

Development of a Faith and Piety Integrated Science and Biology Module on Environmental Pollution

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ABSTRACT

This study aimed to develop a science and biology module integrating the values of faith and piety (IMTAQ) and to evaluate its validity, practicality, and effectiveness in the learning process. The module was developed using the 4-D model, which comprises four stages: define, design, develop, and disseminate. The field trial involved 27 seventh-grade students at SMP Negeri 1 Bajeng. Data were collected using validation sheets, student response questionnaires, and learning achievement tests. Data analysis focused on assessing the validity, practicality, and effectiveness of the developed product. The findings demonstrated that the module achieved a high level of quality. The mean validation score of 3.81 indicated that the module was highly valid, while the mean student response score of 3.64 showed that it was highly practical for instructional use. Furthermore, all students achieved learning mastery, resulting in a 100% mastery rate and indicating that the module was highly effective. Based on these findings, the IMTAQ-integrated science and biology module was considered suitable for use as instructional material because it met the criteria for validity, practicality, and effectiveness.

ABSTRAK: Penelitian ini bertujuan untuk menghasilkan modul IPA Biologi yang mengintegrasikan nilai-nilai iman dan takwa (IMTAQ), sekaligus mengevaluasi tingkat validitas, kepraktisan, dan efektivitas modul tersebut dalam proses pembelajaran. Pengembangan modul dilakukan menggunakan model 4-D yang meliputi empat tahapan, yaitu define (pendefinisian), design (perancangan), develop (pengembangan), dan disseminate (penyebaran). Penelitian melibatkan 27 peserta didik kelas VII di SMP Negeri 1 Bajeng sebagai subjek uji coba. Pengumpulan data dilakukan menggunakan lembar validasi, angket respons peserta didik, serta tes hasil belajar. Analisis data difokuskan pada penilaian aspek validitas, kepraktisan, dan efektivitas produk. Hasil penelitian menunjukkan bahwa modul yang dikembangkan memiliki tingkat kualitas yang sangat baik. Nilai rata-rata validasi sebesar 3,81 mengindikasikan bahwa modul berada pada kategori sangat valid, sedangkan rata-rata skor respons peserta didik sebesar 3,64 menunjukkan bahwa modul tergolong praktis untuk digunakan. Selain itu, seluruh peserta didik mencapai ketuntasan belajar dengan persentase 100%, sehingga modul dinyatakan efektif. Berdasarkan temuan tersebut, modul IPA Biologi terintegrasi IMTAQ dinilai layak diterapkan sebagai bahan ajar karena telah memenuhi kriteria valid, praktis, dan efektif

Keywords: *Biology science module, faith and piety (IMTAQ), environmental pollution*

INTRODUCTION

Education is one of the key factors determining the progress of a nation. The quality of a nation is reflected in its capacity to develop and optimize human resources, which is strongly influenced by the quality of its education system. Therefore, improving the quality of education, particularly for students, is essential to producing highly competent and competitive human resources (Makhin et al., 2014).

Education plays a crucial role in promoting the progress and development of society. Through education, students are guided to develop their potential optimally in terms of

spirituality, personality, intelligence, moral character, and skills. This is consistent with Article 1, Paragraph (1) of Law No. 20 of 2003, which defines education as a conscious and planned effort to create a learning environment and instructional process that enable students to actively develop their potential, thereby acquiring spiritual and religious strength, self-control, personality, intelligence, noble character, and the skills required for themselves, society, the nation, and the state (Komariah et al., 2015).

Character education represents an important effort to instill positive values in students so that they develop the knowledge, awareness, willingness, and concrete actions required to practice virtuous conduct. These values concern not only the individual but also one's relationship with Allah the Almighty, other people, the surrounding environment, and the nation and state, thereby supporting the development of good moral character. Therefore, moral values should be integrated into every learning process, including science education, so that teachers not only deliver scientific content but also cultivate moral values, faith, and piety throughout instructional activities (Dewi et al., 2015).

The goals of national education extend beyond the attainment of knowledge to include the development of students' faith and piety. Through education, students are expected to grow into an intelligent generation characterized by faith, piety, good moral conduct, and gratitude for the blessings bestowed by Allah the Almighty in their daily lives. However, these goals have not yet been fully achieved, as educational outcomes remain less than optimal in fostering students' spiritual and moral attitudes. Therefore, educational processes need to place greater emphasis on cultivating faith, piety, and moral character so that students not only excel academically but also develop strong and virtuous character (Dewi et al., 2015).

As a key component of instruction, teaching materials play a strategic role in supporting the success of the teaching and learning process. They provide educators with a framework for organizing and presenting instructional content in a structured, systematic manner aligned with predetermined learning objectives, thereby enabling instruction to be implemented effectively and efficiently. Appropriate teaching materials are essential in every learning activity because, without them, the learning process may be difficult to conduct optimally and the intended objectives may not be readily achieved. One form of teaching material that can support systematic learning is a module, as it helps both educators and students understand the content in a more coherent, clear, and needs-based manner (Fortiana, 2013).

