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Banyumasan Context-based Modul Improves Mathematical Literacy in Data Content of Junior High School Students

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ABSTRAK

Pembelajaran matematika merupakan salah satu jenis pembelajaran yang cukup sulit. Namun pembelajaran akan lebih mudah dipahami siswa jika materi yang disampaikan menggunakan konteks keseharian siswa. Modul pembelajaran akan membantu siswa untuk memahami pembelajaran secara mendalam. Penelitian ini bertujuan untuk mengembangkan modul matematika berdasarkan konteks Banyumasan. Penelitian pengembangan ini diadaptasi dari model pengembangan ADDIE (Analysis, Design, Development, Implementation, Evaluation). Metode pengumpulan data dilakukan melalui angket dan tes literasi matematika. Data dianalisis dengan analisis deskriptif dan analisis kuantitatif. Hasil penelitian menyimpulkan bahwa: hasil validasi menunjukkan bahwa modul berbasis konteks Banyumasan memenuhi standar kelayakan dan termasuk dalam kategori sangat baik. Hasil pengembangan modul berbasis konteks Banyumasan dinyatakan praktis untuk digunakan, dengan skor kepraktisan termasuk dalam kategori baik. Hasil pengembangan modul berbasis konteks Banyumasan dinyatakan efektif digunakan dengan hasil ***t-obs*** *= 8,2140 dengan luas kritis t > 2,030 yang berarti literasi matematika siswa yang menggunakan konteks Banyumasan Modul berbasis konteks lebih baik dibandingkan literasi matematika siswa sebelum menggunakan modul berbasis konteks Banyumasan. konteks Banyumasan.*

ABSTRACT

Learning mathematics is a type of learning that is quite difficult. However, learning will be easier for students to understand if the material presented uses the students' daily context. Learning modules will help students to understand learning in depth. This research aims to develop a mathematics module based on the Banyumasan context. This development research was adapted from the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. Data collection methods were carried out through questionnaires and mathematical literacy tests. Data were analyzed using descriptive analysis and quantitative analysis. The research results concluded that: validation results show that the Banyumasan context-based module meets the feasibility standards and is included in the very good category. The results of developing the Banyumasan context-based module were declared practical to use, with a practicality score included in the good category. The results of the development of the Banyumasan context-based module were declared effective in use with the result t-obs = 8.2140 with a critical area of t > 2.030, which means that the mathematical literacy of students who used the Banyumasan context. The context-based module was better than the mathematical literacy of students before using the Banyumasan context-based module. Banyumasan context.

1. INTRODUCTION

Education cannot be separated from changes and developments over time. Education is very dynamic following fundamental changes compared to previous times. Changes in the 21st century era as a period of globalization and the era of society 5.0, meaning that human life in the 21st century experiences changes in the concept of society which is human-centered and technology-based (Agustini et al., 2019; Malik, 2018; Wagiran et al., 2019). Likewise, as students, students have life skills demands in the era of society 5.0, including the skills to learn to innovate, use information technology, and life skills to solve problems and contribute to society (Lestari, 2018; Turiman et al., 2012). Regarding developments and

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changes in the era of society 5.0, previous study argues improving the quality of human resources through the education pathway starting from basic education, secondary education to tertiary institutions is the key to being able to keep up with the developments in the era of society 5.0 (Lase., 2019). Junior secondary education is a continuation of basic education, namely junior high school. The learning process at junior high school level begins to collaborate with literacy. This is a movement to face the challenges of the society 5.0 era. Other study argues the intended literacy movement focuses on three main literacy namely reading literacy, technological literacy, and mathematical literacy (Hastuti & Lestari, 2018). Collaborating literacy in the learning process from an early age can train literacy skills to increase analytical power, solve problems, and interpret problems in various situations. Overall, Indonesian students' mathematical literacy has not met expectations. The mathematical literacy gap can be seen from the results of the Program for International Student Assessment (PISA). Indonesia's PISA results achieved an average mathematics score of 389 out of the highest total score of 490 in 2018 (Hewi & Shaleh, 2020; Megawati & Sutarto, 2021). For mathematics, in the Trends in International Mathematics and Science Study (TIMSS) Indonesian junior high school students got a score of 397 out of the highest score of 618 or below average. international average (Saefurohman et al., 2021; Syaifuddin, 2022).

