



Development of Numeracy and Literacy-based Probability Teaching Materials

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Abstract

The aim of this research was to develop a product based on numeracy skills through teaching materials. This study used a research and development (R&D) methodology approach using the ADDIE model. This research aimed to develop a product based on numeracy literacy through teaching materials. This research used research and development (R&D) with the ADDIE model. The participants in this study were categorized into two groups, large groups and small groups of grade 10 from SMAN in one of the cities of East Jakarta. Data collection included an expert test with three expert validators, material, media, and language, and an interview and student response questionnaire. The results of product development form teaching materials based on numeracy literacy using Flip PDF Corporate Edition. The results from material expert, media expert, and linguist expert validation obtained an average score of with the category "Excellent". As a result, it can be concluded that teaching materials based on numeracy literacy are eligible for use as teaching materials probability.

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1. Introduction

Numeracy literacy is an ability that makes it a prerequisite in 21st-century learning, and it has become an obligation for an educator who is inclusive to students to develop literacy skills in the world of education (Husniati et al., 2022; Novitasari, 2022). In numeracy, there are four domains: number, algebraic, geometry, and data and uncertainty. With these 4 domains, it is educators' duty to support students' needs in developing numeracy literacy that has been owned so that it can be developed further to achieve the best results.

In general, numeracy literacy in Indonesia is very low compared to other parts of the world. This situation is influenced by several aspects, including the lack of quality education, available and appropriate media, and the lack of stimulus from parents or society (Faza & Fathina, 2022). As a result, assessing reports from public education report cards proves that students' literacy and numeracy skills have reached the minimum competency. Put, an effort or movement is needed so that students can achieve the best results in the field of literacy and for numeracy, the percentage of students has reached the minimum competency limit of less than 50% with a total of 1,009,544 respondents (Kemendikbudristek, 2022).

The low numeracy literacy of students is caused by several factors, including not being accustomed to reading activities (family), lack of educational facilities and reading facilities in an inadequate school environment, and lack of motivation in terms of reading related to the times, one of which is technology (social media) (Lestari et al., 2022). Numeracy literacy in Indonesia involves many factors, including a person's level of education, the experience of learning and practicing with numbers and mathematical symbols, and other factors, such as language and memory skills.

Efforts to deal with these problems require effective learning to train students to learn independently without forgetting cognitive, affective, and psychomotor aspects, one of which is by using appropriate teaching materials and being able to support the needs of students (Indriana & Maryati, 2021; Musyriyah et

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al., 2022). The presence of teaching materials can help students in developing numeracy literacy as the function of teaching materials is a reference capital for students' reading literature which contains a set of learning tools in the form of teaching material components that aim to assess the achievement of learning outcomes and can stimulate the quality of learning for students (Nasution et al., 2018; Wulandari & Indarini, 2022). From the teaching materials that have been made, it can be developed with learning information sources and students' learning independence because it is the main factor in the development, which can be related to numeracy literacy (Rahmawati et al., 2019). In addition, developing teaching materials is an essential procedure in the education system. This is because teaching materials are one of the factors that can affect the quality of the teaching and learning system and the learning performance of students in the form of learning outcomes (Hasyim & Umar, 2019).

In the research of (Lisda Ramdhani et al., 2022) with the theme of developing numeracy literacy of learners, it was found that the results of student work showed a significant increase in the three schools before treatment and after treatment at an appropriate level $<5\%$. A significant increase based on the average score of students from the three schools before and after treatment in the growth of students' numeracy literacy and obtained results based on multivariate tests.

Then, in the research of (Widiantari et al., 2022) with the theme of Improving Numeracy Literacy with Ethnomathematics E-Modules that the results of the calculation of the average value of validity and practicality are valid and reasonable categories, as well as efficiency tests concerning numeracy literacy and character building in the excellent category. Valid and good categories are based on assessing the three aspects (validation, practicality, effectiveness) according to several stages of the procedure, according to Plomp.

Based on the explanation above, researchers are interested in making updates made by researchers in previous studies, namely the development of teaching materials. Therefore, researchers are interested in developing teaching materials for numeracy literacy-based probability materials. This research aims to develop teaching materials based on numeracy literacy.

2. Methods

The research method used was the research and development (R&D) method. Research and development (R&D) was a method applied by researchers to produce specific product and validate whether it is suitable for use (Fransisca & Putri, 2019). This researched method used the ADDIE model approach. ADDIE (analysis, design, development, implementation, and evaluation) was simply learned by developing practical and attractive products to create an efficient learning system (Winatha et al., 2018). This research was conducted on students of grade X in one of the schools in East Jakarta using a questionnaire. The stages of the ADDIE model were described as follows.

2.1. Analyze

This phase was to find out the needs of students by examining their characteristics of students, reviewing the curriculum to compile teaching materials have been made, and formulating the types of teaching materials have been developed by referring to references that researchers had collected.

