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Development of Modules Based on Blended Learning Life Cycle Material for Grade IV Students

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Abstract: The issue addressed in this research is the low learning outcomes of students in science lessons, specifically on the water cycle material, in grade IV elementary school using a blended learning model. This problem arises due to the lack of blended learning-based modules or teaching materials in science. Therefore, there is a necessity to develop such modules. This research follows a Research and Development (R&D) approach, encompassing stages such as information collection, planning, product draft development, initial field trials, revision of product test results, field tests, improvement of field test results, field tests, improvement of the final product, and dissemination and implementation of the final product. Data analysis techniques include product feasibility analysis, initial and final data analysis using t-tests and N-gain tests. The results indicate that the developed blended learning-based modules are suitable for use as teaching materials for science lessons on the animal life cycle in grade IV. Validation results show a media validation score of 78% (suitable for use) and a material validation score of 68% (decent). Student response results were 92%, and teacher responses were 93%, both indicating excellent criteria. In conclusion, the development of blended learning-based modules for teaching science in grade IV is deemed feasible and effective in improving students' science learning outcomes. The research recommends that teachers should be more creative in developing learning media to enhance student learning outcomes and processes.

Keywords: Module, blendeb learning, learning outcomes

1. Introduction

Blended learning is a combination of various learning media that involve technology, activities, and methods to create an optimal learning environment for students (Hrastinski, 2019). It provides opportunities for communication, discussion, and active participation, enabling students to access extensive material and broaden their knowledge (Da-Wei et al., 2018). The blended learning model allows students to become active learners and can enhance their motivation to learn.

According to Lochmiller and Lester (2015), teaching materials are all forms of resources used to assist teachers in educational activities, systematically arranged to create an environment conducive to learning. Daryanto (2013) states that modules are subject matter compiled and presented in writing, enabling learners to absorb the material independently. Based on an analysis of student books during interviews and observations, several shortcomings were identified in the teaching materials used in grade IV for theme 1. These include: 1) the material in the student's book is limited to basic knowledge, resulting in a lack of depth without additional guidance from teachers; 2) insufficient illustrations, making the content more abstract; 3) the absence of evaluation questions to assess students' skills and knowledge; and 4) the current teaching materials do not facilitate independent understanding due to their limitations and lack of illustrations.

This problem is evident in the low science learning outcomes of grade IV students at SDN Mangunan Lor. In the 2020/2021 academic year, out of 34 students (13 male and 21 female), only 12 students (35.25%) met the KKM (Minimum Competency Criteria), while 22 students (64.75%) did not, with the KKM set at 70. To address these weaknesses, it is essential to develop blended learning-based modules that help students comprehend abstract and complex concepts more easily and retain the lessons over a long period.

Several studies have highlighted the benefits of blended learning teaching materials. Picciano (2013) found that blended learning materials are effective, efficient, and attractive, also increasing student motivation. Nirahua et al. (2020) demonstrated that blended learning-based astrophysics teaching materials enhance critical thinking skills and are suitable for use. Similarly, Rafiola et al. (2020) showed that learning motivation, self-efficacy, and blended learning positively impact students' academic achievement.

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Given the identified issues and the positive outcomes of previous research, this study aims to develop blended learning-based modules to improve the learning outcomes of grade IV science students. The existing teaching materials primarily include student and teacher books produced by the Ministry of Education and Culture. By developing new teaching materials, teachers can create innovative and creative resources tailored to students' needs, thereby enhancing learning outcomes.

The low learning outcomes in science subjects related to the life cycle of living beings in grade IV are attributed to the suboptimal use of blended learning materials. Analysis shows that current student books provide only basic knowledge, limiting students' understanding without additional teacher guidance. Blended learning should enable students to be independent learners, which requires creative, innovative, and engaging modules. Therefore, developing blended learning-based teaching materials is crucial.

The development of these modules aims to motivate students to become active and independent learners, making learning enjoyable. It also seeks to address the deficiencies in existing student books, ensuring grade IV students can comprehend science material effectively and achieve learning objectives. The goals of this study are: 1) to develop blended learning-based modules for grade IV science lessons on theme 6, 2) to analyze the feasibility of these modules, and 3) to evaluate the effectiveness of the developed modules in improving learning outcomes.

