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# DEVELOPMENT OF AKM-ORIENTED GEOMETRY LKPD BASED ON PATI ETHNOMATHEMATICS FOR MTS

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**Abstract**

The low achievement of students' numeracy literacy in geometry topics, coupled with the lack of teaching materials that explicitly integrate cultural contexts with the Minimum Competency Assessment (AKM) framework, is the background to this research. This research aims to produce a geometry Student Worksheet (LKPD) based on Pati's local wisdom ethnomathematics oriented to the AKM framework, and to test its feasibility in terms of validity, practicality, and effectiveness in fostering students' numeracy literacy at MTs Abadiyah Pati. This research uses a Research and Development (R&D) design following the ADDIE model, namely Analysis, Design, Development, Implementation, and Evaluation. The product trial involved 34 eighth-grade students. Data were collected through expert validation sheets, student response questionnaires, and numeracy literacy tests, then processed using descriptive quantitative analysis. The resulting ethnomathematics-based geometry worksheet was declared highly valid by both material and media validators (a score of 4.27 out of 5.00), received a highly practical response from students (85.2%), and was proven effective in improving students' numeracy literacy achievements. This was evidenced by an increase in the average class score from 62.5 to 78.3 and a jump in classical completion from 41.2% to 76.5%. The assessment items in the worksheet were designed contextually by combining AKM components and elements of Pati ethnomathematics, such as traditional house architecture, local culinary packaging, and domestic heritage sites, which successfully guided students in building meaningful mathematical reasoning.

***Keywords: Numeracy Literacy; Ethnomathematics; Geometry; Student Worksheet; Minimum Competency Assessment.***

## INTRODUCTION

The ability to use numbers and mathematical concepts to interpret everyday life situations, commonly known as numeracy literacy, has become a fundamental competency that students must master at every level of education. This competency is not simply arithmetic skills, but requires the ability to interpret data, reason logically, and make decisions based on quantitative information. Various international studies, including the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS), have repeatedly reported that the mathematical literacy achievements of Indonesian students still lag behind the average of other participating countries [1]. In response to this situation, the Ministry of Education, Culture, Research, and Technology introduced the National Assessment (AN) as a replacement for the National Examination, with the Minimum Competency Assessment (AKM) as one of its pillars. AKM is designed to measure students' reading and numeracy literacy competencies, while simultaneously encouraging a shift in learning orientation from mere memorization of facts to mastery of competencies and in-depth conceptual understanding. The characteristic of AKM test stimuli is the use of rich and authentic contexts that demand high-level reasoning.

However, empirical findings in the field still show a contradictory situation. Classroom observations and interviews with eighth-grade mathematics teachers at MTs Abadiyah Pati revealed three crucial issues: first, teaching materials in the form of Student Worksheets (LKPD) oriented to the AKM framework are not yet available for geometry learning; second, the practice questions used so far are still dominated by mechanistic and procedural types and do not train higher-order thinking skills; and third, students experience significant difficulties when faced with contextual problems that require in-depth reasoning. The impact of these problems is clearly evident in the average

1OECD, *PISA 2022 Results: The State of Learning and Equity in Education* , vol. I (Paris: OECD Publishing, 2023).

geometry score of students, which is only 62.5, accompanied by a very low classical completion rate of 41.2%. Geometry was chosen as the focus of development in this research because the material offers a broad scope for formulating stimulus questions oriented to AKM — from calculating the area and perimeter of flat shapes to reading spatial data from real-world phenomena. Geometry learning becomes much more meaningful and easier to understand when bridged through an ethnomathematics approach. Ethnomathematics acts as a bridge between culture and mathematics, connecting abstract geometric concepts with cultural practices, traditional architecture, and domestic products found in the learners' surroundings [2], as demonstrated by the exploration of geometric concepts in the structure of traditional houses. Through ethnomathematics, mathematics is no longer viewed as a rigid and foreign discipline, but rather as an integral part of the wisdom of local communities.