2.2. Design

This phase was to design teaching materials that would be made by the researchers. This phase could be made by examining the problem and exploring solutions based on the first phase. This phase aims to compile a design of teaching materials have been developed by paying attention to the design format created.

2.3. Development

The aim this development phase was to implement the draft teaching materials which had been revised on expert assessments so that they could be tested on students. Here are the things that were done at this stage.

2.3.1. Instrument Validation

Initially, the instruments created in the previous phase could be validated by expert validators to determine the validity of the learning components developed.

2.3.2. Product Validation

Teaching materials produced could be validated by expert validators to determine the feasibility of teaching materials developed. Three experts validate teaching materials to assess the feasibility of teaching materials designed for use in learners, including materials experts, media experts, and language experts. The validators the researchers used by three mathematics lecturers from Prof. Dr. Hamka Muhammadiyah University and three mathematics educators from one of the schools in East Jakarta.

2.4. Implementation

After the development phase, the validation results that the validator had validated could be applied to teaching materials to revise or supplement the teaching materials made so that the teaching materials became significant to the needs of students and educators. After the revision, the teaching materials were tested on educators and students to find out the responses of educators and students to the teaching materials made by paying attention to the aspects of effectiveness and practicality in the use of teaching materials, the completeness of the material, the usefulness of the language, and the attractiveness of the design made. To test the teaching materials, researchers used interviews with educators and questionnaires for educators and students. Study involved three educators and 39 students in large and small groups.

2.5. Evaluate

Final phase was carried out with the aim of revising the teaching materials and the determining the final results of the feasibility the teaching materials. The data obtained from experts, educators, and students were calculated using the average score and percentage formula.

Average Score Formula

$$\bar{X} = \frac{\sum x}{n} \quad (1)$$

Description:

\bar{X} = Mean

$\sum x$ = Total Score

n = Total Subjects

Percentage Formula

$$P = \frac{f}{N} \times 100\% \quad (2)$$

Description:

f = The frequency being sought for percentage

N = Number of Cases

P = Percentage Rate

Then, in Table 1 below, interpret the percentage (%) of the researched results that used the Likert scale assessment criteria (Riduwan, 2019).

Table 1. Likert scale assessment.

Description	Percentage
Excellent/ Strongly Agree	81% – 100%
Good/Agree	61% – 80%
Enough	41% – 60%
Poor/Disagree	21% – 40%
Weak/Very Weak	0% – 20%

3. Results & Discussions

The results of the research development conducted by researchers are teaching materials based on numeracy literacy. The techniques in this development research include analyzing the needs and studying the characteristics of students to determine the needs of teaching materials based on the characteristics of students, then making a design or formation of products to be developed. The next phase is the development phase, by being validated by teaching material experts who have made and then revised again; after going through the development stage, teaching materials can be tested on students. Teaching materials that have been developed are validated by three validators consisting of material experts, media experts, and linguists and tested on educators and students by interviewing educators and using questionnaires for the responses of educators and students.

3.1. Feasibility Validation

In assessing the feasibility of probability teaching materials, researchers used three validators, each consisting of 3 lecturers and three educators. The development results in this study, namely teaching materials based on numeracy literacy, are declared feasible to use.

Table 2. Material expert scoring.

Validator	Assessment Aspect	Total Score	Statement	Percentage	Criteria
Material Expert	Content Quality	54	6	90	Excellent
	Coverage Provision	18	2	90	Excellent
	Language Feasibility	34	4	85	Excellent
	Applicability	45	5	90	Excellent
Total Score		151	17	88.75	Excellent

Table 3. Media expert scoring.

Validator	Assessment Aspect	Total Score	Statement	Percentage	Criteria
Media Expert	Cover Design of Teaching Materials	39	5	78	Good
	Cover Illustration of Teaching Materials	9	1	90	Excellent
	Layout Consistency	17	2	85	Excellent
	Layout Elements	17	2	85	Excellent
	Page Speed Layout	18	2	90	Excellent
	Simple typography of teaching materials	35	4	87.5	Excellent
	Typography of Teaching Material	7	2	70	Good
	Content Facilitates Understanding				
	Illustration of Contents	17	2	85	Excellent
	Ease of Use	17	2	85	Excellent
Total Score		224	21	83.40	Excellent

The percentage score of the material expert validator is 88.75%. The assessment criteria table shows that the numeracy literacy-based probability teaching materials meet content quality aspects, coverage provisions, language feasibility, and implementation criteria. So that the teaching materials developed are categorized as suitable for use in learning.

Table 4. Language expert scoring.

Validator	Assessment Aspect	Total Score	Statement	Percentage	Criteria
Language Expert	Straightforward	28	3	93	Excellent
	Communicative	10	1	100	Excellent
	Dialogical and Interactive	18	2	90	Excellent
	Suitability to Learner	18	2	90	Excellent
	Development	18	2	90	Excellent
	Conformity with Language Rules	18	2	90	Excellent
	Use of terms, symbols, or icons	18	2	90	Excellent
Total Score		128	12	92.16	Excellent

Table 5. Total score conclusion from the validators.

