

Designing a Basic Natural Science E-Module: Integrating Eco-Socioscience and Maqasid Shariah for Non-Science Learners

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ARTICLE INFO

Keywords:

E-module;
BNS;
Eco-socioscience;
interdisciplinary learning

Article history:

Received 2024-12-22
Revised 2025-05-19
Accepted 2025-05-29

ABSTRACT

Climate change presents critical challenges to both ecosystems and human well-being, necessitating proactive educational approaches that engage students as future stewards of the environment. A comprehensive understanding that integrates religious, scientific, social, and environmental perspectives is essential to instill moral responsibility in students. This study aimed to develop a Basic Natural Science (BNS) learning module integrated with eco-socioscience and grounded in *maqasid sharia* principles. The research employed the 4-D development model: Define, Design, Develop, and Disseminate. Six experts—two each in material, design, and language—evaluated the module for validity. Practicality testing was conducted with 31 students. Validation results indicated high feasibility: material experts scored the module at 88.33%, design experts at 92.86%, and language experts at 89.16%, yielding an overall validity score of 90.12%. The practicality test returned an average score of 3.99 (out of 5), confirming the module's applicability in real learning environments. The module effectively integrates eco-socioscience content, such as the ecological and social impacts of pollution, while embedding Islamic ethical teachings. Concepts like stewardship (*khalifah*) and the prohibition of waste (*israf*) align environmental responsibility with Islamic values. This fusion promotes environmental awareness rooted in both scientific understanding and religious morality. The BNS module is a valid, practical, and effective educational tool. It successfully fosters environmental literacy and moral consciousness among students through an interdisciplinary and faith-based pedagogical approach.

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1. INTRODUCTION

The escalating global environmental crisis has emerged as one of the most pressing challenges of the 21st century. This degradation is driven by both the rising frequency of natural disasters and irresponsible human activities, including deforestation, land conversion for mining, and high greenhouse gas emissions. The consequences of climate change are becoming increasingly evident, with ecological disasters such as floods, landslides, and coastal erosion severely weakening the resilience of

ecosystems worldwide (Alcántara-Ayala, 2025; Dong et al., 2024; Subramanian et al., 2023). These environmental disruptions also exacerbate issues related to food security, water quality, and public health, posing a serious threat to the well-being of all life on Earth (Edo et al., 2024; Kolawole & Iyiola, 2023; Rahman et al., 2024). Addressing climate change is, therefore, both critical and urgent, requiring collective action across all sectors of society. Students, in particular, play a vital role in shaping sustainable policies and contributing to informed decision-making for a more sustainable future.

Science and environmental education have a vital role to play in addressing the challenges of climate change. It not only provides basic knowledge about natural phenomena, but also develops a deeper understanding of how individuals can contribute to climate change mitigation (Kang & Tolppanen, 2024; Kumar et al., 2023). A holistic approach to science education, which integrates concepts of science, technology and the environment, enables students to understand the complex relationships between these fields and the broader context of climate change (Maspul, 2024). In addition, science education helps foster critical thinking skills, creativity, and sustainable decision-making, all of which are essential in designing innovative solutions to the global environmental crisis (Henriksen, Mishra, & Stern, 2024; Uralovich et al., 2023).

However, many non-science students in higher education still lack in-depth knowledge of environmental issues, even though they have an important role in decision-making that impacts environmental sustainability in policy, business, and everyday life (Rousell & Cutter-Mackenzie-Knowles, 2020; Rousell, Wijesinghe, & Cutter-Mackenzie-Knowles, 2023; Setiaji, Santoso, Aziz, Retnawati, & Khairudin, 2023). To bridge this gap, the Basic Natural Sciences (BNS) course is designed to provide an understanding of the relationship between science, society, technology, and the environment. However, the traditional BNS teaching methods, such as lectures and discussions, tend to be passive and unable to effectively engage students in the learning process, thus limiting their understanding and interest in scientific concepts related to environmental issues (Ntsonde & Aggeri, 2021; Zeidler, Walker, Ackett, & Simmons, 2002). Therefore, BNS teaching needs to adopt more interactive and problem-based learning methods in order to engage students more deeply and encourage their awareness of the importance of contributing to environmental sustainability.

