

Development of a Problem-Based Learning Module on the Topic of Kingdom Plantae at Islamic Boarding Schools

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Abstract: This study aimed to develop an effective biology learning module based on Problem-Based Learning (PBL) for Kingdom Plantae, tailored to the educational needs of students in Islamic boarding school environments. The methodology employed was the Research and Development (R&D) approach using the 4-D model, encompassing the stages of definition, design, and Development, including validation by subject matter and media experts and readability evaluations by teachers and students. The validation results indicated high content and presentation viability, with overall validation scores of 95.74% from subject matter experts and 91.93% from media experts. Positive feedback was also received from teachers and students, suggesting the module's suitability and effectiveness in enhancing material comprehension. The primary limitations include the coverage of only one topic and the need for improvements in presentation techniques and graphic design.

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Introduction

In recent decades, the quality of education has become a significant topic of discussion due to a range of underlying issues, including weak management within the educational sector, disparities in educational facilities between urban and rural areas, inadequate government support, poor quality of teaching resources, and insufficient standards for learning evaluation (Alifah, 2021). These factors have substantially contributed to the decline in educational quality in Indonesia, further exacerbated by challenges in the teaching and learning processes (Fitri, 2021). According to Marzuki (2022), the quality of education heavily depends on the effectiveness of the learning process in enhancing and developing educational resources to support student outcomes and produce high-quality learners.

The disparity in learning resources between urban and rural schools is stark, with students in rural areas often lacking access to adequate facilities such as computer labs and internet connectivity (Vito & Krisnani, 2015). Furthermore, Restiana et al. (2021) noted that teaching materials in some schools are limited to worksheets and textbooks, which are often insufficient in quantity and variety, leading to inadequate library facilities and a lack of diverse teaching methods. This situation poses difficulties for students, particularly in subjects like biology, where instruction is typically lecture-based and lacks variety, thus failing to motivate students effectively.

This issue is also evident at MA Miftahul Ulum Bettet Pamekasan, a school under the auspices of the Miftahul Ulum Bettet Pamekasan Islamic Boarding School. Interviews conducted with biology teachers and students on September 26, 2022, revealed that biology teaching heavily relies on lecture methods and student worksheets, causing students to become quickly bored and struggle with understanding complex topics such as the Kingdom

Plantae, which require numerous examples and illustrations. With their unique environment and learning resources, Islamic boarding schools require a specialized approach to facilitate effective learning (Shulhan, 2021). Using learning modules specifically designed for these conditions can be an appropriate solution. The developed learning modules must accommodate the needs for independent and structured learning that aligns with the learning rhythms at Islamic boarding schools.

Given these challenges, there is an urgent need for teaching materials that can actively and effectively engage students in their learning processes. According to Riski et al. (2020), the success of educational objectives heavily depends on the quality of the teaching materials used. Effective and efficient learning can be achieved with high-quality teaching materials such as learning modules. Modules offer a structured and systematic approach to learning, integrating content, methods, and assessments that can be used independently (Afifah et al., 2018; Zulaiha & Kusuma, 2020). On the other hand, the Problem-Based Learning (PBL) approach has been proven effective in promoting active learning and developing critical thinking skills (Lisniandila et al., 2019; Syahfitri & Sulaiman, 2023). Within Kingdom Plantae learning, this approach enables students to actively solve real problems related to the material (Wulansari et al., 2018), thus deepening their understanding while applying learned concepts in real-life scenarios. The PBL approach also supports the Development of social competencies and collaboration, which are highly valued in the Islamic boarding school environment. Therefore, this study aims to develop a valid and practical Problem-Based Learning module for the Kingdom Plantae topic. The developed module is expected to support students in an independent and interactive learning process at Islamic boarding schools.

Research Method

Research Design

This study employed a Research and Development (R&D) design to produce a Problem-Based Learning (PBL) instructional module. The research adopted the 4-D model (Define, Design, Develop, and Disseminate) developed by Thiagarajan and Semmel in 1974 (Juliarti et al., 2022). This study was conducted up to the development stage through expert validation and the module's teacher and student readability tests. The following outlines the activities at each stage of the research. Define: This stage involved gathering data to identify and analyze the actual needs of students and teachers in the school. Data were collected through observations, interviews with teachers and students, and analysis of existing curriculum documents. The findings from this study were used to design a basic framework for the module that meets the learners' needs. Design and Development of the Module: Based on the preliminary study data, the module was designed to integrate PBL principles. The module's content included the main concepts of Kingdom Plantae, accompanied by contextual problems that students needed to solve. Each unit or chapter of the module included learning objectives, instructional material, PBL activities, and evaluation instruments to measure student competency achievement. Expert Validation: Before widespread use, the developed module was validated by subject matter experts. This validation aimed to assess the feasibility of the module's content, structure, and pedagogical design. Feedback from experts was used to revise and improve the module before field testing.