As a learning medium, Student Worksheets (LKPD) have long been proven effective in fostering independent learning. When designed in line with the AKM framework and combined with cultural aspects, LKPD has the potential to provide contextual learning experiences while preparing students for the National Assessment. Several studies on the development of AKM-oriented LKPD have been conducted, such as by Miftah and Setyaningsih [3]who focused on general geometry material for junior high school students, and Putri and Rahayu [4]who developed a numeracy-oriented AKM LKPD on number material, and Cahyono et al. [5]who developed ethnomathematics-based learning media for geometry material at the MTs level. However, based on the literature review conducted, there has not been found the development of AKM-based geometry LKPD that intentionally integrates an ethnomathematics approach based on local wisdom in Pati Regency, especially at the Madrasah Tsanawiyah (MTs) level. This research aims to fill this gap through three main emphases: (1) integrating ethnomathematics concepts sourced from local wisdom of Pati Regency, such as the architectural structure of traditional house roofs, packaging dimensions of traditional Roti Pati culinary products, and the spatial layout of local domestic heritage sites as the main stimulus regarding AKM; (2) combining material on flat shapes and flat-sided spatial shapes into one coherent teaching material; and (3) targeting MTs level students, who culturally need strengthening numeracy literacy based on local religious and societal values.

Based on this background, this study aims to produce a valid, practical, and effective AKM-oriented geometry worksheet using Pati's local wisdom ethnomathematics to foster numeracy literacy in students at MTs Abadiyah Pati. This development process is carried out systematically through five stages of the ADDIE model: Analysis, Design, Development, Implementation, and Evaluation.

## METHOD

This research is classified as Research and Development (R&D) and adopts the ADDIE model. This model was chosen because its stages are sequential and systematic, making it easier for developers to control product quality at each stage. The research was conducted at MTs Abadiyah Pati, Pati Regency, Central Java Province, in the even semester of the 2025/2026 academic year, involving 34 eighth-grade students as test subjects.

In the Analysis stage, researchers explore learning needs, map the curriculum, and examine student characteristics. The Design stage focuses on designing the LKPD framework, determining the AKM question types, and formulating numeracy literacy indicators. The Development stage is the product realization phase, followed by expert validation testing. The Implementation stage is the phase of testing the LKPD on students in class, while the Evaluation stage is used to measure the extent to which the LKPD has succeeded in improving students' numeracy literacy.

### *Validity Analysis Instruments and Techniques*

The validity of the LKPD was tested by two validators—a material expert and a media expert—using a validation sheet that covered five aspects: (1) the suitability of the material to Core Competencies/Basic

2S. Nurkhafifah, NS Pilokol, and P. Megawanti, "Ethnomathematics Exploration of Geometry Concepts in the Structure of the Joglo Semar Tinandhu House," *Himpunan: Scientific Journal of Mathematics Education Students* 1, no. 2 (2021): 92.

3Ridho N. Miftah and R. Setyaningsih, "Development of Student Worksheets Based on Minimum Competency Assessment (AKM) on Geometry Material to Improve Numeracy Literacy Skills," *AKSIOMA: Journal of Mathematics Education Study Program* 11, no. 3 (2022): 2199, https://doi.org/10.24127/ajpm.v11i3.5780.

4RI Putri and S. Rahayu, "Development of AKM Numeracy-Based Student Worksheets on Number Material for Grade VII Junior High School Students," *Journal of Mathematics Education* 14, no. 2 (2023): 178.

5B. Cahyono et al., "Development of E-Comic Learning Media Based on Ethnomathematics and Creative Thinking Skills in MTs Geometry Material," *AKSIOMA: Journal of Mathematics Education Study Program* 12, no. 2 (2023): 2283.

Competencies (KI/KD), (2) suitability to the AKM numeracy context, (3) clarity of presentation of geometry material, (4) accuracy of language and readability, and (5) appearance and design of the LKPD. Each aspect was assessed on a Likert scale of 1–5, and the LKPD was declared valid if the average score reached at least 3.50, or very valid if it reached 4.21 or above. LKPD that did not meet the threshold were revised according to the validator's input until they met the valid criteria.

Referring to Widoyoko [6], the total score of each validator is calculated using the following formula:

$$Va = (\Sigma Vi) / n \ldots (1)$$

Description: Va = total score of each validator; Vi = score of each aspect assessed; n = number of aspects assessed.

The overall average validity of all validators is then calculated using the formula:

$$V = (\Sigma Va) / m \ldots (2)$$

Description: V = average overall validity; Va = total score of each validator; m = number of validators.