A promising approach is the development of interdisciplinary learning modules that integrate social, religious and environmental aspects. One of these approaches is the integration of *maqāṣid al-sharī'ah* (goals of Islamic law), which emphasizes the protection of religion, soul, mind and descendants (Adiyono, Fitri, & Al Matari, 2024). This framework is in line with the principles of eco-socioscience because it promotes the principles of environmental responsibility and sustainability for future generations. For example, the *maqāṣid al-sharī'ah* emphasize the protection of life (*ḥifẓ al-nafs*) and the welfare of future generations (*ḥifẓ al-nasl*), which is in line with the ecological focus on sustainability and resource conservation in the eco-socioscience approach. Integrating these principles into BNS courses can increase students' moral awareness and responsibility for environmental preservation, as well as provide a more holistic view of the relationship between science, society, and the environment (Y. Al-Qardāwy, 2001; Zeidler et al., 2002).

Several studies have explored the use of e-modules based on science and technology integration, such as research Dina (2023), which shows that STEM-based e-modules improve problem-solving abilities, as well as Meisita (2023) and Herlina (2022), which highlights the effectiveness of problem-based e-modules with STEM integration in fostering critical thinking skills. However, most of these studies focus on elementary to secondary education levels, with limited research on developing e-modules for non-science students in higher education (Zarkasih, Diniya, Permana, & Kirana, 2023). Relevant studies in this context include those conducted by Asiah (2019), which develops BNS modules based on Islamic values, and Permana et al. (2023), which creates an integrated science-Islamic module that is effective in shaping the character of high school students.

However, there is still a lack of research that specifically develops BNS e-modules based on *maqāṣid al-sharī'ah* for non-science students that directly discuss ecological and environmental issues. Most of the existing modules are still text-based and have not been able to encourage active student

involvement in building knowledge, critical thinking, and environmental awareness. In fact, environmental preservation is a shared responsibility, especially for students who will become future leaders and policymakers in encouraging sustainability.

Based on this, this study aims to develop an e-module for BNS courses that integrates scientific, social, religious, and environmental concepts based on *maqāsid al-sharī'ah*. This e-module is expected to increase student involvement in environmental issues and deepen their understanding of the relationship between science, technology, and sustainable living practices. By using socio-scientific issues in learning, this approach can strengthen high-level reasoning skills, which ultimately improve students' scientific literacy and environmental awareness (Tsai, 2018).

This research is expected to contribute to creating a generation of students who have strong scientific knowledge and a high moral responsibility towards environmental preservation, thereby helping to realize sustainable life in the 21st century.

2. METHODS

This research is development research that aims to produce an e-module of Basic Natural Sciences integrated with socio-scientific and environmental factors based on the *Maqāsid al-Sharī'ah* framework. This research uses the 4-D development model (Define, Design, Develop, Disseminate) developed by Thiagarajan (1974). This methodological approach is designed to ensure that the developed e-module has validity and can be applied in real learning situations.

Considering the limitations of time, resources, and research scope, the main focus of this research is on the development stage to ensure that the developed e-module meets the validity criteria and can be used effectively in a controlled learning environment. This stage includes refining and testing the e-module, collecting feedback from material experts, and conducting a trial to ensure its suitability for teaching.

The dissemination phase, which involves distributing the e-modules more widely and in various classroom contexts, is beyond the scope of this study. This phase generally requires additional time and resources, including widespread distribution to educational institutions, teacher training, and long-term evaluation of the implementation. Therefore, the Disseminate phase will be considered as a follow-up step after the completion of this study. This step is necessary to ensure the sustainability of the use and effectiveness of the e-modules in the long term.

By focusing on the development stage, this research ensures that the e-module is well-designed, has been tested, and is ready for further development and implementation in the future.

