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Development of Mathematics Learning Tools Based on the *Discovery Learning Model* with the RME Approach Containing Mathematical Literacy

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Abstrak

Kemampuan literasi matematika siswa Indonesia dikategorikan rendah berdasarkan hasil tes PISA 2022. Hal ini dapat ditingkatkan dengan memberikan pembelajaran berbasis literasi matematika kepada siswa. Penelitian sebelumnya menunjukkan bahwa mayoritas pendidik sudah familiar dengan literasi matematika, tetapi belum mampu merancang pembelajaran yang mencakup literasi matematika. Berdasarkan kondisi tersebut, dikembangkan perangkat pembelajaran berbasis literasi matematika untuk mendukung peningkatan kemampuan literasi matematika siswa. Tiga perangkat pembelajaran dikembangkan: modul ajar, lembar kerja siswa, dan soal-soal literasi matematika sumatif. Ketiga perangkat pembelajaran ini dikembangkan menggunakan metode RND dan model 4D. Berdasarkan uji validitas oleh dua orang ahli menggunakan V-Aiken, diperoleh hasil 0,97 untuk modul ajar, 0,93 untuk lembar kerja siswa, dan 0,95 untuk soal tes literasi matematika sumatif yang semuanya dinyatakan sangat valid. Sementara itu, berdasarkan uji praktikalitas, diperoleh skor rata-rata 95% untuk modul ajar, 95% untuk lembar kerja siswa, dan 94% untuk soal tes literasi matematika sumatif. Ketiganya dinyatakan sangat praktis. Karena perangkat pembelajaran telah dinyatakan sangat valid dan sangat praktis, perangkat pembelajaran yang dikembangkan dapat diimplementasikan dalam proses pembelajaran.

Abstract

Indonesian students' mathematical literacy skills were categorized as low based on the results of the 2022 PISA test. This can be improved by providing students with mathematical literacy-based learning. Previous studies have shown that the majority of educators are familiar with mathematical literacy, but are unable to design learning that includes mathematical literacy. Based on this condition, a mathematical literacy-based learning tool was developed to support the improvement of students' mathematical literacy skills. Three learning tools were developed: a teaching module, a worksheet, and summative mathematical literacy questions. These three learning tools were developed using the RND method and the 4D model. Based on validity testing by two experts using V-Aiken, the results were 0.97 for the teaching module, 0.93 for the worksheet, and 0.95 for the summative mathematical literacy test questions, all of which were declared very valid. Meanwhile, based on the practicality test, an average score of 95% was obtained for the teaching module, 95% for the student worksheet, and 94% for the summative mathematical literacy test questions. All three were declared highly practical. Because the learning tools have been declared highly valid and highly practical, the learning tools developed can be implemented in the learning process.

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Introduction

Mathematical literacy skills are highly emphasized in education. This is because mathematical literacy skills can provide various benefits to improve the quality of human resources. One benefit of mathematical literacy skills is that they help someone develop a good understanding of problems (Kurniawan & Djidu, 2021) . Furthermore, Kurniawan & Djidu (2021) also explain that mathematical literacy skills can help someone develop mathematical ideas and concepts. This knowledge development can help someone solve problems in a more structured way (Kurniawan & Djidu, 2021) . Wardono & Masjaya (2018) also explain that mathematical literacy skills are useful for connecting mathematical concepts to life contexts, a process also known as mathematical connections. With mathematical literacy skills, someone can conduct in-depth analysis of issues or data in everyday life. This process can require someone to develop *critical thinking* and *creative thinking skills* in solving existing problems. Through these abilities, it can support efforts to create higher-quality human resources.

Beyond the various benefits outlined above, Indonesia should place greater emphasis on developing students' mathematical literacy skills. The 2022 PISA results show that Indonesia's mathematical literacy score has decreased by 13 points. This decline is certainly not better than the PISA results for the mathematical literacy category in 2018 (*Pisa 2022 and Learning Recovery in Indonesia 5* , 2023) . Judging from its ranking, Indonesia ranked 70th out of 81 countries in the mathematical literacy category (*Pisa 2022 and Learning Recovery in Indonesia 5* , 2023) . When compared with the mathematical literacy scores of various countries worldwide, Indonesia is still classified as one of the 15 countries with low conditions in the aspect of mathematical literacy skills. Furthermore, the 2022 PISA scores also found that the creative thinking performance of Indonesian students is still categorized as low due to their mathematical performance being below the OECD average (OECD, 2024) . However, solving problems and improving mathematical literacy skills requires students' creative and mathematical performance. This situation does not yet categorize Indonesia as a country with human resources with good mathematical literacy skills. The explanation above concludes that students are not reaping the various benefits of mathematical literacy skills due to their low mathematical literacy skills.