2. Methodology

This study employs development research, specifically Research and Development (R&D), aimed at validating and developing educational products. R&D serves to test the effectiveness and validity of existing products and update them to be more practical, effective, and efficient, or to create entirely new products (Sugiyono, 2016). The development procedure used in this research follows the Borg anf Gall model (1984), which consists of ten steps: 1) Information Collection: Gathering relevant information to understand the current situation and identify needs, 2) Planning: Establishing a detailed plan for developing the product, including objectives, resources, and timelines, 3) Product Draft Development: Creating an initial draft of the product based on the information collected and planning, 4) Initial Field Trials: Testing the initial product draft in a real-world setting to gather preliminary feedback and data, 5) Revision of Product Test Results: Analyzing feedback from the initial field trials and making necessary revisions to the product, 6) Field Tests: Conducting more extensive tests of the revised product to further evaluate its effectiveness and identify any remaining issues, 7) Improvement of Field Test Results: Refining the product based on data and feedback from the field tests, 8) Field Tests: Repeating the field tests to ensure all improvements are effective and the product meets the desired standards, 9) Improvement of the Final Product: Making final adjustments and enhancements to the product based on comprehensive testing and feedback, and 10) Dissemination and Implementation of the Final Product: Distributing and applying the final product in the intended educational settings. The research and development process depicted in Fig. 1. This systematic approach ensures that the developed product is thoroughly tested and refined, ultimately leading to a high-quality educational tool that effectively meets the needs of its users.

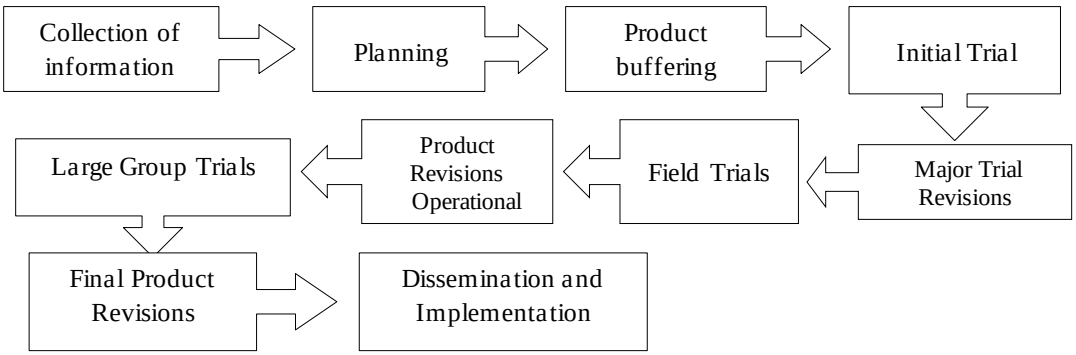


Fig. 1: Stages of Borg & Gall research and development

The study involved teachers and students from SDN Klampok Lor, SDN Mijen 1 Kebonagung, SDN Mijen 2 Kebonagung, SDN Mijen 3 Kebonagung, SDN Babad 1, and SDN Babad 2 as data sources. Two types of data were collected: qualitative and quantitative. Qualitative data, consisting of words, sentences, or images, were obtained through interviews, observations, and questionnaires. Quantitative data, represented numerically, were derived from validations by material and media experts.

Data collection employed non-test techniques, starting with structured interviews conducted with teachers and students. Observations were carried out to gain an understanding of the implementation of grade IV science learning through blended learning. Questionnaires were also used, including product validation questionnaires by material and media experts, as well as questionnaires to assess the needs of teachers and students to test the feasibility of the blended learning modules. These questionnaires were closed-ended to facilitate easier analysis of respondents' answers.

The research instruments included both test and non-test tools, such as questionnaires, interview guidelines, and observation guidelines. The data analysis involved evaluating the feasibility of the model using both quantitative and qualitative descriptive analyses. This included analyzing validation test data and the responses from students and teachers. The validity of the modules was assessed by media experts, linguists, and material experts.