Permendikbudristek No. 5 of 2022 in the Graduate Competency Standards states one of which focuses on students being able to demonstrate mathematical literacy skills in reasoning, using mathematical concepts, procedures, facts and tools to solve problems related to themselves, the immediate environment, and the surrounding community (Baran et al., 2011; Prijanto & Kock, 2021). Program for International Student Assessment mathematical literacy is a student's ability to reason mathematically, formulate, use, and interpret mathematics to solve problems in various real-world contexts. The application of mathematical literacy aims to help students know the role of mathematics and make logical decisions in a constructive, involved, and reflective 21st century era (Maruti, 2022; Moonsamy & Govender, 2018). Learning mathematics is easier for students to understand if the material is presented using the daily context of students. Previous research did this by using the Minangkabau cultural context in developing mathematics modules to obtain effective and practical results in increasing mathematical literacy and motivating students (Masamah et al., 2023).

Adding students' insight and experience with the surrounding environment requires modules that can integrate with existing contextual values in the area. With this solution, learning by connecting mathematics with the environment around students, involves students actively, allows students to build and develop ideas and understanding of mathematical concepts broadly and is able to apply them to various life problems (Siregar et al., 2021; Sumirattana et al., 2017). Modules are one of the teaching materials used in the learning process, modules are different from textbooks or printed books in general. A module is defined as a collection of material written with the aim that students can learn independently without or with teacher guidance (Sopacua et al., 2020; Xu, 2017). Modules are learning activities that contain clear planning of goals to be achieved, provision of learning materials, and evaluation as a measure of student success in completing competencies. This means that students can carry out their own learning activities without the direct presence of a teacher. A quality module needs to pay attention to the characteristics required for the module, including: self-instructional, self-contained, stand-alone, adaptive, user friendly (Asmi et al., 2018; Darmayasa et al., 2018). Development of Banyumasan context-based modules as a form of effort to contextualize data content in using infographics for presenting data on Banyumasan Regency Government, Banyumasan MSMEs and others. This can apply learning values contextually in explaining learning outcomes in data analysis elements. The reduction in learning outcomes becomes a flow of learning objectives that include (1) explaining data (2) collecting, presenting and analyzing data (3) using tables and graphs to present and interpret data. The effort to develop the Banyumasan context-based module is to see the validity of the practicality and effectiveness of the module in increasing mathematical literacy.

2. METHOD

This study used the Research and Development (R&D) method with the development model developed which is the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) (Rustandi & Rismayanti, 2021; Shelton & Saltsman, 2006). The development procedure for the ADDIE model stage is show in Figure 1. The validity of the module is seen from the validation results of material experts and media experts. Validation analysis aims to see the validity of the module seen from the aspect of material validation including content feasibility, presentation feasibility, and language, while media validation aspects include graphics. The assessment criteria for determining the validity of the Banyumasan context-based module used the criteria presented in Table 1.

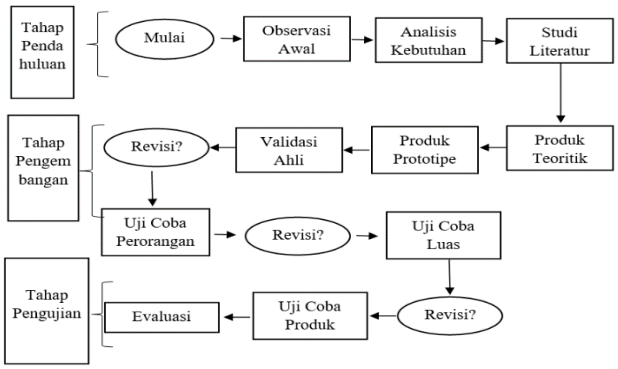

Figure 1. Module Development Procedure

Table 1. Valid Assessment Criteria for A Product

Penilaian (%)	Kategori
$0 < P \leq \mathbf{20}$	Very Unfavorable
$21 < P \leq \mathbf{40}$	Not Good
$41 < P \leq \mathbf{60}$	Fairly Good
$61 < P \leq \mathbf{80}$	Good
$81 < P \leq \mathbf{100}$	Very Good