A module is a type of teaching material systematically developed based on syllabus requirements and designed as a complete yet simple and comprehensible unit of instruction. The use of modules enables students to learn independently within a specified period because they contain instructional content, guidance, and learning experiences that are purposefully and systematically organized. In addition to facilitating students' understanding of the material, modules can serve as assessment tools for determining the extent to which learning objectives have been achieved at the end of the learning process. Thus, modules constitute instructional materials that support students in learning more independently, systematically, and in accordance with the intended learning objectives (Fatikhah & Izzati, 2015).

Learning modules should also be designed with a structured, clear, and visually engaging format to facilitate students' learning. A module typically contains instructional content, learning methods that support the learning process, and practical exercises that students can complete independently to help them achieve the expected competencies (Joko, 2017).

The development of an integrated faith and piety (IMTAQ)-based science and biology module represents an appropriate strategy for making biology instruction more authentic, meaningful, and relevant to students' everyday lives. Through this module, biological concepts are understood not only from a scientific perspective but also in relation to the values of faith and piety. Therefore, educators need to continuously improve the quality and innovation of instruction by integrating IMTAQ values into every stage of the learning process so that learning activities not only enhance students' knowledge but also foster positive attitudes and character development (Maiefli & Usmeldi, 2012).

RESEARCH METHOD

This study employed a Research and Development (R&D) approach aimed at developing an educational product and evaluating its validity, practicality, and effectiveness (Sugiyono, 2013). The study was conducted at SMP Negeri 1 Bajeng, with seventh-grade students serving as the research participants. The development framework adopted was the 4-D model proposed by S. Thiagarajan, Dorothy S. Semmel, and Melvyn I. Semmel, which consists of four stages: define, design, develop, and disseminate.

The research instruments consisted of questionnaires and learning achievement test items. To ensure their suitability for data collection, the instruments were first validated by experts. Data were collected to obtain information regarding the results of the module development process based on the 4-D model. The student response questionnaire was

used to assess the practicality of the module, whereas the learning achievement test was administered to evaluate its effectiveness.

Data analysis in this study covered three aspects: validity, practicality, and effectiveness. The validity criteria were determined based on assessments conducted by two expert validators. A mean score of $3.5 \leq M \leq 4$ was categorized as highly valid, $2.5 \leq M \leq 3.5$ as valid, $1.5 \leq M \leq 2.5$ as moderately valid, and $M \leq 1.5$ as invalid. The practicality criteria were derived from student and teacher response questionnaires. A score of $3.5 \leq X_i \leq 4$ was classified as highly practical, $2.5 \leq X_i \leq 3.5$ as practical, $1.5 \leq X_i \leq 2.5$ as moderately practical, and $0 \leq X_i \leq 1.5$ as impractical. Meanwhile, the effectiveness criteria were determined through students' learning achievement tests. Scores above 80 were categorized as highly effective, scores above 60 and up to 80 as effective, scores above 40 and up to 60 as moderately effective, scores above 20 and up to 40 as less effective, and scores of 20 or below as highly ineffective.

RESULTS AND DISCUSSION

Development Stages of the Faith- and Piety-Integrated (IMTAQ) Science and Biology Module

The development of the faith- and piety-integrated (IMTAQ) science and biology module comprised four stages based on the 4-D model: define, design, develop, and disseminate. The procedures undertaken at each stage of the development process are described below:

The first stage in developing the faith- and piety-integrated (IMTAQ) science and biology module was the define stage. At this stage, the researchers conducted several preliminary analyses to identify problems encountered during the learning process and determine the need for appropriate instructional material development (Mirojiyah, 2016). An analysis of student characteristics was conducted to understand students' conditions, abilities, and learning needs when using the IMTAQ-integrated science and biology module. The findings indicated that students' level of understanding remained moderate, highlighting the need for instructional materials that could facilitate a better understanding of the subject matter. A concept analysis was subsequently conducted to identify, elaborate, and systematically organize the key concepts contained in the learning material. This was followed by a task analysis to determine learning activities appropriate to the subject matter and students' abilities. The define stage concluded with the formulation of learning objectives that students were expected to achieve after using the module.

The second stage was the design stage, which focused on preparing Prototype I of the science and biology module. This stage consisted of four phases: initial design, test development, media selection, and format selection. The selected instructional medium was the science and biology module. The module format was subsequently determined by considering several aspects, including visual appearance, content structure, layout, color scheme, illustrations, and writing style. These elements were designed to ensure that the faith- and piety-integrated (IMTAQ) science and biology module was visually appealing, easy to understand, and convenient for students to use. The module predominantly employed green, which conveys a natural, fresh, and calming impression. The use of this color was expected to enhance students' motivation, interest, positive emotions, and enthusiasm throughout the learning process (Purnama, 2010).