Regarding the article written by Pulungan, Delyanti Azzumarito; Herosian, Mila Yulia; Harahap (2023) , the majority of educators already know about mathematical literacy, but still experience many difficulties in the implementation process. Some of these difficulties include difficulties in incorporating mathematical literacy into learning designs, difficulties in the availability of teaching materials, difficulties in guiding students to find the context of the discussion, and difficulties in the evaluation process (Pulungan, Delyanti Azzumarito; Herosian, Mila Yulia; Harahap, 2023) . If educators still experience difficulties in the learning process, it will be difficult to direct students to learning containing mathematical literacy. In fact, this ability is highly emphasized in

efforts to improve students' mathematical literacy skills (Abdillah et al., 2022) . Through an immature learning planning process, educators will also experience difficulties in determining the right techniques in learning containing mathematical literacy. Meanwhile, in improving mathematical literacy skills, educators are required to implement techniques that are appropriate for students (Abdillah et al., 2022) . The readiness of educators in providing learning containing mathematical literacy is highly emphasized as an effort to improve students' abilities in the aspect of mathematical literacy.

Based on the issues regarding mathematical literacy and the importance of educators' readiness in providing learning containing mathematical literacy, it is important to develop learning tools as a reference in providing learning containing mathematical literacy for students. However, from the description above, it can be concluded that educators still have difficulty in creating learning tools or lesson plans containing mathematical literacy. In an effort to minimize educators' difficulties in preparing learning tools containing mathematical literacy, researchers took the initiative to develop learning tools to support the mathematical literacy skills of grade VIII SMP/MTs in statistics material. Grade VIII was chosen as the research subject because it meets the criteria for students who are the subject of the PISA assessment. The OECD as the institution that organizes PISA provides international assessments to students aged 15 years and still in junior high school (Siregar, 2023) . Siregar (2023) also explains that students' mathematical literacy is one of several aspects assessed by PISA.

The reason for choosing statistics as a chapter in the development of learning tools is because statistics is included in the PISA questions tested on students. There are four types of content included in the PISA questions: shape and space , change and relationships , quantity , and uncertainty and data (Junika et al., 2020) . In this case, statistics includes uncertainty and data content that involves uncertainty and data that exist in life. Furthermore, statistics is also related to other branches of science and is widely applied to assist human work. N (2019) explains that statistics is related to natural sciences, business, economics, industry, and several other branches of science. Furthermore, statistics also plays a vital role in the development of technological science and assists in *polling calculations* or *quick counts.* (N, 2019) . Based on this description, the needs of students in the learning process are in line with the selection of subjects and materials in the learning tools being developed.

The learning tools developed include teaching modules, student worksheets (LKPD), and summative mathematical literacy exam questions. The developed learning tools can support educators in overcoming difficulties encountered in the implementation of mathematical literacy-based learning. Through the provided teaching modules, educators can provide more focused mathematics learning containing mathematical literacy. The developed LKPD can also serve as teaching materials that help educators connect mathematical concepts to real-life contexts. Meanwhile, the summative

mathematical literacy exam questions can help educators assess students' mathematical literacy abilities. Through the summative mathematical literacy exam scores obtained, educators can also conduct more focused learning evaluations.

In developing various learning tools, the *discovery learning model is used* as a reference in developing learning plans. The *discovery learning model* is considered effective in improving students' abilities in the aspect of mathematical literacy. Pernandes & Asmara (2020) explained in their research that the implementation of the *discovery learning model* is also more effective in supporting the improvement of students' mathematical literacy skills compared to conventional learning models. The effectiveness of improving mathematical literacy skills through the *discovery learning model* is also emphasized by Kusumadewi et al., (2019) entitled "The Effectiveness of the *Discovery Learning Model* on Mathematical Literacy Skills in Elementary Schools". It is hoped that the use of the *discovery learning model* in developing learning tools can help improve students' mathematical literacy skills well.

In addition to the *discovery learning model* , the development of learning tools also uses the RME (*Realistic Mathematics Education) approach.* Learning mathematics using the RME approach makes it easier for students to understand the material through the involvement of concrete or imaginable objects (Astuti, 2018) . There are previous studies that prove the effectiveness of the RME approach in supporting the improvement of students' mathematical literacy skills. Some of them are Komala & Erma Monariska (2023) who explained that the RME approach has a positive impact on improving students' mathematical literacy skills compared to the scientific approach. In addition, there is also research by Listi et al. (2024) who found that mathematical literacy skills improved well when using the RME approach compared to the direct approach. Based on these two studies, it is proven that the RME approach can be used as an option in the development of learning tools with the aim of improving students' mathematical literacy skills.

