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# The Impact of Elementary School Number Learning Module Based on Team-Based Project on Critical Thinking Ability

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**Abstract**

Critical thinking is needed to seek new ideas and discoveries to solve complex life problems in the 21st century. One effort to meet these needs is to use a supportive learning model based on a team-based project. The model is directed to be able to influence the way of thinking of students who are more critical. However, the implementation of this learning has not been supported by mature learning tools, the modules that are currently owned still have some limitations because they were made at the beginning of the program implementation period and of course during that period certain conditions were found in the field that required adjustments and refinements to fit the context. problems encountered in the field. This research is a Research and Development study that uses the development steps developed by Borg and Gall including: 1) Needs Analysis; 2) Teaching Material Development Planning; 3) Design validation; 4) Product trials in small groups; 5) Product revision; and 6) Product trials on large groups. The data and data sources used are: (1) expert assessment data, (2) trial results data on small groups and (3) test results data on large groups. The implementation of this research was in the Tadulako University PGSD study program and the test subjects were students of the 2019/2010 class. The results of the research that has been carried out are the Team-Based Project-Based SD Numbers Learning Module on the Critical Thinking Ability of PGSD Study Program Students based on the results of validation from material experts and media experts as well as from the results of initial field trials and the results of the main field trials it can be concluded that the numbers learning module SD based Team Based Project for PGSD students is said to be Valid and practical so that this module is feasible to use.

**Keywords:** Elementary School Number Learning, Module, Team-Based project, Critical Thinking

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## INTRODUCTION

In contemporary times, the Merdeka Belajar (Independent Learning) program has gained attention for implementation in both public and private higher education institutions. Merdeka Belajar is an initiative by the Minister of Education and Culture of the Republic of Indonesia, Nadiem Makarim, aimed at providing freedom for both teachers/professors and students to innovate, be independent, and creative, ultimately leading to a joyful learning environment. Merdeka Belajar is expected to bring about a transformation in the current classroom-dominated learning system and assessment methods that primarily rely on specific tests. Learning within the Merdeka Belajar framework aims to create a comfortable environment for teachers and students, where learning goes beyond just observing teachers/professors, fostering independent personalities, innovation, the courage to express opinions, and exploring students' inherent abilities since every individual possesses intelligence and talents.

To create the desired learning environment within Merdeka Belajar, the government has introduced learning models that can be used to achieve these goals. Some of these models include team-based project-based learning and the case method. These models align with the learning needs and key performance indicators of higher education institutions, as outlined in Ministerial Decree No. 754/P/2020. The models introduced to enhance learning development require effective learning strategies to ensure that the learning outcomes are highly relevant to the needs of the job market (Rosidah & Pramulia, 2021). According to Franco-Santos & Gomez-Mejia (2015), the team-based project strategy is effective in fostering innovative ideas among learners, as students have confidence in showcasing their best work when collaborating in groups. Therefore, the use of models that stimulate students' ideas and group work is one of the strategies within Merdeka Belajar.

Sunardi & Hasanuddin (2019) explain that effective strategies can enhance student engagement, creativity, innovation, meaningful learning, problem-solving skills in real-life situations, cognitive and manipulative abilities, design skills, technology utilization, application of knowledge, and the ability to combine cognitive and psychomotor skills, thereby sparking creative imagination and critical thinking. The emphasized learning strategy in Merdeka Belajar is problem-based learning conditioned by real-life situations to stimulate students' critical thinking. Critical thinking is crucial for students in the 21st century, as everything is rapidly evolving, including science and technology. Critical thinking is necessary for generating new ideas and discoveries to address complex life problems in the 21st century. Mimbs (2005) states that critical thinking skills are essential for students as a vital skill in the present era. Hasruddin (2009) explains that critical thinking is crucial for students to solve problems and make decisions based on scientific facts. Therefore, problem-based learning and designing strategies that allow students to explore their potential within a group setting can help generate new ideas and make decisions based on scientific facts, thereby enhancing critical thinking skills.