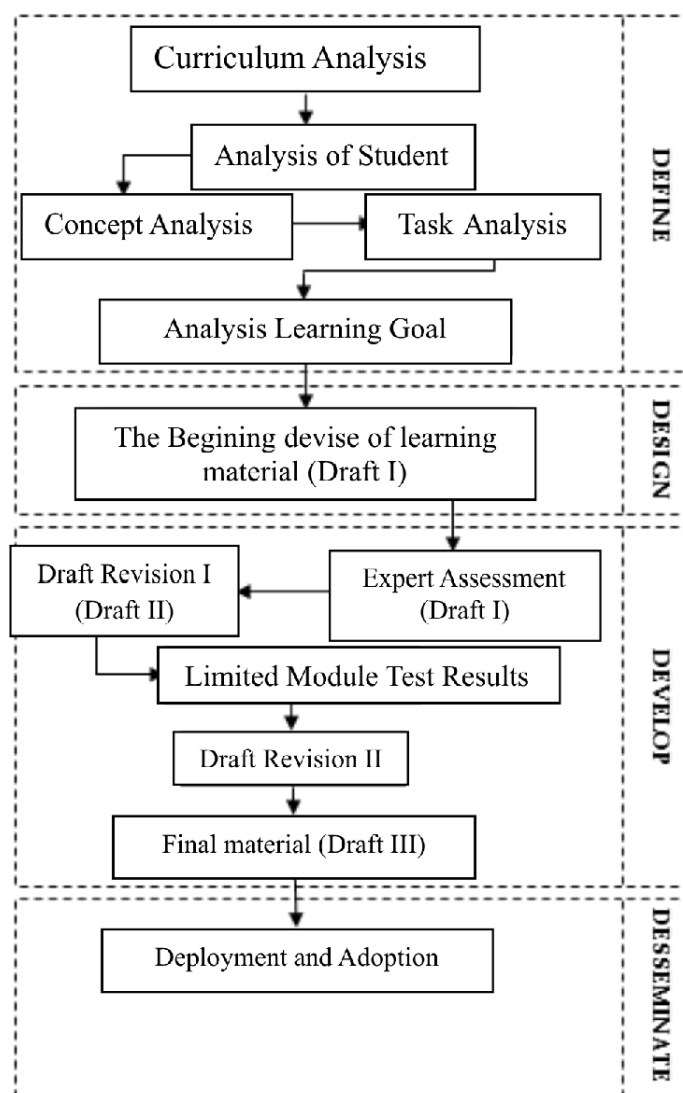


Figure 1. Research design for the development of an integrated BNS e-module Eco-Socioscience based on *maqasid sharia*

In the define stage, the study begins by assessing the needs, objectives, and success criteria in the Basic Natural Sciences learning process. This study involves a comprehensive analysis, including problem analysis, learner analysis, task analysis, concept analysis, and needs analysis. The problem analysis aims to identify the main problems faced by lecturers and students in the existing learning process, especially in the use of e-modules for Basic Natural Sciences courses. Learner analysis is carried out to ensure that the developed e-modules are in accordance with student characteristics, including cognitive development, prior knowledge, and learning motivation. Task and concept analysis focuses on identifying the academic skills needed and key content to be integrated, with a particular emphasis on the principles of eco-socio-science and Maqāṣid al-Sharī'ah.

The design stage involves the creation of the e-module, the selection of an appropriate format, and the design of the materials to be integrated into the final product. This activity includes content development, preparation of written materials, preparation of instruments such as questionnaires for feedback, and creation of a module storyboard. The design of the module emphasizes the integration of scientific content with social and environmental issues, framed by Islamic ethics according to the principles of Maqāṣid al-Sharī'ah. In addition, materials and resources needed for module development are collected to ensure that the final product is comprehensive and effective in meeting the learning needs identified in the previous stage.

At the development stage, the e-module was validated by six experts from various fields, namely two material experts, two design experts, and two language experts. Feedback from these experts was used to refine the module until it became the second draft.

The module was then trialled on a limited basis to 8 students, and their feedback was used to make revisions. After that, a large-scale trial was conducted for further validation, and the module was revised again as needed. The large-scale trial involved 31 students from the Islamic Religious Education Study Program of IAIN Ternate. The students were between 19 and 22 years old and were mostly in their second or third year of study. They had varying levels of prior knowledge about environmental issues and basic science concepts, with most having a general understanding but limited exposure to socio-scientific topics related to environmental sustainability..

Data collected from expert assessment results, limited trials, and large-scale trials will be analyzed using descriptive statistics to assess the validity, practicality, and effectiveness of the e-module. The effectiveness of the module is evaluated through various instruments, including observation sheets, student feedback questionnaires, and interviews with students and lecturers. These data collection methods provide comprehensive insights into the impact of the module on learning outcomes, environmental literacy, and student engagement in learning.

3. FINDINGS AND DISCUSSION

3.1 Findings

3.1.1 Definition Stage

The definition stage in the development of the Basic Natural Sciences (BNS) e-module includes five important aspects, namely problem analysis, student characteristics, materials, assignments, and learning objectives. From the problem analysis, it is known that the teaching materials used by lecturers, such as modules, books, and videos, are still too theoretical, boring, and not in accordance with student characteristics. Students themselves admit that they have difficulty understanding abstract material and feel less motivated in the learning process. Therefore, lecturers and students suggest the need for integration of BNS with social and religious sciences, as well as the preparation of modules that are more interesting, systematic, and present contextual examples. In addition, students are known to have a high interest in BNS, but prefer active learning methods such as discussion, observation, and question and answer, so modules should be designed by considering these learning styles and supported by audiovisual media and experimental approaches.