There is previous research on the development of mathematics learning tools to develop students' mathematical literacy skills. Some of these include research by (Hidayat et al., 2021) . Hidayat et al. (2021) have developed learning tools to support the improvement of mathematical literacy skills in the form of a syllabus, lesson plans, and student worksheets. There are several differences between the learning tools developed by (Hidayat et al., 2021) and this research. In this study, the researchers not only developed lesson plans or teaching modules and student worksheets, but also developed summative mathematical literacy test questions to determine students' mathematical literacy skills after implementing mathematical literacy-based learning. Furthermore, there is research by Lestari et al. (2023) which developed a fairly comprehensive learning tool, which includes lesson plans, teaching materials, media, student worksheets, and mathematical literacy questions. However, the research conducted by (Lestari et al., 2023) only focused on the elementary school level, while the development of the learning tools developed by the researchers focused on the

junior high school/Islamic junior high school level. Regarding the use of learning models and approaches, there is research by Sitorus et al. (2021) which also developed learning tools using the *discovery learning model* and the RME approach in mathematics learning, but this study did not include mathematical literacy. In this study, in addition to developing learning tools, mathematical literacy content was also provided to improve students' mathematical literacy skills. Researchers have not found any research that develops learning tools containing mathematical literacy using the *discovery learning model* and the RME approach. Several previous studies only used one of these models and approaches in developing learning tools containing mathematical literacy, not both. In this study, both models and approaches were used. It is hoped that the novelty in this research will have a positive impact on the learning process in schools, particularly related to mathematical literacy.

Method

This study uses the *Research and Development* (RnD) method. The model used in this study is the 4D model consisting of four steps, including *Define, Design, Develop, Dissaminate* . However, this study only reached the *develop stage* . In the *Define stage* , a needs analysis was conducted in mathematics learning, particularly in improving students' mathematical literacy skills. This stage was carried out through previous research literature. Problems found in the *define stage* were then analyzed and their solutions formulated in the form of learning tools. The second stage is the *design stage.* At this stage, learning tools are designed that are needed in mathematics learning based on the problems found in the previous stage. The third stage is the *development stage* . The core of this section is the development of a complete and integrated learning tool that is in line with the design in the previous section. In this section, validity testing was also conducted by experts after the entire development process was carried out. There were two experts who provided an assessment of the developed learning tools. The following is the V-Aiken formula used to measure the validity of learning tools (Retnowati, 2016) :

$$V = \frac{\sum s}{N\,(c-1)}$$

Information:

V : Expert agreement index

S : R – Lo

R : Expert assessment score

Lo : Lowest Validity Score

C : Highest validity score

N : Number of experts/validators

After calculating the level of validity using the V-Aiken formula, the validity measure is then determined using the following criteria (Retnowati, 2016) :

Table 1. Validity Criteria for Learning Tools

Aiken Index (V)	Criteria
V > 0.8	Very Valid
0.4 < V ≤0.8	Quite Valid
V ≤0.4	Less Valid

After being declared valid by experts, the next step was a practicality test conducted by several mathematics teachers in Kudus. The following are criteria for measuring the practicality of the learning device (Sugiyono, 2018) :

Table 2. Practicality Criteria for Learning Tools

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

Results and Discussion

Result

There are three stages carried out to develop this mathematical literacy-based learning tool, including *define, design,* and *develop. In the define* stage , an analysis of student needs and the mathematics learning process is carried out, especially in the aspect of mathematical literacy. This needs analysis was obtained through literature in previous studies on students' mathematical literacy abilities. From the process of searching various literature, several facts were obtained, including the PISA mathematical literacy score in 2022 showing that Indonesia experienced a decline in scores of up to 13 points and placed it in position 70 out of 81 countries (*Pisa 2022 And Learning Recovery In Indonesia 5* , 2023) . In addition, Pulungan, Delyanti Azzumarito; Herosian, Mila Yulia; Harahap (2023) also emphasized that most educators are already aware of mathematical literacy, but still experience difficulties in designing learning tools and lesson plans used in the implementation process. Some of the difficulties experienced by educators include difficulties in designing learning plans used in the implementation process, difficulties in designing teaching materials used as one of the infrastructure in the learning process, and difficulties in designing the evaluation process after the learning is implemented (Pulungan, Delyanti Azzumarito; Herosian, Mila Yulia; Harahap, 2023) . The unpreparedness of educators in providing mathematical literacy-based learning actually makes it even more difficult for educators to provide learning containing mathematical literacy by prioritizing harmony between learning techniques and the characteristics and needs of students (Abdillah et al.,

2022) .

After the definition stage, the researcher entered the design stage . The design process was carried out on the three learning tools to be developed: the teaching module, the student worksheet (LKPD), and summative mathematical literacy questions. This process was also carried out based on the problems identified by the researcher in the *define stage.* The first learning tool to be designed was the teaching module. The first step in designing this teaching module began with determining the learning outcomes and objectives. The following are the learning outcomes used as guidelines for developing the learning tools:

1. Students can determine and interpret the mean, median, and mode of data to solve problems.
2. Students can analyze data from many objects and measurement data in the form of pictures, pictograms, bar charts, and frequency tables to obtain information.