Without critical thinking skills, individuals tend to accept information from various sources without questioning or selecting the information they receive. This often occurs in schools when students express their opinions and encounter opposition from peers, causing them to doubt their own opinions. This happens because of the lack of strong arguments in their expressions. Weak arguments occur due to the students' limited critical thinking skills, preventing them from building strong rationales and claims within their arguments or conclusions. Efforts to meet these needs and indicators, especially in higher education, such as PGSD FKIP Universitas Tadulako, have implemented supportive learning models. One of these models is team-based project-based learning, aimed at influencing students to think more critically. However, the implementation of this learning approach has not been supported by mature instructional materials, such as modules that would facilitate instructors in delivering this model. The modules currently available still have some limitations because they were created at the beginning of the program's implementation. Naturally, during this time, certain specific conditions were encountered in the field that required adjustments and refinements to align with the contextual issues encountered.

This research aims to develop a mathematics learning module for elementary school students (SD) to support the implementation of team-based project-based learning in the course on mathematics teaching models for elementary school students. This research is expected to enhance the quality of the implementation of team-based project-based learning, which can significantly influence students' critical thinking.

## METHOD

This study is a developmental research conducted in the Elementary School Teacher Education Program (PGSD) at Tadulako University, and the trial subjects are students from the 2019/2020 cohort.

The Research and Development (R&D) in this study follows the development steps developed by Borg and Gall, which include: 1. Needs Analysis; 2. Development of Teaching Material Planning; 3. Design Validation; 4. Product Testing with a Small Group; 5. Product Revision; 6. Product Testing with a Large Group.Data and data sources used in this study include: 1. Expert assessment data; 2. Data from testing with a small group; and 3. Data from testing with a large group

There are three steps involved in analyzing the data from this research: 1. Content validity analysis; 2. Design analysis; and 3. Questionnaire analysis. The assessment in module validation includes two aspects: the content of the material and the presentation of learning within the module (Daryanto, 2013). The Normalized Gain Test technique is used to process data in the field test, which includes pretest and posttest data. The pretest is administered to students before learning with the mathematics learning module using the Team-Based Project model, and the posttest is given to students after learning using the same module. The analysis aims to determine whether the mathematics learning module using the Team-Based Project model is suitable for use. It is conducted using the formula for Normalized Gain or N-gain score. The categories are determined using the interpretation of the Normalized Gain index (g), as modified by Hake (as cited in Fadhila, 2017):

**Table 1.** Category of Normalized Gain Index (g)

| Normalized Gain Score | Interpretation |
|---|---|
| $-1.00 < g < 0.00$ | Decrease |
| $g = 0.00$ | Stable |
| $0.00 < g < 0.30$ | Low |
| $0.30 < g < 0.70$ | Average |
| $0.70 < g < 1.00$ | Hight |

## RESULTS AND DISCUSSION

### Preliminary Research and Data Collection

Preliminary research and initial data gathering were conducted by the researcher based on the experiences of the teaching team in mathematics-related courses as initial information to serve as the foundation for the research. This involved field studies through interviews with all course instructors, including those with experience in the subject matter, who were also instructors for the course.

The interviews and observations conducted by the researcher regarding mathematics education, specifically on the topic of elementary school number learning, revealed fundamental issues related to the teaching materials currently in use. The current teaching materials include modules and various books covering elementary school number learning. However, they do not align with the principles of independent learning. The ideal module should simplify and clarify the presentation of learning, focusing on the student and problem-based approaches to stimulate critical thinking.

The research team also conducted a literature review by examining mathematics textbooks, particularly those related to elementary school number learning. This was done to identify theories and theoretical foundations that would be used in the development of the elementary school number learning module based on the Team-Based Project. This step aimed to ensure that the module aligns with the current curriculum. The researcher found that there were no modules presenting Team-Based Project-based learning specifically for elementary school number learning.

### Planning

Based on the information and data collected from the preliminary activities, such as observations and interviews with instructors teaching elementary school number learning, the researcher proceeded with planning. During this stage, several activities were carried out.