The lecturer emphasized the importance of modules that not only convey theoretical concepts but also encourage developing critical thinking skills, moral attitudes, and awareness of environmental sustainability. The material in the e-module must be structured concretely and equipped with clear step-by-step guidelines, and linked to real situations in everyday life. In addition, the contents of the module must be integrated between science, social, ecological, and Islamic values based on *maqasid sharia*. Some important themes proposed include understanding the nature of humans from the perspective of science and the Qur'an, the structure and function of the human body, the process of creating the universe, and environmental topics such as water, air, soil, ecosystems, and environmental ethics. The assignments in the module must be exploratory, analytical, and based on problem-solving so that students can better understand and relate scientific concepts to real life.

The purpose of developing this e-module is to improve critical thinking skills, moral character formation, and environmental awareness. Therefore, the design of the e-module needs to consider various technical and pedagogical needs, such as the preparation of an attractive and easily accessible layout, and the provision of clear instructions for use. In addition, the module development process should involve students, lecturers, and material experts so that the content remains relevant and of high quality. The material in the module must be presented interactively and inclusively, and can be accessed by all students, including those with special needs. Additional support in the form of technical

assistance, pedagogical assistance, and learning resources that enrich understanding also needs to be prepared. By fulfilling these aspects, the BNS e-module is expected to be able to support the achievement of learning objectives effectively and comprehensively.

3.1.2 Design Stage

The results of the analysis at the definition stage become the basis for designing the e-module at the next stage. This process includes planning the learning structure, compiling the material content, and selecting interactive elements to be used in the e-module. The preparation of the initial draft begins with the development of an e-module framework consisting of several components, namely the introduction, instructions for using the e-module, mapping of basic competencies, learning outcomes, and sub-learning outcomes. In addition, learning activities are also designed, which include an introduction to the material, learning objectives, material content with video links, summaries, evaluation questions, and a bibliography as additional references.

In terms of visuals and aesthetics, the cover design and page display of the e-module are designed using the Canva application, taking into account the appeal and comfort of reading. This e-module is also equipped with multimedia elements such as images, videos, and interactive layouts. The goal is for students to not only understand the material conceptually, but also to be able to develop critical thinking skills through various learning activities that are presented in an interesting and relevant way. The selection of learning resources is carried out selectively so that the content presented remains valid, up-to-date, and in accordance with the level of understanding of students, especially at the junior high school level.

The Basic Natural Science e-module developed carries an eco-socioscience approach based on *maqasid sharia*, and is presented in PDF format so that it can be accessed flexibly via devices such as computers, laptops, or mobile phones. This e-module is designed to be used in two modes, namely online and offline. Offline, students can download the e-module file, which is around 2.25 MB in size, and share it via the WhatsApp application. Meanwhile, for online access, students can use the edLink platform, a learning management system (LMS) integrated with SIAKAD at IAIN Ternate. This allows wider access and supports efficient and easily accessible learning for all students.

3.1.3 Development Stage

The development of the e-module prototype focuses on organizing content in an interesting and systematic way, including the arrangement of text, images, and layouts that support reading comfort. The user interface is designed to make it easier for students to explore the contents of the e-module, so that the learning experience becomes more enjoyable. This prototype is also equipped with various interactive features, such as trigger questions, essay-style practice questions, and exploratory activities. All of this aims to encourage the development of students' critical thinking skills. In addition, the compatibility of the e-module with various devices such as computers, tablets, and smartphones is also considered so that e-module access can be done flexibly. The development of the e-module prototype focuses on organizing content in an interesting and systematic way, including the arrangement of text, images, and layouts that support reading comfort. The user interface is designed to make it easier for students to explore the contents of the e-module, so that the learning experience becomes more enjoyable. This prototype is also equipped with various interactive features, such as trigger questions, essay-style practice questions, and exploratory activities. All of this aims to encourage the development of students' critical thinking skills. In addition, the compatibility of e-modules with various devices such as computers, tablets and smartphones is also taken into consideration so that e-module access can be carried out flexibly.