Base on Table 1 in this study the module was said to be valid if the validation results obtained more than 61% in the "good" category, then the Banyumasan context-based module has been said valid and can be used with the condition that researchers must improve according to the suggestions given. The practicality of the module can be seen from the results of student responses and teacher responses. The aim of student responses is to measure the practicality of the module from the aspects of interest, material and language. The teacher's response questionnaire was seen from the aspects of appearance, presentation, material and language. The assessment criteria for determining the practicality of the module from the teacher and student response questionnaire used criteria presented in Table 2.

Table 2. Criteria for Practical Assessment of A Product

Penilaian (%)	Kategori
$0 \leq P \leq \mathbf{39}$	Very Unfavorable
$40 \leq P \leq \mathbf{69}$	Not Good
$60 \leq P \leq \mathbf{74}$	Fairly Good
$75 \leq P \leq \mathbf{84}$	Good
$85 \leq P \leq \mathbf{100}$	Very Good

Base on Table 2 In this study the module was said to be practical if the results of the student and teacher response questionnaire obtained more than equal to 75% in the category "good" then the Banyumasan context-based module has been said to be practical and can be used with the condition that the researcher must improve it according to the suggestions given.The instrument used for module effectiveness data uses the results of a mathematical literacy test. Data analysis in the effectiveness test is used as a measurement of the score for increasing students' mathematical literacy skills which has been carried out by researchers. Data obtained from the initial test (pretest) and (posttest) were tested using the paired sample t-test. Before carrying out this test, a prerequisite test is carried out which includes a normality test and a homogeneity test. This test was carried out to determine whether the module was said to be effective if the Banyumasan context-based module had the effect of increasing mathematical literacy skills after using the module better than the results of students' mathematical literacy abilities before using the module.

3. RESULTS AND DISCUSSION

Result

Module development in this research refers to the ADDIE development model, which consists of Analysis, Design, Development, Implementation, and Evaluation. This research and development produced a Banyumasan context-based module on statistical material. The module developed consists of a

foreword, instructions for using the book, table of contents, learning activities, summary, concrete actions, glossary and bibliography. The Analysis stage includes field study analysis (learning process, teaching materials, student abilities), analysis of student needs, and literature study. This stage identifies several deficiencies or problems in the learning process and the teaching materials used and how to overcome these problems. Students' mathematical literacy results are still relatively low and need improvement. The low mathematical literacy of students is due to the unavailability of teaching materials that can encourage students to become literate. This makes students unmotivated to learn. The Banyumas context-based module really helps students to be literate in information so that it can motivate students to understand the meaning and benefits of statistical material by relating the context of their daily lives to the Banyumasan regional environment.

The Design stage includes determining Learning Outcomes and Learning Objectives, creating module drafts, preparing module prototypes, creating Teaching Modules and module assessment instruments. Determining Learning Outcomes and Learning Objectives is based on the existing learning syllabus as well as discussions with the supporting teacher. Making a module draft consists of a title page, an introductory section (module identity, foreword, instructions for using the module, and a list of module contents), a content section (Learning Achievements and Learning Objectives, material description, summary of student activities, example questions, practice questions) , and the closing section (answer key, reflection, glossary and bibliography). The presentation of this material is designed based on the Banyumasan context. The results of the Banyumasan ontes-based module design is show in Figure 2.

Figure 2. Banyumasan Context-Based Module Design

The Development stage includes assessment by experts, this stage is carried out to see the validity of the module that has been developed. The validity of the module is seen from the validation results of material experts and media experts. Expert validation was carried out by three mathematics education lecturers as someone who is competent in their field. Validators are given an assessment related to module suitability standards according to the National Education Standards Agency (BSNP) in 2012 which has now been changed to the Educational Standards, Curriculum and Assessment Agency (BSKAP) including aspects of content suitability, presentation suitability, graphics and language suitability. The validation results obtained from the assessment sheets of the three material experts are presented in Table 3.