From these two learning achievements, the following learning objectives were then developed:

1. Students can state the measure of data central tendency, namely a value that represents data, according to the situation (mean, median, or mode).
2. Students are able to analyze data in the form of frequency tables.
3. Students can analyze data on many objects and measurement results.

After that, we proceeded to determine the learning model, approach, and method. In this case, we used the *discovery learning model* , *the Realistic Mathematics Education* (RME) approach, and demonstration, lecture, and several other methods. Once all components were determined, the next step was to design activities that aligned with the various components.

The design stage is also carried out on the LKPD learning tools. Before developing the LKPD, a search for the steps in *discovery learning is conducted.* This is done to ensure that the material delivery in the LKPD aligns with the model and approach in the teaching module. After understanding the steps in *discovery learning* , the next step is to determine the problem context as a stimulus before the core learning activities are implemented. The problems involved are concrete contexts to accommodate the realistic aspects of RME. The problems or stimuli provided are used as a reference in determining each step written in the LKPD.

The final learning tool that also went through the design stage was the summative mathematical literacy questions. The process of developing summative mathematical literacy questions began with determining content that aligns with the learning outcomes in the question development. Once the content was determined, the next step was to create a question outline, which was then developed into summative mathematical literacy questions. Five questions were developed and given to students to measure mathematical literacy skills in statistics. The five questions were presented in a mixed format, namely multiple choice and descriptive. The question development was also based on the RME approach, which involves everyday life phenomena and is imaginable for students.

After the design of the teaching module, LKPD, and summative mathematical literacy exam

questions was completed, the next stage was development . From *the design stage,* the learning tools were then developed in a complete and integrated manner. The first learning tool to be developed was the teaching module. The teaching module, which had defined learning outcomes, objectives, models, approaches, and methods, was then compiled into a design that aligned with the existing components. Two teaching modules were developed, covering material on data centralization measures and data presentation. The following are the teaching modules that have been developed:

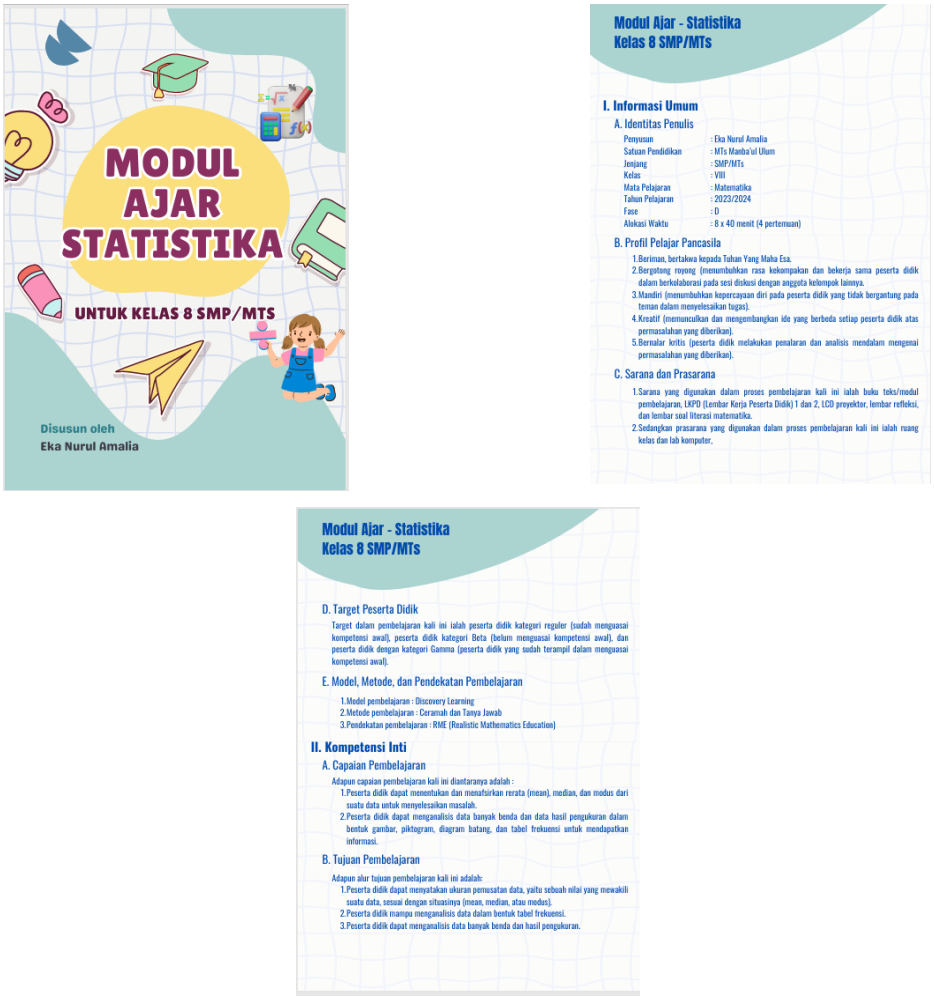

Figure 1. Data Centralization Measurement Teaching Module

The second development was carried out on the Student Worksheet (LKPD) learning tool. LKPD development was based on the learning design that had been prepared in the teaching module. The LKPD consisted of two materials: data centralization and data presentation. The material delivery steps used in the LKPD were aligned with the *discovery learning model* , namely providing stimulus, problem identification, data collection, data processing, verification, and generalization. The following is the LKPD design that has been developed:

Figure 2. LKPD Statistics Material

The third development is summative mathematical literacy questions. Summative mathematical literacy questions are developed based on a pre-designed question grid. This grid is developed based on learning objectives and mathematical literacy indicators, which are then translated into question indicators. The following are the question indicators used in developing summative mathematical literacy exam questions:

1. Students can use their ability to state the measure of central tendency of data to solve problems.
2. Students can analyze data in the form of bar charts regarding cases of *bullying* to evaluate the solutions offered to the problem.
3. Students can formulate problems and use analysis related to the presentation of data obtained in the form of frequency tables to solve problems.
4. Students can analyze data from many objects and measurement results to find solutions and interpret solutions in problem solving.
5. Students can analyze and use data presentation in the form of frequency tables to solve problems.

These question indicators were then used as a reference in developing summative mathematical literacy exam questions. Five mathematical literacy questions were developed based on the grid. Here are some of the mathematical literacy questions that were developed:

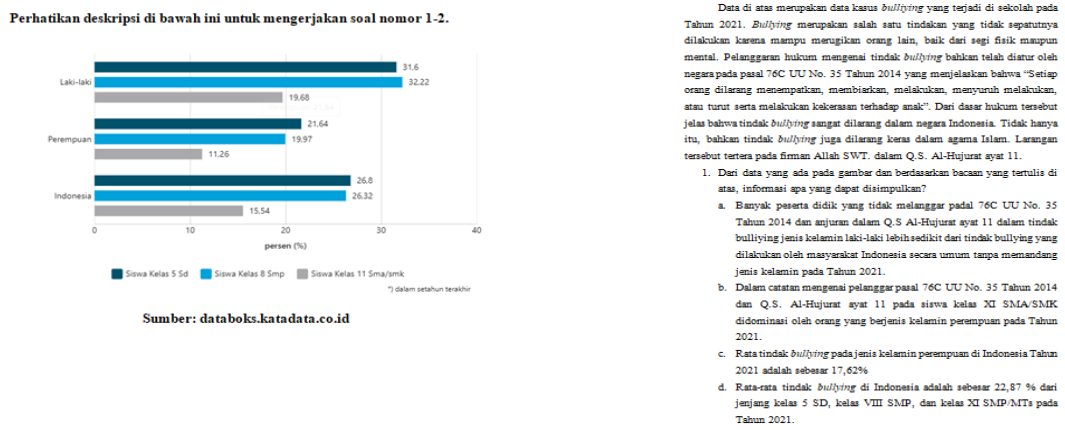

Figure 3. Question No. 1 Summative Mathematical Literacy

After all learning tools were developed, at this stage, testing was also carried out on the level of validity and practicality of the learning tools. Each test was carried out on each learning tool. The validation process was carried out by two experts using a validity questionnaire. There were several aspects assessed by the experts in this teaching module learning tool, including the aspect of content suitability (in the form of identity, core components, completeness of attachments, clarity and systematic sequence of activities, as well as the alignment of the models, approaches, and methods used), the aspect of content suitability with the *discovery learning model,* and linguistic aspects. Through these trials, the validity score data for the teaching module was obtained as follows:

Table 3. Validation of Teaching Modules

Item	Aspect	Validator Score 1	Validator Score 2	Average V Validator
1	Content Eligibility	5	5	0.958333
2		5	5	
3		5	5	
4		5	5	
5		5	5	
6		4	4	
7	Content Suitability with the *Discovery Learning Model*	5	5	1
8		5	5	
9		5	5	
10		5	5	
11		5	5	
12		5	5	
13	Linguistics	5	4	0.9375
14		5	5	
Overall V Average				**0.965278**

From Table 3 above, it can be seen that the expert validation score for the teaching module learning device is 0.97. Based on Table 1, it can be concluded that this score can be categorized as very valid.

