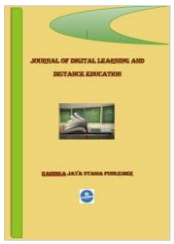

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The Development of Module in Mathematics Teaching Materials at PGSD Study Program of University Musamus

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Abstract

The decline in student interest in learning affects learning outcomes, thus putting pressure on lecturers to produce high-quality teaching. To create quality learning, modules that meet the needs are required; thus, research was conducted to produce interactive modules in the development of valid and practical mathematics teaching materials. This study's objective was to produce a module that is interactive in the development of valid and practical mathematics teaching materials. The ADDIE model was used in this development research, but only up to the development stage. One media expert and one material expert acted as research subjects. The results showed that the developed mathematics teaching material development module can be applied to learning in the Musamus University primary school teacher education study program. This is evident from the validation of the material by the material expert, who obtained a score of 92 placings it in the "very feasible" category in terms of the feasibility of the content and presentation. The media validation of the resulting module is in the excellent category, according to the media validation score of the media expert, which is 95. Therefore, it is recommended to use the module as one of the learning resources for developing mathematics teaching materials.

Keywords: Learning, module, materials, media, and resources

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Introduction

Education is essential to the overall development of human beings in terms of knowledge, skills, and attitudes so that they are prepared to become independent and sustainable individuals. Education should be planned to help people recognize potential future challenges and solutions. This involves more than just making young people equipped and able to work. However, the most crucial factor is education as a process of developing the abilities needed to become responsible citizens who will actively participate in solving future problems in line with changes and progress in society. An educational revolution is needed because the industrial revolution has changed the teaching system, student behavior, and thinking in terms of generating creative and innovative solutions to problems (Saputra, 2020). Technology is used as an additional tool in education to make it easier to teach learners and help achieve the goals to be achieved (Maritsa et al., 2021). Technology is used in education in Indonesia in such a way that it can be used as a teaching tool, an administrative tool, and a learning resource (Lestari, 2018). As a result, technology allows all parties to contribute equally because it opens up the world and can provide previously unknown knowledge (Mokalu et al., 2022). A country's progress is directly correlated with the quality of its educational system. The nation will be prosperous and peaceful if education is well implemented. As a result, education has a major role to play in preparing the next generation of the nation to face the future.

Innovation and positive change must be possible in education to advance education. Using information technology in educational activities can be achieved if there is a global renewal in educational activities. Technology is developed to facilitate work and solve problems. Technology plays an important role in life and makes an important contribution, and education is no exception. Technology helps to successfully optimize learning according to the growth, conditions, and needs of society. If educators use various learning strategies, learning goals will be met. Use is one instance of interactive learning media integrated with technology, which can encourage students' interest in education and enhance student performance. Technology can improve the education system and service standards (Ajizah, 2021). There needs to be innovation during the learning process, one of which is making tools for teachers on the characteristics of the subjects to be taught. The use of appropriate teaching materials can inspire children to learn (Rahim et al., 2022). Technology-based teaching materials are a reflection of educational progress and provide several benefits for education and students (Maskar & Dewi, 2020). One of the modules contains teaching materials that can be used. A module is an important part of the learning process. The existence of modules can help students learn their course material. However, module development must be tailored to meet the needs of students.

Learning through the use of modules is one way for students to develop their ability to think critically and creatively when solving problems (Anggoro, 2017). With modules, students can fully understand the concept of learning based on their learning style (Suastika & Rahmawati, 2019). Module utilization can improve learning outcomes (Herawati & Muhtadi, 2018). Using printed modules to support 21st-century skills is a good idea (Puspitasari, 2019). The module will be able to encourage students to engage in more active learning, which will undoubtedly affect their learning outcomes. These descriptions give a broad picture of how crucial the created module is to influencing the learning process. For this reason, research was conducted to determine the effectiveness of using learning modules in the development of mathematics teaching materials in the PGSD study program at Musamus University. In contrast to previous studies, this module will be developed by the materials for developing mathematics teaching materials and the demands of lecturers and students for reading materials according to the curriculum. The existence of this research will certainly provide the best solution to improving learning, especially in the course of developing mathematics teaching materials.