Table 3. Material Expert Validation Assessment Results

No	Aspect	Persentase	Assessment category
1.	Content Eligibility	95.00%	Very Good
2.	Feasibility of Presentation	95.00%	Very Good
3.	Language	91.67%	Very Good
Average		**93.89%**	**Very Good**

Based on Table 3, validation scores obtained from material experts for the three aspects show that in terms of material, the module is in the very good category. Overall, based on the assessments obtained from the three validators, which include assessing the appropriateness of the content,

appropriateness of presentation and language, each is included in the very good category. The validation results obtained from the assessment sheets of the three media experts are presented in Table 4.

Table 4. Results of Media Expert Validation Assessments

Validator	Aspect	Persentase	Assessment category
First	Graphics	84.37%	Good
Second		92.18%	Very Good
Third		90.62%	Very Good
Average		**89%**	**Very Good**

Based on Table 4, the validation value obtained from media experts for the graphic aspect shows that in terms of module it is in the very good category. Overall, based on the assessments obtained from the three validators which include graphics, it is in the very good category. At this implementation stage, a trial was carried out on class VII students of SMP Negeri 2 Purwokerto using a Banyumasan context-based module. This stage is carried out to see the practicality and effectiveness of the module. The practicality of the module can be seen from the results of student and teacher response questionnaires. Effectiveness can be seen from the results of students' mathematical literacy posttests. In the practicality test of the module, students are given an assessment sheet relating to the use of the module which contains statements and a suggestion column for improving the module. The assessment criteria for student response questionnaires are seen from the aspects of interest, material and language. The results of student responses are presented in Table 5.

Table 5. Results of Student Response Questionnaires

No	Aspect	Persentase	Assessment category
1.	Interest	81.33%	Good
2.	Material	83.87%	Good
3.	Language	80.64%	Good
Average		**81.94%**	**Good**

Based on Table 5, the assessment obtained from 31 students for the interest aspect of the module was 81.33% on a scale of four and included in the good category. The material aspect obtained was 83.87% on a scale of four and was included in the good category. The value obtained for the language aspect was 80.64% on a scale of four and was included in the good category. Based on the average value of the three aspects, it was obtained at 81.94% with the criteria "Good". Therefore, the indicator of the practicality of the module is fulfilled, namely the practicality of the student response questionnaire. The results of the teacher response questionnaire are presented in Table 6.

Table 6. Teacher Response Questionnaire Results

No	Aspect	Persentase	Assessment category
1.	Appearance	95.00%	Very Good
2.	Presentation of Material	81.25%	Good
3.	Language	75.00%	Good
Average		**83.75%**	**Good**

Based on Table 6, the teacher's assessment for the module display aspect is 95% on a scale of four and is in the very good category. The percentage of material presentation obtained was a percentage of 81.25% on a scale of four and was included in the good category. The value obtained for the language aspect was 80.64% on a scale of four and was included in the good category. Based on the average value of the three aspects, a percentage of 81.94% was obtained with the criteria "Good". Therefore, the indicator of the practicality of the module is fulfilled, namely practicality from the teacher response questionnaire. The module is said to be effective when the learning module developed is able to increase students' mathematical literacy. Increasing students' mathematical literacy was analyzed from the pretest and posttest scores from the experimental class. To test the effectiveness of the product, the pretest and posttest scores are made on the same scale, namely 100. The analytical test used is a hypothesis test of the difference in average data on mathematical literacy results for paired data between the pretest and posttest. Before testing the hypothesis, prerequisite tests are carried out, namely normality and homogeneity tests. The normality test is show in Table 7.

Table 7. Normality Test of Experimental Class Effectiveness Data

Data	L_{obs}	Critical Area	Test Decision	Conclusion
Pretes	0.1377	$L > L_{0,05;36}$	H_0 accepted	Normal
Postes	0.081766	$L > L_{0,05;36}$	H_0 accepted	Normal

Based on Table 7, it is found that the data on the pretest and posttest scores for students' mathematical literacy in the experimental class is normally distributed. This means that the sample comes from a normally distributed population.