Data Collection and Analysis

The research was conducted at MA Miftahul Ulum Bettet Pamekasan. Data were collected from the validation and student response surveys. Module validation was conducted

by two expert validators in content and instructional media (Andrianto et al., 2021). Additionally, to assess the readability of the module, responses from teachers and students were measured. The data obtained included both quantitative and qualitative types. Quantitative data came from expert validation results and teacher responses to the module. Qualitative data were derived from student responses to the developed module. Data from expert validation and teacher responses were analyzed descriptively in percentage form. The evaluation criteria for the module by validators included four answer choices: highly suitable (score = 4), suitable (score = 3), less suitable (score = 2), and not suitable (score = 1). This data was then summed and converted into percentages (Selviani, 2019) and categorized into four categories, as shown in Table 1 (Sugiyono, 2016).

Table 1. Module Viability Levels

Achievement Level	Description
76-100%	Highly suitable; no revisions needed
51-75%	Suitably viable, revise as per expert advice
26-50	Insufficiently viable; revisions needed
≤25	Not suitable, must be revised

Based on Table 1, the Development of a biology learning module based on Problem-Based Learning for the topic of Kingdom Plantae is considered viable if it achieves a feasibility percentage between 51% - 75% and 76% - 100%, corresponding to the criteria of "suitable" and "highly suitable". If the percentage is less than 51%, then the developed module is unsuitable for use and needs to be revised.

Result and Discussion

Module Validation Results

The developed module comprises three components: basic competencies, achievement indicators, learning objectives, and the material on Kingdom Plantae, along with examples, following the 2013 curriculum (Ayu et al., 2018). The module validation results by the subject matter expert are outlined as follows.

1. Module Validation by Subject Matter Expert

A subject matter expert validated the developed module to determine the suitability or viability of the module's content. The results of the subject matter expert validation are presented in Table 2.

Table 2. Module Validation Results by Subject Matter Expert

No.	Component	Score
Content Viability		
1.	Material Relevance	9
2.	Material Accuracy	26
3.	Material Support	24
4.	Material Currency	16
Presentation Viability		
1.	Presentation Technique	8
2.	Presentation Support	32
3.	Learning Presentation	4
4.	Learning Support	12
Language Viability		

1.	Clear and Direct	9
2.	Communicative	8
3.	Dialogic and Interactive	8
4.	Suitability for Learner Development	8
5.	Logical and Integrated Thought Flow	8
6.	Use of Terms, Symbols, and Icons	8
Total Score		180
Percentage		95.74%

2. Validation by Media Expert

In addition to validation by the subject matter expert, validation by a media expert was also conducted. This validation aimed to assess the module's viability from the perspective of a media learning expert. The results of the validation by the media learning expert are presented in Table 3.

Table 3. Module Validation Results by Media Learning Expert

No.	Component	Score
Module Size		
1.	Physical Size	8
Module Cover Design		
1.	Cover Layout	13
2.	Attractive and Easy-to-Read Font	12
3.	Cover Illustration	8
Module Content Design		
1.	Layout Consistency	8
2.	Layout Elements	10
3.	Complete Layout Elements	8
4.	Layout for Understanding	8
5.	Simple Content Typography	7
6.	Readable Typography	9
7.	Content Facilitates Understanding	8
8.	Illustrations	15
Total Score		114
Percentage		91.93%

3. Biology Teacher Response

This evaluation aims to ascertain the biology teachers' perceptions of the quality and viability of the module. The summarized results of the teacher's responses to the module are presented in Table 4.