This study's objective was to produce a module that is interactive in the development of valid and practical mathematics teaching materials. This research approach is called using the ADDIE approach for research and development. Analysis, design, development, implementation, and assessment procedures are all included in the research process, but in the process of creating this module, only up until the development stage was the research conducted. Students in Musamus University's PGSD program's fifth semester served as the study's subjects. The stages of deployment and evaluation will continue in future studies to assess the efficacy of the use of the module for developing instructional materials for mathematics. A validation sheet was employed as the research tool to evaluate the validity and applicability of the module.

Methodology

This research methodology is a development of a mathematics teaching material module for Musamus University's PGSD study program. The ADDIE model is considered appropriate for developing modules of mathematics teaching materials because of the complex steps involved in its application and evaluation. The development of this model focuses on five fundamental parts, including analysis, design, development, implementation, assessment, and revision. The development process of this research follows the steps of the ADDIE model. The effectiveness test of the products produced is the stage of this study. This study's objective was to create an interactive module on the development of valid and practical mathematics teaching materials. The subjects in this study were one material expert and one media expert. The goal of the study is to determine the feasibility of interactive modules that combine elements of appearance, material, media presentation, and learning aspects. The following is an ADDIE research flow:

Analysis Stage

At this stage, researchers analyzed the need to identify problems that arose using interviews, observations, and questionnaires, as well as conducting material analysis.

Design Stage

At this stage, the researcher designs the concepts and content to be developed and develops evaluation tools.

Development Stage

At this stage, researchers made learning media and validated the materials using two predetermined experts.

Implementation dan Evaluation Stage

At this stage, the finished product will be tested to see if the module is valid and practical. This module will be trialed by students, and data will be collected from the questionnaire given to determine the module's applicability and validity. This research is only at the development stage, so further research will focus on implementation and evaluation.

Results

Module development in this mathematics teaching materials development course was carried out using the analysis stage, design stage, development stage, implementation stage, and evaluation stage of the ADDIE model. The ADDIE model, which has five stages, was used in the development of this mathematics teaching material development module. The analysis stage is the initial step. The observation was used at this point to conduct a needs analysis. The results of the researcher's observations revealed that the lecturer teaching the mathematics teaching material development course only used the lecture method and used the blackboard as a tool for education. The lecturer at the mathematics teaching material development course has not used innovative learning media and instead relies on inadequate teaching materials. As a result, students' learning

outcomes and motivation to learn are low. Direct observation also revealed that, while student mobile phones have not been fully utilized, they do exist and can be used as teaching tools. To improve the independent learning of elementary school teacher education students at Musamus University, interactive modules are expected to be integrated into mobile phones to assist the student learning process. To determine the material that will be used in compiling the module of the mathematics teaching material development course, material analysis is also carried out at this stage. The module material developed must be adapted to the RPS.

Design is the next. The design is carried out at this stage in the creation of modules for mathematics teaching materials. Making a module framework, module display design, storyboard, and assessment instruments are things that need to be done. preparation of teaching materials, practice questions, and other additional features. The learning materials were arranged systematically based on the RPS, then assembled into Microsoft Word and translated into PDF format. The next step is for researchers to create practice questions for each chapter, which will include 10 (ten) multiple choice questions, five essay questions, and questions that can be accessed through a link to the Wordwall application, which contains questions packaged in the form of interactive games. Students will receive 5 points for each accurate answer in multiple-choice questions, while 10 points will be awarded for each correct answer in essay questions. To complement and stimulate students' learning spirits, the questions are presented in the form of games and are attractively packaged. The pictures presented by the researcher and included in the module were imported into it after being obtained from various sources. A pleasant color scheme has been used by the researcher to attract and encourage students to read this module. The assessment tool compiled consists of three parts, namely: media feasibility evaluation by media experts; material feasibility evaluation by material experts; and material and media feasibility evaluation for students. The instrument is arranged in the form of a questionnaire with 5 possible results: very feasible, feasible, quite feasible, less feasible, and not feasible.