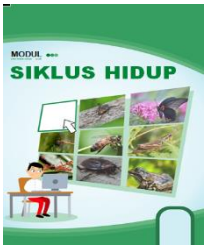
3. Results and Discussion

Interviews with teachers and students revealed that during the Covid-19 pandemic, learning was conducted using a blended learning model. In this model, teachers relied on thematic books provided by the Ministry of Education and Culture for science lessons, without incorporating additional teaching materials. These thematic books contain general information and do not cover the material comprehensively. Consequently, students faced difficulties in understanding the science content, which led to inadequate learning facilities and reduced student engagement in science learning. Teachers also struggled to create supplementary teaching materials to enhance science instruction.

The data showed that more than 75% of teachers and students indicated that blended learning during the pandemic did not motivate students to learn. They expressed a need for science teaching materials that could support teachers in blended learning and help students learn independently. This aligns with the findings of Hartik et al. (2021), which highlighted a lack of Higher Order Thinking Skills (HOTS)-based science books, indicating a need for integrated science teaching materials that promote HOTS in elementary schools.

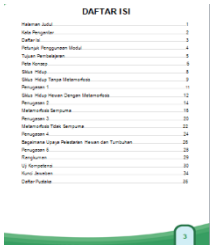
The development of blended learning-based modules aims to provide supplementary teaching materials that assist teachers in explaining the animal life cycle, and help students understand the complete material. The existing thematic materials in the 2013 curriculum are general and incomplete, limiting students' comprehension. The initial draft of the research design for developing these modules included the following steps: 1) curriculum analysis to determine themes, sub-themes, core materials, competency standards (KI), indicators, and learning objectives; 2) setting goals; 3) selecting the material to be included in the module, specifically the grade IV science lesson on the animal life cycle; 4) preparing a lesson plan (RPP) aligned with the media development; 5) establishing development procedures; and 6) identifying validators to assist in validating the product design.

The blended learning-based module is designed as a comprehensive teaching resource focusing on the life cycle of animals. The module is divided into three main sections: introduction, core, and conclusion. The introductory section includes a cover, preface, table of contents, usage instructions, basic competency mapping, and learning objectives. The core section comprises a concept map, main content, sub-materials, and assignments. The concluding section features a competency test, answer key, material summary, and bibliography. This detailed structure ensures that the module serves as an effective educational tool, addressing the gaps in current teaching materials and enhancing both teaching and learning experiences in science education. Fig. 2 shows the media display of modul.



Cover

Foreword



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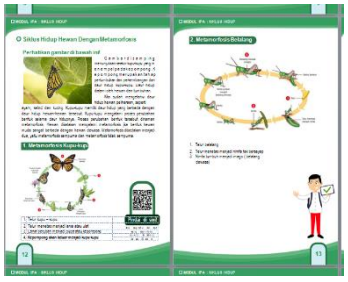
Sub material


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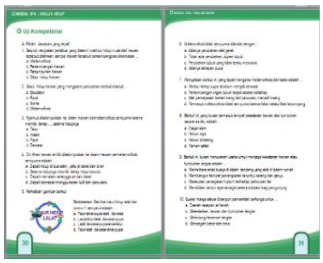
Competency test


Answer key


Library

Fig. 2: Media display

Development Blended learning-based modules are equipped with images in each sub-material to clarify the material presented, in addition to the module design. Blended learning based is made beckground which is attractive according to the characteristics of children of primary school age. Development Blended learning-based modules are also equipped with barcodes that can be scanned and connected with youtube links. Validation of blended learning-based modules by expert media aims to find out whether blended learning-based modules are feasible to be developed in terms of media. The aspects assessed inthe media are the appearance of text, the appearance of colors, the appearance of layouts, the physical appearance and the design of learning messages.

Table 1: Media validation results

Assessed aspects	Indicator	Answer
Text Display	Clear and true text reading	3
	Types of fonts used	4
	Font size used	3
Color display	The suitability of colors in the text	3
	Overall color composition	3
Lay out View	Layout proportions	3
	Design each page	3
Physical appearance	Attractiveness of the front and back covers	3
	Kejelasan QR code	4
	Overall appeal	3
Learning message design	The existence of the principle of readiness	3
	The existence of the principle of concentration of attention	3
	The existence of the principle of active participation of students	3
	The existence of the iteration principle	3
	The existence of the principle of feedback	3
Number of Scores		47
Maximum Score		60
Percentage Value		78
Criterion		Proper

Based on the media validation table for blended learning-based modules, it shows that the results of the percentage assessment for media validation are 78% with decent criteria. The conclusion is that the development of modules based on blended learning is worth testing with revisions as suggested. Themodule is based on blended learning in terms of material consisting of 3 aspects divided into 17 indicators. The aspects assessed are learning, material and curriculum design.

