach to facilitate students' literacy and numeracy, was conducted by two validators who assessed the feasibility of the content, presentation, language, graphics, display, and application. Here is a recapitulation table of the two validators. Below are the results of the design validation presented in the table. 3 The following :

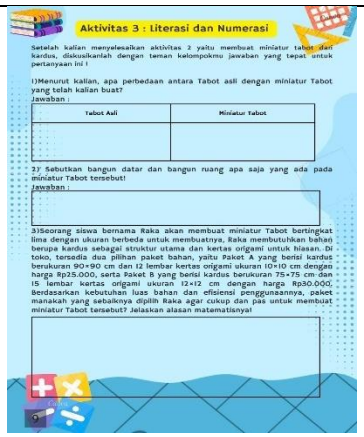
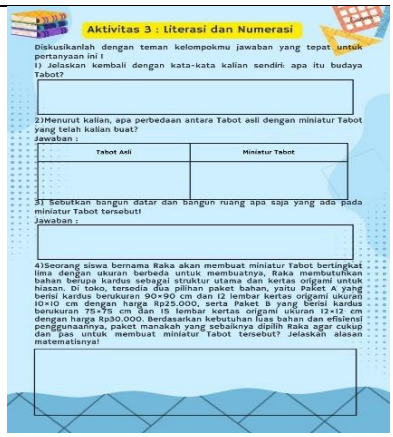
Table 3. Results of the Validation Test on LKPD

No	Validated aspects	Quantity	Maximum Score	Validity Value	Criteria
1	Content eligibility	62	70	88,5 %	Highly Valid
2	Presentation	45	50	90 %	Highly Valid
3	Language	33	40	82,5%	Highly Valid
4	Graphics qualification	44	50	88 %	Highly Valid
5	Display	135	150	90 %	Highly Valid
6	Application	44	50	88 %	Highly Valid
Quantity		363	410	527 %	
Average				87,83 %	Highly Valid

Based on the validation results in Table 3, a score of 362 out of a maximum of 410 was obtained, with a feasibility percentage of 87.83%. The scores obtained from validation by validators, in accordance with the set criteria, indicate that the LKPD is highly valid and feasible for use in the learning process. These results show that the LKPD developed meets quality standards, including language, design, and conformity with the STEAM approach [17]. During the validation process, the researcher received suggestions from the validator indicating a slight improvement. Some of the suggestions and inputs provided by validators include: 1) on the cover this LKPD information has not been presented for the elementary, junior high or high school levels, 2) on the instructions it is necessary to improve minor spelling such as "pray" to pray, so that it is in accordance with KBBI, and information on tools and materials provided by students or researchers has not been

presented. 3) In LKPD, there has been no statement in the form of a request to students to explain again about the culture of the ark. The researcher corrected the LKPD based on the validator's comments. Comparison of product parts before and after revision based on suggestions and feedback from validators.

Table 4. Comparison of LKPD Before and After Revision

No	Comments	Before Revision	After Revision
1.	On the cover, this LKPD information has not been presented for elementary, junior high, or high school levels.		
2.	It is necessary to correct minor spelling errors, such as "pray" to "pray," to ensure they conform to KBBI. Furthermore, the instructions do not include information on the tools and materials provided by students or researchers.		
3.	In LKPD, there has been no request to students to explain the Tabut culture again.		

After the LKPD is corrected based on the validator's suggestions and comments, the next step is to conduct a *field test*. Researchers conducted field trials at SMPN 1 Kepahiang. The subjects of the field trial were 31 children and 1 mathematics teacher. The field trial was conducted in class VII at SMPN 1 Kepahiang. The field trial was carried out 3 times, in the first meeting they were given a brief explanation of the Tabut culture, then given an LKPD in the context of the Tabut culture and there was activity 1, namely designing and coloring, the second meeting of the students continued activity 2, namely assembling miniature arks, and the 3rd meeting students completed activity 3 which contained numeracy literacy questions.