Development is the third stage. The collection of relevant materials to the material raised in the module. At this stage, the researcher also validated the accuracy of the material provided by Mrs. Astuti, S.Pd., M.Pd, a lecturer at Musamus Merauke University teaching elementary school teachers who are material experts. The material assessment instrument consists of nine statement items about the substance of the material and five statement items about the feasibility of the material. The assessment instrument is in the form of a 5-point Likert scale: "very feasible," "feasible," "quite feasible," "less feasible," and "not feasible." More details are in Table 1.

Table 1. Assessment guidelines using a rating scale

Scale	Percentage	Qualification	Follow up
5	81% - 100%	Very decent	Minor revision and implementation
4	61% - 80%	Feasible	Minor revision
3	41% - 60%	Decent enough	Partial revision
2	21% - 40%	Last feasible	Total revision
1	0% - 20%	Not feasible	Total revision

On November 11, 2022, this learning material was validated. The following are the results of the material expert's assessment:

Table 2: Preliminary material expert assessment results

Sub-component	Item	Score
Content eligibility component		
Material coverage	1. Clarity of module objectives	4
	2. Depth of material by module objectives	3
	3. Depth of material by module objectives	3
	4. Clarity of material and content	4
Material precision	5. Correctness of data and facts	3
	6. Accuracy of theories and concepts	4
	7. Accuracy of images and illustrations	3
The sophistication of the material	8. Appropriateness to the latest developments in current science	5
	9. Present examples from the local, national, regional, and international environment.	3
The total score of content eligibility components		32/45 x 100% = 71 Feasible
Presentation feasibility component		
Presentation technique	10. Presentation systematics consistency	3
	11. Logicality of presentation and coherence of concepts	3
	12. Appropriateness and relevance of illustrations to the material	4
	13. Motivate the reader	5
	14. Accuracy of typing and image selection	4
The total score of the presentation feasibility component		19/25 x 100% = 76 Excellent

Source: Rafi'y 2022

Table 3. Material expert's comments and suggestions for improvement

No	Comments
1	The module objectives are explained, and each activity uses existing indicators to show how each indicator is met.
2	Much of the material is in descriptive form, so factual ideas and images should be added.
3	Should we emphasize the appropriateness of the concept and image selection?

Researchers used the evaluation given by this validator as a basis for revising the learning materials. On November 14, 2022, researchers met Ibu Astuti, S.Pd., M.Pd. to provide the revised learning materials. The findings of the revision are as follows:

Table 4. Results of material expert assessment after revision

Sub-component	Item	Score
Content eligibility component		
Material coverage	1. Clarity of module objectives	5
	2. Depth of material by module objectives	5
	3. Depth of material by module objectives	5
	4. Clarity of material and content	5
Material precision	5. Correctness of data and facts	5
	6. Accuracy of theories and concepts	5
	7. Accuracy of images and illustrations	4
	8. Appropriateness to the latest developments in current science	5

The sophistication of the material	9. Present examples from the local, national, regional, and international environment.	4
The total score of content eligibility components		43/45 x 100% = 95 Excellent
Presentation feasibility component		
Presentation technique	10. Presentation systematics consistency	4
	11. Logicality of presentation and coherence of concepts	5
	12. Appropriateness and relevance of illustrations to the material	4
	13. Motivate the reader	5
	14. Accuracy of typing and image selection	5
The total score of the presentation feasibility component		23/25 x 100% = 26 Excellent

Source: Rafi'y 2022

One media expert, Mrs. Ni Nyoman Rediani, S.Pd, M.Pd, a lecturer in elementary school teacher education at Musamus University Merauke, validated the learning tools. This instrument has 15 (fifteen) statement items, including 8 items related to content feasibility and 7 items related to development. The evaluation tool is a Likert scale with five possible answers: very valid, valid, moderately valid, and invalid. More details are in Table 5.