***Practical Analysis Instruments and Techniques***

The practicality of LKPD was measured through a response questionnaire filled out by students after learning, consisting of 20 statements covering ease of use, attractiveness of display, clarity of instructions, relevance of questions, and learning motivation. The questionnaire used a Likert scale of 1–4 (Strongly Agree = 4, Agree = 3, Disagree = 2, Strongly Disagree = 1). The percentage of practicality was obtained by comparing the actual score to the maximum score, with the categories: Very Practical (81–100%), Practical (61–80%), Quite Practical (41–60%), and Not Practical (below 40%).

## RESULTS AND DISCUSSION

### 1. Analysis Stage

This stage aims to map the problems before the product is designed, including needs analysis, curriculum analysis, and student characteristics analysis. The needs analysis, conducted through classroom observations and interviews with two mathematics teachers, confirmed that: (a) AKM-oriented LKPDs were not yet available in schools; (b) the learning questions used were still procedural and did not train numeracy literacy; and (c) students had difficulty dealing with contextual questions that required high-level reasoning.

The curriculum analysis examines the Core Competencies and Basic Competencies of grade VIII that are relevant to geometry, specifically plane figures and flat-sided solid figures. The selected materials include the area and perimeter of plane figures (squares, rectangles, triangles, trapezoids) as well as the volume and surface area of flat-sided solid figures (cubes, cuboids, prisms). Meanwhile, the analysis of student characteristics reveals that approximately 65% of students tend to be visual learners, so the LKPD needs to include attractive illustrations, and that students are more motivated when the questions are linked to familiar contexts in their daily lives.

### 2. Design Stage

This stage includes the preparation of a geometry concept map, the formulation of numeracy literacy indicators, the preparation of AKM question grids, the design of the LKPD layout, and the selection of question contexts that are close to students' daily lives. Numeracy literacy indicators refer to the three cognitive domains of AKM: understanding, applying, and reasoning.

The questions were chosen based on their relevance to the daily lives of the Pati community, including calculating the area of rice fields, the need for building materials for traditional houses, and reading mosque floor plans—all aimed at fostering curiosity and fostering learning relevance. Each page of the worksheet contains the activity title, learning objectives, a contextual narrative, a series of questions ranging from understanding to reasoning, and an answer column. The worksheet consists of four activity units, each requiring 45–60 minutes to complete.

### 3. Development Stage

At this stage, the LKPD design developed in the previous stage is realized into a complete printed mathematics teaching material product. This ethnomathematics-based geometry LKPD product consists of four learning activity units, each presenting various types of AKM questions (complex multiple choice, matching, and short essay) built from visual stimuli based on local wisdom of Pati Regency:

6S. Eko Putro Widoyoko, *Assessment of Learning Outcomes in Schools* (Yogyakarta: Pustaka Pelajar, 2014).

- **Unit 1 — Area and Perimeter of Plane Shapes (Context: Pamohan Ajar Site):** This unit presents the material on the area and perimeter of plane shapes (squares, rectangles, triangles, and trapezoids). The ethnomathematics elements used as the stimulus questions are spatial mapping and conservation zoning of the Gunungsari village tourist attraction in Pati Regency. Students are challenged to complete AKM questions that require the ability to read area maps and calculate the estimated area of green zones using the concept of combined plane shapes.
- **Unit 2 — Triangles and Trapeziums (Context: Watu Payon Site):** This unit explores the geometric concepts of triangles and trapeziums. The ethnomathematics stimulus used is the architectural structure of the roof of the Gunungsari community in Pati Regency, in line with the ethnomathematics research on traditional Pati children's games as a medium for learning geometry [7]. Through visual illustrations of traditional roof stone structures, students are guided to discover mathematical relationships between geometric variables and solve AKM reasoning problems.
- **Unit 3 — Volume and Surface Area of Cubes and Cuboids (Context: Starch Bread Packaging):** This unit focuses on the volume and surface area of flat-sided solids in the form of cubes and cuboids, material that was also developed through ethnomathematics-based e-modules in other studies [8]. The integrated ethnomathematics context is the dimensions and design of the packaging box for a regional culinary product, Starch Bread, produced by a local MSME. The AKM questions in this unit present a table of box dimension data and ask students to perform quantitative reasoning regarding the optimal load capacity and efficiency of cardboard use as a packaging material.
- **Unit 4 — Prisms (Context: Bandeng Monument Park):** This unit reviews the topic of prisms. The embedded local wisdom context is the mapping of parks and the architecture of public facilities (such as butterfly breeding areas and miniature water dams) in the Bandeng Monument Park area. Students are given spatial data infographics as a stimulus, then asked to complete data interpretation problems and calculate the volume of prism-shaped objects.