Table 4. Teacher Response to the Module

No.	Component	Score
Presentation Components		
1.	Presentation Technique	4
2.	Presentation Support	29
Content Components		
1.	Material Coverage	8

2.	Material Accuracy	10
3.	Supporting Material	7
Language Components		
1.	Suitability with Student Intelligence Level	5
2.	Communicative	10
3.	Clear and Direct	9
Graphic Components		
1.	Module Cover Design	9
2.	Module Content Design	15
Total Score		106
Percentage		69.73%

4. Student Response

This evaluation aims to determine students' perceptions regarding the quality and viability of the Kingdom Plantae module based on Problem-Based Learning (PBL). The response consists of two parts: first, the students' reactions to the module content in percentage form, which are then categorized; second, comments from students concerning the developed learning module. The data on students' responses to the module content are displayed in Table 5, while comments related to the module are presented in Table 6.

Table 5. Student Responses to Module Content

Student	Percentage	Category
1	87%	Highly Suitable
2	82%	Highly Suitable
3	92%	Highly Suitable
4	92%	Highly Suitable
5	93%	Highly Suitable
6	81%	Highly Suitable

Table 6. Recapitulation of Student Comments on the Module

Student	Comments and Suggestions
1	In my opinion, the quality of the module in terms of usefulness and appearance is good, and we can easily understand it.
2	It was very good for tenth-grade students, and we quickly grasped the material.
3	This module is very useful and suitable for use. It can be easily understood.
4	I found this biology module easy to understand and interested in using it.
5	This module is an excellent learning tool because it contains images with explanations, and the presentation is attractive due to the colourful images.
6	This module is suitable for use because it makes it easy for readers to understand the material.

Subject matter expert validation indicated a high suitability percentage (95.74%), signifying that the module is highly viable in content. Aspects such as material accuracy and support received high scores, demonstrating substantial quality in presenting precise and current material. However, the aspects of presentation technique and learning support received relatively lower scores, indicating the potential for improvement in the way the material is delivered and the interactivity of the module. Additionally, validation by media experts yielded a percentage of 91.93%, indicating a high viability level. Elements such as readable typography and attractive illustrations received positive evaluations, which is crucial

in supporting students' understanding of the material. This underscores the importance of engaging design and accessibility in learning modules.

From the teachers' perspective, the overall score (69.73%) was lower compared to expert validation. This indicates several areas that require enhancement, particularly in material presentation and graphic design. Although teachers acknowledged the accuracy of the content, they suggested improvements in the module's presentation techniques and graphic design. On the other hand, student responses were overwhelmingly positive, with the majority indicating that the module is highly suitable. Student comments confirmed that the module delivers material effectively, is easily understood, and is visually appealing (Sari et al., 2022). This shows that the module has successfully made material engaging and accessible to students, though there is room for improvement, as identified by teachers (Prihatiningtyas et al., 2022).

These findings align with those of previous research. The Development of problem-based learning (PBL) modules for Kingdom Plantae has shown positive results. Previous studies have demonstrated the high feasibility and effectiveness of these modules, which have been validated by subject matter experts, media experts, and teachers, with validation percentages ranging from 85.3% to 96.3% (Turrohman & Hakim, 2022; Firdaus & Pahlevi, 2022; Shafarina & Erviana, 2022). Furthermore, these modules have significantly enhanced students' problem-solving abilities, as evidenced by increased n-gain test scores (Sulistiyaniti et al., 2021). The overall quality assessment of these modules consistently falls into the "highly suitable" or "excellent" category, making them appropriate for enhancing the learning process in biology classes, particularly with a focus on the Kingdom Plantae material (Fadillah et al., 2022).

Nonetheless, the PBL-based learning modules that have been developed possess both strengths and weaknesses. In addition to being PBL-based, the advantage of these modules is that the learning activities are more student-centred, not merely based on rote memory but also on experiences that can enhance student understanding. Moreover, these modules are particularly well-suited for use in schools within Islamic boarding school environments that prohibit students from carrying electronic devices like smartphones, as they include images commonly found in everyday life. However, a limitation of these modules is that they cover only one topic, Kingdom Plantae.

Conclusion

The Problem-Based Learning (PBL) module for the Kingdom Plantae material developed in this study effectively meets the learning needs within the Islamic boarding school environment, integrating learning concepts and practical activities well. Validation by experts and feedback from users affirm the module's viability and effectiveness, marked by improved understanding and student engagement. Although this module offers many benefits, such as supporting independent learning and enhancing comprehension through practical illustrations, some shortcomings need to be addressed, such as limited topic coverage and the need for improvements in graphic design aspects. Going forward, further Development is required to expand the topics and enhance the visual and interactive elements of the module, thereby increasing the learning effectiveness.

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