The e-module consists of six sections designed based on the results of the needs analysis and the principles of critical thinking. Module 1 contains an introduction to the essence of basic natural science, scientific methods, and scientific attitudes. Module 2 discusses the human mind from a scientific, social,

ecological, and Qur'anic perspective. Module 3 reviews the universe and the solar system from a similar perspective. Module 4 touches on the process of life on earth, while Module 5 focuses on water and the process of life. All of these modules integrate science with social, ecological, and religious values (*maqasid sharia*). The main components of the e-module are visualized in Figure 2 which is not only an illustration, but also shows the systematic structure of the module based on Ennis' critical thinking indicators applied to each learning concept.

After the first prototype was developed, a limited trial was conducted to evaluate the practicality and effectiveness of the e-module. The initial evaluation involved assessments from experts, both in terms of content, media design, and language used, to ensure the overall quality of the module. A trial was also conducted involving a small group of students to see their interactions with the e-module and identify the difficulties they faced. Feedback from this activity was used to refine the product before moving on to a broader formative evaluation stage using the Tessmer evaluation model. This process is important so that the e-module is effective in improving students' critical thinking skills, can shape their character positively, and provide a fun and meaningful learning experience.

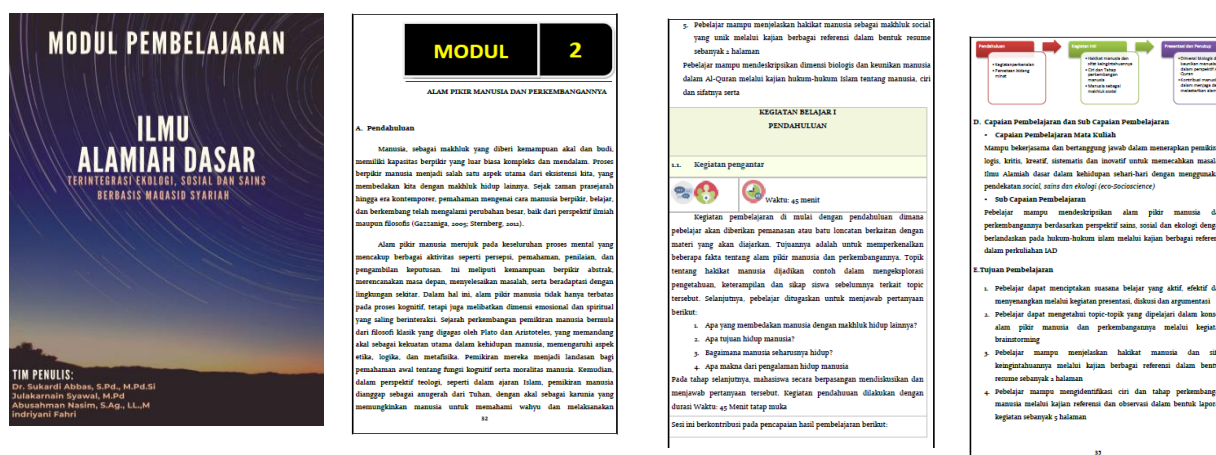


Figure 2. E-module design of basic natural science integrated with eco-socio science based on *maqasid sharia*

3.1.4 Module Validity Test Result Data

A validation test was carried out to assess the extent to which the Basic Natural Sciences learning e-module, which is integrated with eco-socioscience and based on *maqasid sharia* is suitable for use, with a focus on the suitability of content, design and language. Assessment is carried out using criteria with a score range of 0–100%, with the following qualifications: “very feasible” (80–100%), “decent” (61–80%), “quite feasible” (41–60%), “not feasible” (21–40%), and “not feasible” (0–20%). If the average score obtained from material, design and language experts shows the less appropriate or lower category, then the e-module is considered unfit for use. On the other hand, if the score is in the range 61–100, then the e-module is declared feasible or very suitable for use.

The validation data that has been collected provides a comprehensive picture of the level of e-module feasibility based on expert assessments. The following is the validation data from the experts.

Table 1. Recapitulation of Expert Validation Results for Integrated Basic Natural Science Module Material Eco-Socioscience Based on Maqasid Syariah

Validator	Number of Items	Ideal Score	Score Acquisition	Percentage	Qualification	Information
1	12	60	51	85.00 %	Very Worth It	No revision needed
2	12	60	55	91.67 %	Very Worth It	No revision needed
Amount	24	120	106	88.33%	Very Worth It	No revision needed

Based on the results of the development that has been carried out, the validators gave an assessment of the Basic Natural Science learning e-module integrated with eco-socioscience and based on maqāṣid shariah, as shown in Table 1, with a score reaching 88.33%, which indicates that the module meets the established eligibility standards. Referring to the value conversion table, it can be concluded that this module is feasible to use and ready to be tested on students without requiring further revision after the first revision.