No.	Validator	Total Score	Percentage	Criteria
1	Material Expert	151	88.75	Excellent
2	Media Expert	224	83.40	Excellent
3	Language Expert	128	92.16	Excellent

**Figure 1.** the cover of the teaching material

The percentage score of the media expert validator is 83.40%. Based on the assessment criteria table shows that the teaching materials based on numeracy literacy meet the criteria of the cover design aspects of teaching materials, illustrations of teaching material covers, consistent layout words, layout elements, page speed layout, straightforward typography of teaching material content, the typography of teaching

material content facilitates understanding, illustration of content, and ease of use. So that the teaching materials developed are categorized as suitable for use in learning.



Figure 2. (a) indicates teaching materials haven't been revised; (b) the teaching materials have been revised.

The percentage score of the linguist validator is 92.16%. Based on the assessment criteria table shows that the numeracy literacy-based probability teaching materials meet the criteria for communicative, dialogical, and interactive straightforward aspects, compatibility with learner development, conformity with language rules, and use of terms, symbols, or icons. So that the teaching materials developed are categorized as suitable for use in learning.

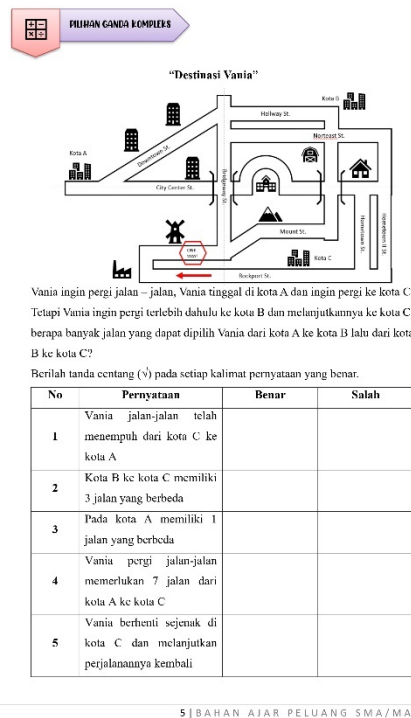


Figure 3. numeracy literacy-based probability material

Based on the assessment by validators, namely material experts, media experts, and linguists, can be seen in Table 5.

Table 6. Math teacher scoring.

Validator	Assessment Aspect	Total Score	Statement	Percentage	Criteria
Math Teacher	Attraction	69	7	98.50	Excellent
	Material	56	6	93.30	Excellent
	Language	29	3	96.7	Excellent
Total Score		154	16	96.16	Excellent

Table 7. Student scoring.

Validator	Assessment Aspect	Total Score	Statement	Percentage	Criteria
Student	Attraction	171	7	81.42	Excellent
	Material	161	6	89.94	Excellent
	Language	83	3	96.70	Excellent
Total Score		415	16	92.20	Excellent

3.2. Educators and Learners Response

After the product is validated by experts and improved according to the experts' suggestions, the product is tested on three educators and 39 students, consisting of a large group of 33 students and a small group of 6

students. After the revision is made, it is helpful to know the response of educators and students to the effectiveness and attractiveness of the product seen in Table 6 and 7 (Nurafni et al., 2019).

The percentage score of the teacher respondents is 96.16% based on the assessment criteria table, which shows that the numeracy literacy-based probability teaching materials have a good assessment. This shows that the teaching materials meet the criteria for suitability for aspects of interest, material, and language.

The percentage score of student respondents is 92.20%; the assessment criteria table shows that the teaching materials based on numeracy literacy have a good assessment. This shows that teaching materials meet the criteria for suitability for aspects of interest, material, and language.

3.3. Product Evaluation

Product evaluation helps obtain products that are suitable for use. The product was evaluated and revised based on the assessment results and suggestions from the validators. The developed product has revisions based on the evaluation results after the validator's assessment. Among them are the systematic presentation of material, the use of sound and correct language, and the attractiveness of the design of teaching materials.

The final product of teaching material development is numeracy literacy-based probability teaching materials according to the needs of students in one of the schools in East Jakarta. Based on the results of the three validators, namely material experts with a percentage of 88.75% (excellent), media experts with a percentage of 83.40% (excellent), language experts with a percentage of 92.16% (excellent), educators' responses with a percentage of 96.16% (excellent) and students' responses with a percentage of 92.20% (excellent) as well as improvements obtained from the validators. The numeracy literacy-based probability teaching materials that have been developed have met the criteria of very good/fit for use in learning.

4. Conclusion

Researchers who develop numeracy literacy-based probability teaching materials should pay attention to the numeracy literacy domain to support the needs of students and reading skills (literacy) and memory skills (numeracy) by conducting various studies on learning and analyzing problems to solve problems correctly.

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