Table 5. Media expert assessment results before revision

Sub-component	Item	Score
Content eligibility component		
Characteristics and aesthetics	1. The composition of the module is in line with the module objectives.	4
	2. Proportional use of text and graphics	3
	3. Layout attractiveness	3
	4. Attractive color selection	4
	5. Harmony of text and images	3
Overall content	6. The product helps expand the reader's knowledge.	5
	7. The product is informative to the reader.	5
	8. Overall, the module product encourages the reader's curiosity.	5
Development Components		
Presentation technique	1. Consistency of systematic presentation in chapters	4
	2. Logicality of presentation and coherence of concepts	3
	3. Consistency of substance between chapters	4
	4. Balance of substance between chapters	3
Supporting the presentation of material	5. Appropriateness and relevance of illustrations to the material	4
	6. Appropriateness of images and captions	5
	7. Reference source	5
The total score of content eligibility components		60/25 x 100% = 80 Feasible

Source: Rafi'y 2022

Table 6. Media experts' comments and suggestions for improvement

No	Comments
1	Please improve the writing style; the table of contents page does not match the module content.
2	The cover has been updated to make it more attractive for module users to read.
3	The wording was changed to make it easier for module users to read.
4	The lack of accompanying images makes the module appear monotonous.
5	Increase practice to improve student understanding.

Table 7. Media expert assessment results after revision

Sub-component	Item	Score
Content eligibility component		
Characteristics and aesthetics	1. The composition of the module is in line with the module objectives.	5
	2. Proportional use of text and graphics	4
	3. Layout attractiveness	4
	4. Attractive color selection	5
	5. Harmony of text and images	
Overall content	6. The product helps expand the reader's knowledge.	5
	7. The product is informative to the reader.	5
	8. Overall, the module product encourages the reader's curiosity.	5
Development Components		
Presentation technique	8. Consistency of systematic presentation in chapters	5
	9. Logicality of presentation and coherence of concepts	5
	10. Consistency of substance between chapters	4
	11. Balance of substance between chapters	4
Supporting the presentation of material	12. Appropriateness and relevance of illustrations to the material	5
	13. Appropriateness of images and captions	5
	14. Reference source	5
The total score of content eligibility components		71/25 x 100% = 95 Excellent

Source: Rafi'y 2022

The fourth stage is the implementation stage. Before implementation, an expert test was conducted to ensure the opinions of material experts, learning media and learning design experts, and students regarding attractiveness and feasibility. Learning media specialists and material experts verified the implementation's outcomes. The evaluation stage analyzes the findings from the formative and summative evaluations collected during implementation to assess the product's development and effectiveness. To achieve product improvement, the formative evaluation results will be analyzed in the form of expert validation assessments. Meanwhile, the effectiveness of the resulting product is evaluated using the findings from the summative evaluation.

Discussion

The results showed that the PGSD Department of Merauke University successfully utilized the learning modules. This is certainly interconnected with the process used to create learning modules. The developed module has met the standards in terms of presentation and display of

material, according to the validation of material experts and media experts. Validation conducted by material experts yielded a score of 92, which placed it in the category of "very feasible" in terms of the feasibility of the content and presentation. The findings of the validation by media specialists yielded a score of 95, indicating that the media components of the module generated were likewise in the "very good" category. Students will more readily understand the information by using the module to study because the learning material is illustrated with graphics. The module is made on the curriculum, student needs, and student characteristics. By paying attention to these factors, the developed module can be applied effectively to improve student learning outcomes. Because the resulting module is a combination of material and images, students will be more involved in the learning process. The module is made on the curriculum, student needs, and student characteristics. By paying attention to these factors, the developed module can be applied effectively to improve student learning outcomes. Because the resulting module is a combination of material and images, students will be more involved in the learning process. The use of modules can have an impact on student learning outcomes (Lestari, 2021). Critical thinking skills improve through the use of contextual learning modules based on multiple representations (Ardiansyah et al., 2018). Thus, the module can enhance student learning outcomes when it is created according to the pupils' needs and traits.

Conclusion

The results showed that components are being developed in the course and that developing mathematics teaching materials is feasible to use in the learning process. This is evident from the material expert validation, which received a score of 92, placing it in the "very feasible" category for both presentation and content feasibility. Media expert validation received a score of 95, which also shows that the module is in the "very good" category. Therefore, the use of the module as one of the learning resources to create mathematics teaching materials is highly recommended.

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