However, the validators provided several constructive suggestions, including suggesting increasing the use of verbs in the formulation of learning outcomes to reflect high-level skills, arranging the material so that it is more structured according to learning objectives, adding relevant website links, and complementing the material with images to increase attractiveness and understanding. Apart from that, it is also recommended that the display of the material be made more visually attractive, with a more systematic and clear presentation flow that integrates scientific, social, ecological and maqāṣid sharia aspects. All of these suggestions have been corrected, and the e-module is declared ready for limited testing.

Table 2. Summary of Expert Validation Results for Designing Basic Natural Science e-Module Integrated with Eco Socioscience Based on Maqasid Syariah

Validator	Number of Items	Ideal Score	Score Acquisition	Percentage	Qualification	Information
1	14	70	64	91.43 %	Very Worth It	No revision needed
2	14	70	66	94.29 %	Very Worth It	No revision needed
Amount	28	140	130	92.86%	Very Worth It	No revision needed

The validation results carried out by the expert design validator in Table 2 show a percentage of 92.86% for the development of an e-module for learning Basic Natural Sciences integrated with eco-socioscience based on maqāṣid shariah, which includes 14 indicators for assessing the overall quality of the module. Based on the validation results and referring to the value conversion table, it can be concluded that the developed module has met the requirements for use, which means that this e-module is ready to be tested on students in the learning process.

With a high validation percentage, the researcher does not need to make further revisions because the module has successfully met the standards set by the design expert. However, although the e-module was declared feasible, the validator provided several suggestions for further development, including that the e-module cover include the full title, use a more attractive template image, and add images that are relevant to the material. In addition, other suggestions include improving the layout and using more attractive fonts in each chapter in the e-module. All of these suggestions have been corrected, and the e-module is declared ready to be used in a limited trial.

Table 3. Results of the Summary of Validation Data by Language Experts for the Integrated Basic Natural Science E-module Eco Socioscience Based on Maqasid Syariah

Validator	Number of Items	Ideal Score	Score Acquisition	Percentage	Qualification	Information
1	12	60	54	90.00%	Very Worth It	No revision needed
2	12	60	53	88.33%	Very Worth It	No revision needed
Amount	24	120	107	89.16%	Very Worth It	No revision needed

Based on the data in Table 3, the validator gave an assessment of the Basic Natural Science learning e-module integrated with Islamic values, with results reaching 89.16%, which indicates that this module received a very good evaluation and met the standards that have been set for use in learning. Referring to the value conversion table, it can be concluded that this module is feasible to be implemented among students, without requiring further revision, and is ready to be tested in a real learning context.

This positive assessment provides confidence that the development that has been carried out is in accordance with learning needs, thus allowing the learning process to take place more effectively. The validator also provided several important suggestions related to the development of the e-module, such as improving the use of words, punctuation, and foreign terms and simplifying scientific language to make it easier to understand. In addition, it is recommended that the images used be more active and relevant to the material. The summary covers the entire contents of the material, and includes citations and a bibliography. All of these suggestions have been improved, and the e-module is now declared ready for use for limited trials, with evaluation and input from the validator providing clear guidance for the development of the e-module in the future.

Based on the validation results, the e-module was declared "very feasible" to use, with an average score above 88% in three main aspects: material, design, and language. However, qualitative input from experts also greatly influenced the improvement of the module's quality. In terms of material, the validator suggested increasing the level of thinking in learning objectives using HOTS-level operational verbs, such as "analyzing", "evaluating", and "designing solutions". In addition, the material is arranged more systematically and flows according to learning outcomes, equipped with links to scientific sources and supporting images such as infographics and environmental data. In terms of design, improvements were made to the cover which now contains the full title and thematic illustrations, the layout was made more attractive with different colors for each chapter, activity icons (such as discussion, reflection, and group assignments), and the use of consistent and easy-to-read fonts. In terms of language, sentences were simplified to make them easier to understand, especially for scientific and foreign terms which are now explained or included in the glossary. The validator also emphasized the importance of improving punctuation and sentence structure to improve readability.