Table 2: Validation results materials

Assessed aspects	Indicator	Answer
Learning	Clarity of product titles	3
	Clarity of user goals or objectives	3
	Clarity of study instructions	2
	Accuracy of application of learning strategies (self-study)	3
	Accuracy in the explanation of the material	2
	The importance of the material in helping the user's understanding	3
	Clarity of instructions for doing practice questions or tests	3
	Clarity of formulation of practice questions or tests	2
	The difficulty level of practice questions or tests	2
Material	Scope (breadth and depth of content of the material)	2
	Clarity of the content of the material	3
	Structure or order of the content of the material	2
	Clarity of the language used	2
	The sequence of questions presented	3
Curriculum suitability	Conformity of basic competencies with core competencies	3
	Conformity of basic competencies with indicators	3
	Conformity of basic competencies with product materials	4
	Conformity of the material to the concept of IPA	3
Number of Scores		48
Maximum Score		72
Percentage Value		67%
Criterion		Proper

The validation results of the blended learning-based module material, with a total score of 48 and a percentage value of 67%, fall within the feasible criteria. This indicates that the blended learning modules are suitable for development from a material perspective. Following this validation, the modules can be tested in grade IV science lessons on the animal life cycle, with necessary revisions based on the validator's recommendations. These suggestions include adjusting the material and competencies on each sheet.

The feasibility test results align with the recognized benefits of teaching materials or modules. According to Dansereau (2014), teaching materials are essential content that students must master through learning activities, and they can be developed and modified to meet specific learning needs. Nordell (2009) further explains that teaching materials serve multiple functions: 1) They guide teachers by directing their activities in the learning process and specifying the competencies that should be taught. 2) They guide students by directing their activities in learning and outlining the competencies they need to master. 3) They act as tools for evaluating the achievement of student learning outcomes.

These findings are consistent with the research by Arini et al. (2021), which argues that modules developed through expert trials, individual tests, small group tests, and field tests show high feasibility. The field trials in Arini et al.'s study resulted in 85% approval from teachers and students, indicating good qualifications. The content experts rated the module's content as excellent, with an 89.7% feasibility score. The learning design was rated very good with an 85.46% feasibility score. Individual trials rated the module as excellent with an 82.85% feasibility score, while small group trials rated it at 81.11%. Field trials involving applied science students and teachers rated the module as excellent, with an 85% score (Arini et al., 2021).

Further supporting this study's results, Nindiawati et al. (2021) found that the feasibility of mathematics teaching materials based on a scientific approach received very valid validation scores from material and media experts. The practicality value of these materials was rated as very practical by class VI teachers, and student responses reached 85%. The student response value, converted using the learner response table, showed that students' responses to elementary mathematics teaching materials were very effective, confirming their feasibility for use during the Covid-19 pandemic in both online and offline settings.

Similarly, Rozhana and Anwar (2022) reported that their validation and field tests resulted in a 90.6% feasibility score, deeming the materials very valid and suitable for learning. This product can be implemented in other grade IV elementary schools. The research by Putri et al. (2022) showed that the learning module's validity score from four

validators using the Aiken index (V) was 0.85, categorized as very valid. The practicality of the learning modules, measured through student responses, was in the very practical category with an 82.5% practicality score. These results suggest that the POE-based chemistry learning module on the colligative properties of solutions is feasible and practical for independent learning during a pandemic. In conclusion, the blended learning-based module is appropriate for blended learning environments. This is evidenced by its alignment with the functions and benefits of teaching materials and learning modules, demonstrating its effectiveness and practicality in enhancing student learning outcomes.

4. Conclusion

Based on the results of this study, the development of a blended learning-based module focusing on the animal life cycle for grade IV science lessons has been tailored to the characteristics of grade IV students and the 2013 curriculum. The module has been validated and deemed feasible for use as teaching material in grade IV science learning. It is recommended that teachers become more creative in developing learning media and integrating digital technology into their teaching practices. This approach can motivate students and enhance their learning outcomes and processes.

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