In addition to the teaching modules, the LKPD learning tools were also subjected to validity testing. Similar to the teaching modules, the LKPD also involved two experts in assessing the level of validity. The experts assessed several aspects of the LKPD learning tools, including content suitability, suitability to the *discovery learning model,* language, presentation, and ease of use and usefulness. The following are the validation scores obtained after the LKPD learning tools validity test:

Table 4. Validation of LKPD Learning Tools

Item	Aspect	Validator Score 1	Validator Score 2	Average V Validator
1	Content Eligibility	5	5	0.9375
2		5	5	
3		5	4	
4		5	4	
5	Content Suitability with the *Discovery Learning Model*	5	4	0.979167
6		5	5	
7		5	5	
8		5	5	
9		5	5	
10		5	5	
11	Linguistics	5	4	0.9375
12		5	5	
13	Presentation	5	4	0.958333
14		5	5	
15		5	5	
16	Convenience and Benefits	4	4	0.833333
17		4	5	
18		4	5	
Overall V Average				**0.929167**

From Table 4. above, it can be seen that the expert validation score on the LKPD learning device is 0.93. From Table 1. it can be explained that a score of 0.93 can be categorized as very valid.

The final learning tool that also underwent validity testing was the summative mathematical literacy test. Several aspects were assessed by experts in the learning tool for the mathematical literacy test, including its conformity to mathematical literacy indicators, conformity to the competency criteria (CP) and competency criteria (TP), conformity to the question indicators, language, presentation, work instructions, and scoring guidelines. The following are the validation

scores obtained for the summative literacy test:

Table 5. Validation of Summative Mathematical Literacy Learning Tools

Aspect	Validator Score 1	Validator Score 2	V
Compliance with Mathematical Literacy Indicators	5	4	0.875
Compliance with CP and TP	5	5	1
Compliance with Question Indicators	5	4	0.875
Compliance with Grade Level	4	5	0.875
Use of Question or Command Words	5	5	1
Work Instructions	5	5	1
Scoring Guidelines	5	5	1
Presentation of Tables, Graphs, and Images	5	5	1
Use of Communicative and Easy-to-Understand Language	5	4	0.875
Use of Standard Language Rules and No Offensive to SARA	5	5	1
Use of words that do not give rise to multiple interpretations	5	5	1
Average V			**0.954545**

Based on Table 5. above, it can be seen that the expert validation score on the summative mathematical literacy learning tool is 0.95. From Table 1. It can be concluded that a score of 0.95 can be categorized as very valid.

After all learning devices were declared valid by experts, the next step was to test the practicality of each of the developed learning devices. The practicality test was conducted by junior high school/Islamic junior high school teachers in Kudus, consisting of two teachers from different institutions, namely Mrs. Muryanti, S.Pd. as a mathematics teacher at MTs Manba'ul Ulum Kudus and Mrs. Putri Nabila Masduki, S.Pd. as a mathematics teacher at SMP IT Al-Islam Kudus. The aspects assessed in the practicality test of the teaching module were the completeness of the components in the teaching module, the possibility of the learning design if applied to students, the suitability of the learning design to the needs of students, the suitability of the learning design to the facilities and infrastructure, the meaningfulness of the learning, and linguistic aspects. The following are the scores for the practicality test of the teaching module obtained:

Table 6. Practicality Test of Teaching Modules

Assessor	Score
Assessor 1	38
Assessor 2	38
Total	76
Average	$\frac{38+38}{2} = \frac{76}{2} = 38$
Percentage	$\frac{Skor\ yang\ didapat}{Skor\ maksimal} \times 100\% = \frac{38}{40} \times 100\% = 0.95 \times 100\% = 95\%$

Table 6 explains that the average percentage score for the practicality test of the teaching module is 95%. Based on Table 2, the 95% score is in the 81% - 100% interval, which can be categorized as very practical.

In addition to the teaching modules, a practicality test was also conducted on the LKPD learning tools. The aspects assessed in this LKPD practicality test were students' ease of understanding the material using the language and steps provided, the presentation's impact on student learning motivation, and its usefulness for learning. The following are the LKPD practicality test scores conducted by two experts:

Table 7. LKPD Practicality Test

Assessor	Score
Assessor 1	43
Assessor 2	43
Total	86
Average	$\frac{43+43}{2}=\frac{86}{2}=43$
Percentage	$\frac{Skor\ yang\ didapat}{Skor\ maksimal} \times 100\% = \frac{43}{45} \times 100\% = 0.95 \times 100\% = 95\%$

As explained in Table 7, the average practicality score for the teaching module is 95%. Based on Table 2, a score of 95% can be categorized as very practical.