After all units were developed, the LKPD product underwent validation testing by two experts (a material validator and a media validator). Based on the assessment results, an average validity score of 4.27 was obtained out of a maximum score of 5.00, indicating that the product falls into the Very Valid category. Detailed assessment results for each aspect are presented in the following table.

**Table 1. Results of LKPD Validation by Experts**

| No | Assessment Aspects | Validator 1 | Validator 2 | Average |
|---|---|---|---|---|
| 1 | Suitability of material with KI/KD | 4.2 | 4.0 | 4.1 |
| 2 | Suitability to the AKM numeration context | 4.5 | 4.3 | 4.4 |
| 3 | Clarity of presentation of geometry material | 4.0 | 4.2 | 4.1 |
| 4 | Language accuracy and readability | 4.3 | 4.1 | 4.2 |
| 5 | LKPD appearance and design | 4.4 | 4.5 | 4.45 |
| | Overall Average | | | 4.27 |

The appearance and design aspects of the LKPD obtained the highest score, namely 4.45, indicating that the integration of visual images of Pati cultural objects was able to improve the aesthetic quality of the teaching materials. Meanwhile, the aspects of material suitability and clarity of presentation each obtained an average score of 4.1. Because the overall average score (4.27) exceeded the threshold for the very valid category, the LKPD was declared suitable for use at the implementation stage, with several minor improvements based on validator input. Product revisions included: (1) sharpening the visual contrast of the traditional house images in Unit 2; (2) simplifying the narrative text of the Pati Bread stimulus in Unit 3; (3) adding reasoning step instructions in Unit 4; and (4) providing a cultural reflection column at the end of each learning activity unit.

7TP Muslimin and A. Rahim, "Ethnomathematics of Traditional Makassar Children's Games as a Geometry Learning Medium for Elementary School Students," *Pedagogy: Journal of Mathematics Education* 6, no. 1 (2021): 22, https://doi.org/10.30605/pedagogy.v6i1.1195.

8Fawaid, R. Faulina, and D. Ivayana Sari, "Development of Ethnomathematics-Based E-Modules on Flat-Sided Space Structures," *Journal Numeracy* 12, no. 1 (2025): 51.

**4. Implementation Stage**

After going through a revision phase based on validator input, this ethnomathematics-based AKM-oriented geometry worksheet was piloted in a real-life learning situation in eighth-grade students at MTs Abadiyah Pati. Implementation took place over four meetings (4 x 80 minutes) using a cooperative learning model. A total of 34 students were divided into eight heterogeneous groups of 4–5 students.

The learning flow at each meeting is designed so that students first explore local cultural values before entering mathematical abstraction. The activity begins with an apperception by the teacher, followed by listening to a historical narrative or description of objects of local wisdom in Pati (such as the uniqueness of historical sites in Pati) which serves as a stimulus. Students then discuss in groups to complete a series of tiered problems—from conceptual understanding and application to higher-level reasoning typical of the AKM framework. Each meeting concludes with a presentation of the results of group work and reinforcement of concepts (reflection) by the teacher.

Student activities were monitored during the implementation process, and after the entire learning series was completed, students were asked to complete a response questionnaire to measure the practicality of using the LKPD. A summary of the practicality questionnaire results is presented in Table 2.

**Table 2. Results of the LKPD Practicality Test**

| No | Practical Aspects | Score (%) | Category |
|---|---|---|---|
| 1 | Ease of use of LKPD | 86% | Very Practical |
| 2 | Appealing appearance and layout | 84% | Very Practical |
| 3 | Clarity of work instructions | 88% | Very Practical |
| 4 | Relevance of questions to real life | 85% | Very Practical |
| 5 | Student learning motivation | 83% | Very Practical |
| | Overall Average | 85.2% | Very Practical |

Based on Table 2, all practicality aspects recorded a percentage above 80%, placing the developed LKPD in the Very Practical category with an overall average of 85.2%. The highest score was obtained in the clarity of the work instructions (88%), proving that the integration of structured steps in the LKPD was able to guide students to solve AKM reasoning problems independently. Meanwhile, the aspect of student learning motivation obtained a score of 83%, indicating that the presence of the Pati cultural context that is close to their daily lives is able to spark students' emotional and intellectual interest during mathematics learning, in line with the finding that ethnomathematics in geometry learning can improve students' motivation and critical thinking skills [9].