3.1.5 E-Module Practicality Test Results

The practicality test of the Basic Natural Science (IAD) e-module aims to evaluate the extent to which the e-module can be applied effectively and efficiently in learning, ensuring that the e-module is easy to use by users, both students and lecturers, and has a logical and intuitive design. According to Arikunto (2010), the practicality evaluation aims to determine whether a product or educational tool can be used properly in real situations, with a focus on ease of use, clarity of instructions, and the ability of the module material to improve student understanding.

Data collection was conducted through a questionnaire that collected student responses related to the practical aspects of the e-module, such as design, ease of use, student engagement and motivation, and suitability of time and workload. The data obtained were then analyzed quantitatively by

calculating the average score or percentage of positive responses, and qualitatively to find the main themes of the responses given, which helped the module developer determine whether the e-module had met user needs or still needed further revision. Data from the practicality test analysis of the IAD e-module can be presented in Table 4.

Table 4. Results of the Practicality Test Data Recapitulation of the Integrated Basic Natural Science E-Module Eco Socioscience Based on Maqasid Syariah

Aspect	Number of Respondents	Average Score	Scale Range Category	Information
Module Design	31	4.05	$4 \leq RK M \leq 5$	Very Practical
Ease of Use	31	4.75	$4 \leq RK M \leq 5$	Very Practical
Engagement and Motivation	31	3.94	$3 \leq RK M \leq 4$	Practical
Time and Workload	31	3.90	$3 \leq RK M \leq 4$	Practical
Average Score Achievement	31	3.99	$3 \leq RK M \leq 4$	Practical

Based on the data in Table 4, the average score of the results of filling out the e-module practicality questionnaire showed very positive results in several aspects. The e-module design aspect obtained an average score of 4.05, which is included in the very practical category (range $4 \leq RK M \leq 5$), indicating that students considered the design of this e-module to be very helpful in the learning process. The ease of use aspect of the e-module also obtained a high score, namely 4.75, which is also included in the very practical category, indicating that students feel this e-module is easy to use and not confusing. In addition, the aspects of involvement and motivation to learn received an average score of 3.94, including the practical category (range $3 \leq RK M \leq 4$), indicating that students were quite involved and motivated while using the e-module. The aspects of time suitability and learning workload were also considered practical with an average score of 3.90. Overall, the average value of the practicality of the e-module was 3.99, which is included in the practical category, thus indicating that this e-module is generally considered practical by students.

This result is supported by qualitative data from student interviews stating that this e-module really helped them understand the material in a gradual and structured manner. One student said:

" The module is easy to follow because the content is relevant to everyday life, uses easy-to-understand language and activity icons that make it easier for me to understand and do the assignments "

Another student added,

" For me, this e-module sharpens thinking skills because the tasks and activities are clear and the timing is right, not too hard, but still challenging."

Several students also mentioned that having integrated study guides and material summaries as well as reference links helped them access other references and understand the material well.

"This module is easy to understand because there are clear instructions and there are also other reference links that we can access, the integrated summary of the material gives us additional knowledge, not just science".

"I am happy because in this module there are discussion activities and case studies. Not only reading, but also being invited to think and tell stories".

Several students stated that this module is easy to access online and offline using PC and mobile devices.

"I usually don't like learning through modules, but because this can be accessed from a cellphone and the language is not complicated, I became interested in learning".

This e-module also takes into account differences in access to technology. Although designed in an interactive digital format, the module can still be printed and used offline, so that it can still be accessed by students who have limited internet connections or devices. All important content is arranged so that it does not depend on online features, and each external link or source is given an alternative in the form of a summary of the material in the e-module.

3.2 Discussion

The development of this Basic Natural Science e-module was motivated by the limitations of the previous module which tended to present material theoretically without considering the real context and ethical dimensions. To overcome this, this module was designed by combining the eco-socioscience approach and the maqasid sharia principle to create a more holistic and meaningful learning experience. The eco-socioscience approach helps students understand scientific issues in relation to the environment and society, while the maqasid sharia principle integrates religious, ethical and moral values into the learning process. Through this integration, the development of the module not only focuses on understanding scientific concepts, but also encourages students to realize the relationship between science, religious values, and social responsibility. Thus, this e-module aims to produce graduates who are not only intellectually intelligent, but also have ecological awareness and ethical commitment to the welfare of the people and the environment.