The final practicality test was conducted on the summative mathematical literacy test. The practicality test assessed aspects of the summative mathematical literacy test, including ease of student completion, ease of scoring, and suitability to the established learning plan. The following are the practicality test scores for the summative mathematical literacy test:

Table 8. Practicality Test of Summative Mathematical Literacy Questions

Assessor	Score
Assessor 1	33
Assessor 2	33
Total	66
Average	$\frac{33+33}{2}=\frac{66}{2}=33$
Percentage	$\frac{Skor\ yang\ didapat}{Skor\ maksimal} \times 100\% = \frac{33}{35} \times 100\% = 0.94 \times 100\% = 94\%$

Based on Table 8 above, the practicality test score for the summative mathematical literacy

questions was 94%. This score is in the range of 81% - 100%, which is considered very practical.

Discussion

From the results described, it can be seen that the development of mathematics learning devices containing mathematical literacy is in order to support the improvement of mathematical literacy skills. The development of these learning devices is also a step in minimizing the difficulties of educators in preparing learning containing mathematical literacy (Pulungan, Delyanti Azzumarito; Herosian, Mila Yulia; Harahap, 2023) . There are three learning devices developed by the researchers, including teaching modules, LKPD, and summative mathematical literacy exam questions. The three learning devices have been declared valid and practical by experts. From the validity test process, a score of 0.97 was obtained on the teaching module, 0.93 on LKPD, and 0.95 on the summative mathematical literacy exam questions. The three average percentages are categorized as very valid based on validity criteria. Meanwhile, in the practicality test, it has been declared very practical by two mathematics teachers in Kudus with an average percentage of 95% on the teaching module, 95% on LKPD, and 94% on the summative mathematical literacy exam questions. From the two tests conducted, it was stated that the teaching module, LKPD, and summative exam questions on mathematical literacy were suitable and could be implemented in learning containing mathematical literacy.

Based on the validation results of the teaching module in Table 3, the V-Aiken score was 0.97 and was categorized as very valid. There are several aspects assessed by experts in this teaching module, including aspects of content feasibility, suitability of content with the *discovery learning model* , and language. The content feasibility aspect consists of several items that are assessed, including those related to the completeness of the teaching module identity, the completeness of the core components, the completeness of the teaching module attachments, the suitability of the TP with the specified CP, the clarity and systematics of delivery, and the suitability between the models, methods, and approaches used. In this aspect, the experts gave an average score of 0.96. This score is considered high and provides the conclusion that the developed teaching module has feasibility in the content category. In addition to the aspect of content feasibility, there is an aspect of content suitability with the *discovery learning model* that was also assessed by experts. In this aspect, an assessment is carried out on the steps of the learning design that are adjusted to the steps of the *discovery learning model* , namely the stimulus step, problem identification, data collection, data processing, verification, and generalization. In this aspect, the teaching module was given an average score by experts of 0.93. This category is also considered high and concludes that the developed teaching module is suitable in terms of content suitability with the *discovery learning model* . The final aspect assessed by experts in the developed teaching module is the linguistic aspect. There are two statements assessed in this aspect, including ease of understanding the sentences used and the

suitability of the language used with good and correct Indonesian language rules. In this aspect, the developed teaching module received a score of 0.94. This score is also categorized as high and indicates that the developed teaching module is categorized as suitable in terms of linguistics.

In addition to the teaching module, the developed LKPD learning device is also categorized as very valid with a V-Aiken score of 0.93. There are several aspects assessed by experts in this LKPD validation test, including aspects of content feasibility, suitability with the *discovery learning model* , language, presentation, and ease and usefulness. In this feasibility aspect, an average score of 0.94 was obtained. This feasibility aspect assesses the suitability of the LKPD with the established CP and TP, suitability with the approach used, and the coherence of the material. The second aspect assessed in this LKPD is the aspect of content suitability with the *discovery learning model* . In this aspect, a score of 0.98 was obtained with a high category and is in accordance with the steps in the *discovery learning model* . The third aspect assessed by experts is the linguistic aspect which received a score of 0.94. In this aspect, an assessment was made on the clarity of the information provided, the clarity of the instructions given, and the use of good and correct Indonesian. The score on this aspect was also categorized as high and stated that the developed LKPD was feasible in the linguistic aspect. The fourth aspect assessed in the developed LKPD was the presentation aspect. In this aspect, the selection of *fonts* , colors, and illustrations was assessed. Furthermore, this stage also assessed students' impressions of the illustrations presented. In this aspect, the developed worksheet received a score of 0.96, categorized as high and appropriate in terms of presentation. The final aspect assessed in this worksheet was ease and usefulness. This aspect received a score of 0.83, categorized as high.