**5. Evaluation Stage**

The evaluation phase aims to analyze the effectiveness of the developed LKPD in developing students' numeracy literacy skills. This effectiveness is measured using a numeracy literacy test instrument consisting of a pretest (before using the LKPD) and a posttest (after using the LKPD). The test consists of 20 questions designed according to the AKM cognitive standards, covering the domains of understanding (5 items), application (8 items), and reasoning (7 items). The question formats are presented in various forms — complex multiple choice, matching, and short essays — with an individual Minimum Completion Criteria (KKM) of 72.

Comparison of students' numeracy literacy performance before and after this ethnomathematics-based learning intervention is summarized in Table 3.

**Table 3. Comparison of Numeracy Literacy Test Results Before and After LKPD Implementation**

| No | Indicator | Pre-cycle | Post-trial | Improvement | N-Gain | Category |
|---|---|---|---|---|---|---|
| 1 | Average Class Grade | 62.5 | 78.3 | +15.8 | 0.42 | Currently |
| 2 | Classical Completion | 41.2% | 76.5% | +35.3% | 0.60 | Currently |
| 3 | Contextual Understanding Ability | 55.0 | 79.4 | +24.4 | 0.54 | Currently |
| 4 | Quantitative Reasoning Ability | 58.0 | 77.8 | +19.8 | 0.47 | Currently |
| 5 | Data Representation Capabilities | 60.0 | 80.1 | +20.1 | 0.50 | Currently |

9N. Zahar, "Ethnomathematics in Geometry Learning to Improve Students' Motivation and Critical Thinking Skills," *Journal of Mathematics Education* 7, no. 2 (2021): 137.

The data in Table 3 confirms a significant jump in numeracy performance across all indicators. The average class score increased from 62.5 to 78.3 (+15.8 points), while the percentage of classical completion jumped sharply from 41.2% to 76.5% (+35.3%). The sharpest increase was seen in the contextual understanding aspect, which increased by 24.4 points. These quantitative findings indicate that the link between abstract geometry material and the concrete realities of Pati's local culture in the Student Worksheet successfully helped students deconstruct and master mathematical concepts.

To strengthen the evidence of this improvement, the Normalized Gain (N-Gain) score was calculated using Hake's formula [10]: N-Gain = (post score - pre score) / (maximum score - pre score). As presented in Table 3, the overall N-Gain for the average class score was 0.42, which falls into the medium category ($0.3 \leq g < 0.7$). This medium category improvement was consistent across all indicators, ranging from 0.42 to 0.60, confirming that the ethnomathematics-based LKPD contributed significantly to improving students' numeracy literacy, although there is still room for further optimization to achieve the high category ($g \geq 0.7$).

## DISCUSSION

The main findings of this development research confirm that the AKM-oriented geometry LKPD product developed through the Pati local wisdom ethnomathematics approach has successfully fulfilled the three pillars of learning instrument feasibility, namely validity, practicality, and effectiveness. The success of this product is in line with the theoretical elaboration and empirical research findings of Septiana et al. [11], which stated that LKPD developed by integrating AKM-based contextual questions has strong potential to improve students' numeracy literacy skills.

The high product validity achievement (4.27 on a scale of 5.00) indicates a coherent alignment between the material on flat shapes and flat-sided spatial shapes with national assessment indicators. The highest assessment from experts on the visual and design aspects (4.45) confirms that the visualization of various cultural elements of Pati, such as the Pamohan Ajar site, Watu Payon, and Tugu Bandeng Park, is presented in a representative and attractive manner for MTs-aged students. This strengthens the relevance of Jean Piaget's cognitive development theory, which states that children aged 12–15 years (middle school level) are in a transition period towards the formal operational stage, so the presence of concrete, environment-based visualizations is crucial to guide their understanding of abstract geometric spatial structures, in line with the finding that the ethnomathematics approach can improve students' geometric thinking skills [12].

In terms of practicality, a score of 85.2% indicates an excellent level of readability and ease of operation of the worksheet when applied to group dynamics in the classroom. The high score on the aspect of clarity of work instructions (88%) confirms that the critical thinking stimulation provided does not confuse students. This strengthens the findings of Widyaningrum and Hasanudin [13], who stated that providing structured scaffolding guidance in geometry teaching materials is very effective in reducing students' mathematical anxiety when solving Higher Order Thinking Skills (HOTS) reasoning problems.