Table 8. Normality Test of Control Class Effectiveness Data

Data	L_{obs}	Critical Area	Test Decision	Conclusion
Pretes	0.117134	$L > L_{0,05;36}$	H_0 accepted	Normal
Postes	0.095303	$L > L_{0,05;36}$	H_0 accepted	Normal

Based on Table 8, it is found that the data on the pretest and posttest scores for mathematical literacy of students in the control class are normally distributed. This means that the sample comes from a normally distributed population. The data used is sample data so there needs to be a homogeneity test to find out whether the samples taken are homogeneous. Test homogeneity using the F-test. The results obtained are F_{obs} = 1.73211 with a critical area F < 1.7571 so that the conclusion that H_0 is accepted is obtained. This means that the pretest and posttest data have the same variance (homogeneous). After testing the prerequisites and fulfilling them, hypothesis testing can be carried out. Hypothesis testing uses the t test, namely the mean difference test for paired data. The calculation results obtained t_{obs} = 8.2140 with a critical area $\{t|t > 2.030\}$ so that the test decision was obtained that H0 was rejected. H_0 is rejected, meaning that students' mathematical literacy after using the Banyumasan context-based module is better than students' mathematical literacy before using the Banyumasan context-based module. So it can be concluded that the module is effective.

Discussion

Based on the results of development research, conclusions are obtained the validation results show that the module meets the module eligibility standards and is included in the very good category. The score obtained for the content feasibility component is 95%; presentation feasibility component is 95%; and for the language component it is 91.67% on a scale of four and is included in the very good category. Revisions were made based on input and suggestions from the two experts (Bano, 2018; Pilendia & Amalia, 2020). The scores obtained from media experts show that the module is included in the very good category. The percentage of graphic aspects of the module is 89% on a scale of four and is included in the very good category. The results of the development of the Banyumasan context-based module on statistics material were stated to be practical to use, with a practicality score obtained from the teacher response questionnaire. The score obtained for the display aspect is 95%; the material presentation aspect is 81.25%; the language aspect is 75% on a scale of four and is included in the good category. The results of the student response questionnaire at the field implementation test stage showed that the score obtained from 31 students for the module interest aspect was 81.33% on a scale of four and was in the good category (Jacob & Karn, 2003; Tschand et al., 2020). For the material aspect it is 83.87% and is included in the good category on a scale of four. For the language aspect, it is 80.64% and this value is included in the good category on a scale of four. The result of the development in this research is a Banyumasan context-based module for class VII SMP statistics material.

It is in line with previous study that produce a valid and practical e-module using the Bengkulu context that potentially affects students' literacy skills to understand the materials of patterns and number sequences (Susanta et al., 2022). The result found e-module using Bengkulu context problems can encourage students to improve their mathematical literacy skills. It is supported by other study that create teaching modules that can improve the mathematical literacy of fifth-grade s elementary school students (Yuliana et al., 2023). The result found that ethnomathematics-based teaching module with a realistic mathematics education approach to improve mathematical literacy is valid, practical, and effective. Research and development of this ethnomathematics-based teaching module has been proven effective only in Petanahan District, it needs to be tested for effectiveness in a wider population so that it can be used more widely. Other researchers can develop similar teaching modules by taking ethnomathematics in other areas. This study has the potential to contribute to increasing the mathematical literacy of class VII students in Banyumas. By developing the Banyumas context -based module, students can be more involved in learning mathematics and developing better understanding of

data material. The Banyumas context -based module can be a resource for local learning that is relevant for students in the area. This can help students feel more connected to the mathematical material taught. The results of this study may have limitations in terms of generalization because it focuses on a particular geographical region (Banyumas). The results of this study may not be applied directly to other regions with different characteristics. The process of developing a context -based module can require significant time and resources. This may be a limitation for schools or educational institutions with a limited budget.

4. CONCLUSION

Based on the results of development research, conclusions are obtained the validation results show that the module meets the module eligibility standards and is included in the very good category. The results of the development of the Banyumasan context-based module on statistics material were stated to be practical to use. The results of the development of the Banyumasan context-based module on statistics material were declared effective for use because there was an increase in students' mathematical literacy from before using the module to after using the module.

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