The final learning tool assessed by experts was the summative mathematical literacy test questions. Based on Table 5, the average V-Aiken score for all aspects was 0.95. This score categorizes the summative mathematical literacy test questions as highly valid. There are several aspects assessed by experts in the summative mathematical literacy test questions, including the aspect of conformity with mathematical literacy indicators which obtained a score of 0.88; the aspect of conformity of questions with CP and TP which obtained a score of 1, the aspect of conformity with question indicators which obtained a score of 0.88; the aspect of suitability for class level which obtained a score of 0.88; the aspect of use of question words or commands which obtained a score of 1; the aspect of work instructions which obtained a score of 1; the aspect of scoring guidelines which obtained a score of 1; the aspect of presentation of tables, images, and graphs which obtained a score of 1; the aspect of communicative language use which obtained a score of 0.88; the aspect of use of standard language and not offending SARA obtained a score of 1; and the aspect of using words that do not have multiple meanings received a score of 1. With the suitability of the summative mathematical literacy exam questions in various aspects, it is hoped that it can support learning containing mathematical literacy.

In terms of practicality, the developed learning tools were assessed as facilitating students' understanding of the statistics material. Meanwhile, in this practicality test, the developed learning tools were also assessed as having an attractive appearance and design, while also supporting students' motivation to learn. In terms of usefulness, the developed learning tools were also assessed as being aligned with students' needs in mathematics learning with a mathematical literacy focus.

The development of teaching module learning tools has several benefits for both educators and students in supporting learning containing mathematical literacy. Faridahtul Jannah & Thooriq Irtifa' Fathuddi (2023) explains that teaching modules have an active function in supporting learning so that it runs according to the established objectives effectively and efficiently. Because the objectives formulated in the teaching module are written clearly, this makes it easier for educators to describe learning according to the objectives clearly and specifically so that it is easily achieved by students (Putri et al., 2024) **.** In addition, the development of teaching modules in learning will also support learning to run systematically and regularly (Putri et al., 2024) **.** Thus, teaching modules containing mathematical literacy will help educators in providing learning systematically, clearly, effectively, and efficiently in achieving the goal of improving students' mathematical literacy skills.

In addition to teaching modules, the development of LKPD learning tools also has an active function in supporting the improvement of students' mathematical literacy skills. In general, LKPD has several functions, including facilitating the process of delivering material, as a medium to facilitate students' understanding of the material presented, as a medium for practicing and measuring students' understanding of the material presented by Prastowo Andi (2015) **.** LKPD containing mathematical literacy is developed following the procedures in the *discovery learning model* , where at the beginning of the learning process begins with a stimulus in the form of a problem. The steps in the LKPD containing mathematical literacy will help students understand the mathematical concepts presented contextually and understand the implementation of mathematical concepts in solving problems. The solution process also serves as a means of practice for students to improve their mathematical literacy skills. Prastowo Andi (2015) also outlines the most important function of student worksheets (LKPD): as a medium that minimizes the role of educators while encouraging students to remain active in the learning process. The current independent curriculum emphasizes student-centered learning, requiring students to be more active while educators act solely as facilitators. Through the use of LKPDs containing mathematical literacy, it is hoped that students can actively learn and understand the usefulness of mathematical concepts in solving *problems* based on everyday life contexts.

The final learning tool developed was a summative mathematical literacy test. This learning tool also serves to support the improvement of students' mathematical literacy skills. In general, summative tests serve as learning evaluation materials for students, educators, and parents. Eka Wijaya et al. (2024) explains that with summative exam questions, it can be known whether students

have understood and mastered the material being taught or not. This is also beneficial for educators, namely the results obtained can be used to measure the effectiveness of the teaching strategies that have been implemented (Eka Wijaya et al., 2024) **.** Meanwhile, for parents, these results will help in knowing the academic development of children and knowing what assistance should be provided Eka Wijaya et al. (2024) **.** Similar to the function of summative exam questions in general, the development of summative exam questions for mathematical literacy serves as a measure of students' mathematical literacy abilities after the implementation of a learning process containing mathematical literacy.

Conclusion

Indonesian students have relatively low literacy skills. This is evidenced by Indonesia's ranking in the 2022 PISA (Philosophy of Mathematics and Natural Sciences), which ranked 70th out of 81 countries. However, educators still face challenges in developing lesson plans, teaching materials, and post-learning evaluations. To assist educators in implementing mathematical literacy-based learning, learning tools were developed to facilitate the learning process. Three learning tools were developed: a teaching module (LKPD) and summative mathematical literacy questions. These three tools were validated by two experts. The validation test resulted in a score of 0.97 for the teaching module, 0.93 for the LKPD, and 0.95 for the summative mathematical literacy questions. These three percentages were categorized as highly valid. After being declared valid, the three learning tools were distributed to junior high school (SMP/MTs) mathematics teachers in Kudus. In this case, a practicality test was conducted by two educators. The process yielded an average score of 95% for the teaching module, 95% for the student worksheet, and 94% for the summative mathematical literacy questions. These scores are categorized as very practical based on the established criteria. These tests concluded that the developed learning tools can be implemented in mathematics instruction, aiming to improve students' mathematical literacy skills.

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