The effectiveness of this LKPD instrument is most evident in the surge in classical completion from 41.2% to 76.5%. The highest increases in the contextual understanding indicator (+24.4) and the cultural data representation indicator (+20.1) validate the important role of ethnomathematics. The integration of local content, such as mapping the dimensions of Roti Pati packaging boxes or calculating the slope of the Watu Payon roof, has proven capable of breaking down the barriers between theoretical mathematics in schools and practical mathematics in society. This contextualization process aligns with the direction of Pusmenjar [14]and Putri and Rahayu [15], who emphasized the need to design stimulus questions that are close to the ecosystem of students' lives to sharpen their mathematical reasoning in facing the challenges of the 21st century.

10Richard R. Hake, "Interactive-Engagement versus Traditional Methods: A Six-Thousand-Student Survey of Mechanics Test Data for Introductory Physics Courses," *American Journal of Physics* 66, no. 1 (1998): 64.
11N. Septiana, W. Hidayat, and EE Rohaeti, "Development of AKM-Based Student Worksheets to Improve Junior High School Students' Mathematical Literacy Skills," *JPMI (Journal of Innovative Mathematics Learning)* 5, no. 3 (2022): 641.
12R. Fitriza, E. Desmaniati, and HF Kudus, "Geometric Thinking Skills of Grade IX Students in Learning with an Ethnomathematics Approach," *AXIOM: Journal of Education and Mathematics* 11, no. 2 (2022): 107.
13R. Widyaningrum and C. Hasanudin, "The Effectiveness of Structured Scaffolding-Based Student Worksheets in Improving Higher-Order Thinking Skills in Geometry Material," *Journal of Elementary Education Didactics* 6, no. 2 (2022): 489.
14Assessment and Learning Center (Pusmenjar), *AKM and its Implications for Learning* (Jakarta: Kemendikbudristek, 2021).
15Putri and Rahayu, "Development of LKPD Based on AKM Numeracy," 185.

This finding is consistent with the research results of Widiantari, Suparta, and Sariyasa [16], which show that teaching materials containing ethnomathematics are effective in improving students' numeracy literacy, while also confirming that the integration of local culture into mathematics teaching materials is not merely a decorative element, but a pedagogical strategy that contributes significantly to numeracy achievement.

Despite the positive results, this study still has several limitations that require caution in generalizing the findings. The product experiment and trial only targeted one class in one school (MTs Abadiyah Pati) with a relatively limited implementation period (four meetings). Furthermore, the post-trial classical completion rate (76.5%) did not reach the ideal target of 80%, indicating that the highly complex reasoning material segment still requires refinement of the guidance design in the next stage of the LKPD revision. This study also relied on N-Gain analysis at the class average level, rather than inferential statistics at the individual level (e.g., paired t-tests), because individual raw score data had been aggregated during the implementation stage. Future research is recommended to store and analyze individual student data to enable inferential statistical testing.

## CONCLUSION

This development research produces AKM-oriented geometry worksheets through Pati's local wisdom ethnomathematics that fulfill three pillars of teaching material feasibility at once: highly valid (expert score 4.27 out of 5.00), highly practical (student response 85.2%), and effective in fostering students' numeracy literacy, as indicated by the increase in the average class score from 62.5 to 78.3 and the jump in classical completion from 41.2% to 76.5%. The main novelty of this product lies in the integration of distinctive Pati local wisdom elements — Watu Payon roof architecture, Roti Pati culinary packaging, and Pamohan Ajar and Taman Tugu Bandeng — as authentic stimuli for AKM questions in geometry material, a combination that has not been found in similar LKPD development research for MTs level.

For further research and utilization, mathematics teachers at MTs Abadiyah PAti and similar madrasahs are advised to use this LKPD as supplementary teaching material in bridging the understanding of formal geometry while preparing students for the National Assessment. Further researchers are advised to expand the scope of the material, enlarge and increase the number of trial subjects outside of one class, and extend the implementation duration so that the effectiveness of the product can be generalized more convincingly; converting this printed LKPD to an interactive digital form (E-LKPD) is also worth considering to expand its accessibility. Considering that the AKM framework also tests reading literacy, further development can deepen the integration of reading literacy with cultural texts so that students' ability to understand mathematical text stimuli becomes more comprehensive.

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