Firstly, the research selected six students as subjects for the initial field trial. Next, the researcher began preparing the design of the mathematics module product, considering the intended course learning outcomes. Other preparations included sourcing relevant literature to supplement the module content and ensure alignment with the intended course learning outcomes. Finally, the researcher identified a content validator with expertise in the subject area. Rafiq Badjeber, a permanent faculty member at UIN Datokarama Palu, agreed to serve as the content validator.

**Development of the Initial Draft Product**

The development of the initial draft product began with the determination of the module's structural design, which would be used for the elementary school number learning module based on the Team-Based Project. The researcher adapted the module structure developed by Daryanto, which consists of three main components: introduction, learning, and evaluation. Additionally, other components, such as the cover page, preface, table of contents, module location map, glossary, answer key, and bibliography, were adapted from module structures by Chomsin, S. Widodo, and Jasmadi. The combined structure for the elementary school number learning module based on the Team-Based Project consists of the following sections:

a. Cover/outer cover
b. Preface
c. Table of contents
d. Concept map
e. Module usage instructions
f. Introduction section (description, duration, final objectives, and prerequisites)
g. Learning section (competency standards, learning objectives, core materials, material descriptions, example questions, exercises, summaries, and formative tests)
h. Formative test answer key
i. Glossary
j. Bibliography

Once the structural design was determined, the research team proceeded with the development of the elementary school number learning module based on the Team-Based Project. The prototype module was then provided to the validator for evaluation and validation. Evaluation aimed to gather responses and assessments in the form of feedback, critiques, and suggestions from the subject matter expert regarding the developed module. Evaluation was crucial to assess the module's suitability, identify shortcomings, and correct errors, both in terms of content and media aspects. Validation, on the other hand, involved testing the validity of the elementary school number learning module based on the Team-Based Project according to predefined criteria. The evaluation and validation of the prototype module were performed in two rounds of revisions. The first round addressed content and typographical errors, while the second round focused on improving case presentations for student activities. The validation results from the subject matter expert are presented in Table 2 as follows:

Table 2. Validation Results by Content Expert

| Assessment Indicators | Average | Criteria |
|---|---|---|
| Relevance of content to the given case (problem) | 4.5 | Very Good |
| Accuracy of content | 3.5 | Good |
| Currency of content | 4.5 | Very Good |
| Stimulating curiosity | 4.25 | Very Good |
| Overall Average | 4.18 | Good |

Based on the validation results by the content experts from the first and second validations in Table 1, it can be seen that the validation by content experts, based on the suitability of the

content, obtained the following scores: 1) the indicator of content alignment with learning outcomes (KD) obtained an average score of 4.5 with a classification of "very good," 2) the indicator of content accuracy obtained an average score of 3.5 with a classification of "good," 3) the indicator of content currency obtained an average score of 4.5 with a classification of "very good," and 4) the indicator of stimulating curiosity obtained an average score of 4.25 with a classification of "very good." Based on the average scores obtained, the overall average score based on the content expert's assessment is 4.18 with a classification of "good."

**Preliminary Field Trial**

The preliminary field trial was conducted after the researcher revised the module based on the suggestions from the content experts. The module was deemed suitable and valid for further use. The researcher then conducted a preliminary field trial with a small group of participants who had completed the elementary school number learning material. Therefore, the preliminary field trial was conducted with 6 students from the Elementary Teacher Education Program at FKIP UNTAD. The purpose of the preliminary field trial was to gather the students' responses to the module and their feedback and suggestions would be used by the researcher to improve the module to make it more practical and user-friendly for elementary school students during the main field trial. The students' responses can be seen in Table 3.

Table 3. Student Responses in the Preliminary Field Trial.

| No. | Respondent | Average | Criteria |
|---|---|---|---|
| 1. | 6 students | 4,48 | Very Good |

Based on the research results from the initial field trial, the researcher draws the conclusion that the initial field trial with a small group of 4 PGSD students from different classes who had previously learned integer multiplication in elementary school using the Team-Based Project-based elementary school number learning module obtained an average score of 4.48, categorized as "very good."