During the field trial, students were able to operate the LKPD systematically, from understanding the instructions for use to following the steps to create a square pattern for the miniature Tabut. This activity sparked students' discussion, especially among those who previously lacked a clear understanding of the material, about how to design each miniature level carefully. After the miniature-making activity was completed, students were given a questionnaire on the practicality of the LKPD they had developed. to evaluate their learning experience. The questionnaire data were then analyzed to gauge students' practicality with LKPD using the STEAM approach. It aims to measure the extent to which integrating Tabut culture and square mathematics concepts can assist students in understanding the material through the real products developed. The following are the results of the student practicality questionnaire presented in the table. 5 Next :

Table 5. Results of Student Practicality Test on LKPD

No	Validated Aspects	Quantity	Max Score	Percentage	Criteria
1	Design	292	372	78,49%	Practical
2	Material	510	620	82,25%	Very Practical
3	Language	504	620	81,29%	Very Practical
Quantity		1306	1612	242,03 %	
Overall average				80,67%	Practical

Based on the table above, the results of the student response questionnaire were obtained. It can be seen that a total score of 1,306 was obtained out of a maximum of 1,612, with the average field-trial result for students at 80.67%. The LKPD compiled by the researcher is then validated by the validator and calculated by the researcher using the existing formula. [25]

Table 6. Results of Teachers' Practicality Test on LKPD

No	Aspects Assessed	Quantity	Max Score	Percentage	Category
	Contents Components	20	24	83,3 %	Very Practical
	Presentation	10	12	83,3 %	Very Practical
	language	3	4	75 %	Praktis
	Graphics	7	8	87,5 %	Very Practical
Quantity		40	48	329,1 %	
Overall average				82,27%	Very Practical

Based on the table. 6 obtained from the results of the teacher's questionnaire, it can be seen that the percentage of results obtained through field trials on students is an average of 82.27%. The practicality test results in the LKPD were obtained from the questionnaire

responses during the *field test.* As already explained, the practicality questionnaire was filled out by one of the mathematics teachers and 31 students. The results of the practicality questionnaire completed by students showed an average of 80.67%. Sedangkan hasil angket yang di isi oleh guru mendapatkan presentase 82,27%. Based on the percentages from two data sources on the questionnaire regarding the practicality of student and teacher responses, the average practicality test score was 91.95%, indicating that the LKPD tested in the classroom is a convenient criterion. The development of LKPD with this STEAM approach can encourage improvements in students' numeracy literacy [26]. The value obtained through field trial activities, in accordance with the criteria that have been set, can be concluded that the LKPD in the Context of Tabut Culture with the STEAM Approach that has been developed is included in the criteria that are very valid and practical and feasible to use, in accordance with the criteria that have been set, namely in the range of 81%-100% it is categorized as very valid and very feasible [27]. Thus, LKPD, in the context of the Ark culture with a STEAM approach, is suitable for classroom use in the learning process.

4. CONCLUSION

This research successfully developed LKPD based on the Tabut culture using a STEAM approach, which has been proven valid and practical in facilitating numeracy literacy among junior high school students. Key findings show that the product meets high-quality standards, with high validity and excellent practicality from the perspectives of teachers and students. The implications of this study confirm that integrating local wisdom into mathematics learning not only strengthens conceptual understanding but also effectively enhances students' numeracy literacy through contextual, meaningful activities. This research has limitations: it is carried out only to the development stage without the dissemination stage; the trial is limited to one school; and the material developed is limited to the square concept. Therefore, further research is recommended to conduct the *dissemination stage* in various schools, develop LKPD for other mathematical concepts in the Tabut culture (measurement, build space, congruence, reflection), conduct experimental research to measure the quantitative impact on numeracy literacy, and explore the integration of other local cultures in Indonesia with the STEAM approach. The contribution of this research to the general public is to provide alternative teaching materials that not only improve students' mathematical competence, but also preserve and introduce the culture of the Bengkulu Tabut to the younger generation, so that mathematics learning becomes a means of cultural preservation as well as the development of numeracy literacy in the modern era.

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