The third stage was the develop stage, during which Prototype I of the science and biology module was validated by two expert validators to obtain feedback and recommendations for improvement. The module was subsequently revised based on the experts' comments and suggestions. The revised and validated version was then designated as Prototype II and prepared for field testing.

The fourth stage was the disseminate stage, during which a limited field trial was conducted with students in Class VII A at SMP Negeri 1 Bajeng. The class initially consisted of 30 students; however, three students were absent during the trial. Consequently, the field test involved 27 students as the research sample.

According to Punaji Setyosari's theoretical framework, the study could proceed by considering specific sample proportions, such as 10%, 15%, or 20%, as benchmarks for determining an appropriate sample size (Setyosari, 2016).

Validity Level of the Faith- and Piety-Integrated (IMTAQ) Science and Biology Module

The aspects considered in validating the faith- and piety-integrated (IMTAQ) science and biology module included content structure, language, methods of explanation and presentation, integration, and ease of use (Mustami, 2017). Expert validation was conducted to improve the instructional material and determine its feasibility. The results of the expert assessments are presented in the following table.

Table 1. Assessment Results from the Two Validators

Assessment Aspect	Assessment Results		Σ
	Validator I	Validator II	
Cover Design	3,66	4	3,83
Content Design	3,33	4	3,66

Completeness of the Material	4	3,5	3,75
Content Quality	4	4	4
Overall Mean	Highly Valid		3,81

Based on the data presented in the table, the faith- and piety-integrated (IMTAQ) science and biology module obtained an overall mean validation score of 3.81, placing it in the highly valid category. This result indicates that the developed product was considered appropriate for implementation and field testing with only minor revisions (Fajrianti, 2018).

The assessments conducted by the two validators yielded an overall mean score of 3.81, which fell within the highly valid category of $3.5 \leq M < 4$. The four assessed aspects consisted of cover design, which obtained a score of 3.83; content design, 3.66; completeness of the learning material, 3.75; and content quality, 4.00. Desmiati, Ratnawulan, and Zulkifli emphasized that validity reflects the quality of the alignment between an assessment and the intended indicators within a particular learning category (Desmiati et al., 2017).

Practicality Level of the Faith- and Piety-Integrated (IMTAQ) Science and Biology Module

The practicality of the faith- and piety-integrated (IMTAQ) science and biology module was assessed using questionnaires completed by students and educators after the module had been implemented. The overall results of the students' responses are presented in the following table.

Table 2. Overall Student Response Results

Type of Assessment	Mean Score
Student Responses	3,28
Teacher Response	4
Overall Mean	3,64
Assessment Category	Highly Practica

Effectiveness Level of the Faith- and Piety-Integrated (IMTAQ) Science and Biology Module

The effectiveness of the faith- and piety-integrated (IMTAQ) science and biology module was assessed by administering a multiple-choice learning achievement test to the students. The students' learning achievement test results are presented in the following table.

Table 3. Students' Learning Achievement Test Mastery Level

Category	Frequency	Minimum Mastery Criterion (KKM)
Students Who Achieved Mastery	27 orang	80
Students Who Did Not Achieve Mastery	0 orang	
Percentage of Students Achieving Mastery	100 %	

Based on the data presented above, the percentage of students in Class VII A at SMP Negeri 1 Bajeng who achieved learning mastery reached 100%. Students were considered to have achieved mastery if they obtained a score equal to or higher than the Minimum Mastery Criterion (Kriteria Ketuntasan Minimal [KKM]) of 80. Therefore, the 100% mastery rate indicates that the IMTAQ-integrated science and biology module met the effectiveness criterion. This finding is consistent with Widoyoko's assertion that students are considered to have achieved mastery when they meet the predetermined KKM score, while instruction is considered successful at the class level when at least 80% of students achieve learning mastery (Widoyoko, 2018).

Based on the data presented above, the percentage of students in Class VII A at SMP Negeri 1 Bajeng who achieved learning mastery reached 100%. Students were considered to have achieved mastery if they obtained a score equal to or higher than the Minimum Mastery Criterion (Kriteria Ketuntasan Minimal [KKM]) of 80. Therefore, the 100% mastery rate indicates that the IMTAQ-integrated science and biology module met the effectiveness criterion. This finding is consistent with Widoyoko's assertion that students are considered to have achieved mastery when they meet the predetermined KKM score, while instruction is considered successful at the class level when at least 80% of students achieve learning mastery (Widoyoko, 2018).

CONCLUSION

Based on the findings, the faith- and piety-integrated (IMTAQ) science and biology module on environmental pollution for seventh-grade students at SMP Negeri 1 Bajeng was deemed suitable for use in the learning process. Developed using the 4-D model, the module met the criteria for validity, practicality, and effectiveness. This was demonstrated by a validity score of 3.81, classified as highly valid; a practicality score of 3.64, classified as

highly practical; and a student learning mastery rate of 100%, indicating that the module was highly effective for instructional use.

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