**Revisions Based on the Initial Field Trial Results**

Revisions based on the initial field trial results were carried out after analyzing student responses during the initial field trial. These student responses included challenges related to understanding the readings and materials, as well as observations made by the researcher during the module testing process, such as student comprehension levels and their performance on formative tests and exercises. These student responses served as a reference for improving the module to make it more practical. The revised results from the initial field trial were then used for the main field trial.

**Main Field Trial**

The main field trial was conducted after the researcher had made revisions to the module based on student responses during the initial field trial. The main field trial aimed to assess the practicality of using the Team-Based Project-based integer multiplication learning module. This time, the module was tested on a larger group of 12 students.

**Revisions Based on the Main Field Trial**

Revisions to the product were carried out after the main field trial involving 12 elementary school students from three different schools. These revisions aimed to make the Team-Based Project-based integer multiplication learning module more practical. The revisions were made based on the feedback and responses from students during the main field trial.

**Discussion**

The research and development of the Team-Based Project-based elementary school number learning module followed the Borg and Gall model, encompassing stages from 1 to 7, which include Preliminary Research and Data Collection, Planning, Development of the Initial Draft Product, Initial Field Trial, Revisions Based on the Initial Field Trial, Main Field Trial, and

Revisions. This research was conducted in the Elementary School Teacher Education Program at the Faculty of Teacher Training and Education, Tadulako University.

Based on interviews and observations conducted by the researcher regarding mathematics education, specifically on the topic of elementary school number learning, it was found that a fundamental issue was related to the teaching materials used. The textbooks used for elementary school number learning did not provide detailed coverage of the subject matter, and the presentation of material was often brief. For instance, the textbooks did not delve into multiplication of positive and negative integers but immediately explained the commutative property of multiplication. Additionally, clear agreements regarding the operations were not provided. This situation had an impact as students found it challenging to learn independently from home, especially during the COVID-19 pandemic.

In light of these findings, the researcher developed a learning material for elementary school number learning that provided detailed explanations and used clear agreements. The module was designed based on the Team-Based Project approach with the hope of assisting students in their learning, both in school and during times like the current COVID-19 pandemic. This situation requires students to engage in more independent learning at home, with guidance from parents, allowing them to relate the material to their daily lives. Subsequently, the researcher began to develop a prototype of the Team-Based Project-based elementary school number learning module. The module was then provided to content and media experts for evaluation and validation to ensure its suitability for use.

The results obtained after validation by content experts showed an overall average score of 4.18, categorized as "good." The results from validation by media experts also yielded an overall average score of 4.19, also categorized as "good." The combined overall score for content and media validation was 4.18, again categorized as "good."

The Team-Based Project-based elementary school number learning module underwent validation twice before being deemed valid and suitable for field testing. The researcher then conducted the initial field trial, involving a small group of four students from different classes who had previously learned the subject matter.

Based on the initial field trial, the researcher obtained an average score of 4.48, categorized as "very good." After the initial field trial, revisions were made based on student feedback, which included improving the arrangement of content for clarity, replacing difficult words with easier-to-understand synonyms while maintaining the same meaning, adding instructions for easier use of agreements, and simplifying challenging story problems. Following these revisions, the module was tested in the main field trial with a larger group of students.

In the main field trial involving 12 students, the Team-Based Project-based elementary school number learning module obtained an average score of 4.46, categorized as "very good." After the main field trial, further revisions were made based on student responses.

## CONCLUSION

Based on the results and discussion of the research outlined in the previous chapters, conclusions can be drawn based on the research objectives. In addition to the research findings, there are several recommendations that can be considered for the teaching and learning process: 1) There is a need for more creative innovations in developing the Team-Based Project teaching approach to enhance the critical thinking skills of students, with the hope of maximizing the module's utility; and 2) For other researchers, the findings of this study can serve as input and reference for implementing similar teaching methods in their respective teaching environments. This can be followed by testing the effectiveness of using this module in Team-Based Project-based learning to further develop students' critical thinking skills..

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