The e-module was developed using the 4-D model (define, design, develop, disseminate) from Thiagarajan, but only up to the develop stage. The module structure includes an introduction, introduction, and learning activities that are equipped with evaluations. This is in accordance with Kusnadi (2017), who emphasized the importance of clear learning objectives in the module. The validation results from material, design, and language experts showed that this module obtained an average score of 90.12%, which is categorized as very valid. This means that the contents and appearance of the module have met quality standards and are suitable for use in the learning process.

One of the advantages of this e-module is its ability to present complex material in an interesting and easy-to-understand way, according to Setiawan's (2020) findings that interactive modules can improve student understanding and make the learning atmosphere more enjoyable. In addition, the integration of Islamic values helps students develop scientific and spiritual attitudes simultaneously.

The implementation of e-modules of Basic Natural Sciences based on eco-socio-science that integrate real case studies, reflection, and socio-environmental impact analysis has proven effective in improving students' critical thinking and problem-solving skills. This approach not only challenges students to understand scientific issues in depth, but also to evaluate their impact on society and the environment, and to design solutions based on Islamic ethical values.

In the context of education, the SSI-based approach can be integrated with the principles of maqasid sharia, which emphasize the importance of maintaining a balance between human needs and environmental sustainability. For example, in the topic of environmental pollution, students are not only asked to explain its causes and impacts, but also to evaluate the social consequences of such pollution and design community-based educational campaigns that are in line with Islamic teachings, such as waste recycling programs.

The reflection process that students undertake during learning enables them to connect scientific knowledge with social and religious values. This encourages them to develop creative solutions that are not only scientifically effective, but also ethical and applicable in their social context.

During the trial of the eco-socio-science based BNS e-module, students showed significant positive behavioral changes. They not only improved their critical thinking skills, but also began to voice concrete solution ideas. This phenomenon reflects an increased sense of social responsibility and active involvement in learning. Previous research supports these findings. A study by Utami, Kurniasih, & Pursitasari (2023) developed a climate change e-module based on Socio-Scientific Issues (SSI) and found that the use of this e-module improved students' critical thinking skills with an N-Gain value of 0.78, and increased sustainability awareness with an N-Gain value of 0.45. Students also gave a positive response to this e-module, with an average score of 91%.

In addition, research by Dewi, Suwono, & Susanto (2023) developed an e-module based on Problem-Based Learning (PBL) that integrates disaster mitigation into environmental change material. The results showed that this e-module was effective in improving students' critical thinking skills, with a high N-Gain value in the experimental group compared to the control group. The relationship between local industrial practices and environmental degradation asked by students is in line with the SSI-based approach, which emphasizes the importance of social and scientific issues in learning. This approach encourages students to think critically and seek sustainable solutions to environmental problems.

Overall, the results of the e-module trial indicate that the eco-socio-science-based approach can improve students' critical thinking skills, sustainability awareness, and sense of social responsibility and active involvement in learning. The main challenges during implementation were students' adaptation to the digital platform and limited access to technology. In addition, some students were not yet familiar with the interdisciplinary approach and the context of *maqasid sharia* in science learning. To overcome this, the developer provided an offline version of the module (in PDF format) and provided instructions to students on how to use the module effectively. Lecturers were also actively involved to provide guidance in implementing discussions and evaluations based on case studies.

This e-module has great potential to be applied in various educational institutions. By adjusting to the local curriculum and context, this module can be a learning reference that integrates science and Islamic values to form an intellectually and spiritually intelligent generation (Suharto, 2021). With an interactive and integrative approach that strengthens conceptual understanding and character formation of students, this basic natural science module is proven to be valid, practical, and effective. This e-module also significantly improves students' critical thinking and problem-solving skills, and shows a real impact on their attitudes and behavior in dealing with science and social issues responsibly. This e-module can be an important reference in the development of 21st-century teaching materials that unite science, values, and real action.

4. CONCLUSION

This study successfully developed an e-learning module for Basic Natural Science courses that integrates eco-socioscience with *maqāṣid shariah* principles. The module demonstrated high validity, as confirmed by expert validation: material experts rated it at 88.33%, design experts at 92.86%, and language experts at 89.16%, resulting in an overall validation score of 90.12%. Student responses further confirmed the module's practicality, with an average score of 3.99, indicating its suitability for effective learning. Despite these promising results, the study's limitations include its focus on a single discipline and a relatively short-term evaluation. Future research should expand the application of this integrated approach to other fields, such as social sciences or economics, to examine its interdisciplinary relevance. Additionally, longitudinal studies are needed to assess the long-term effects of the module on students' environmental attitudes and behaviors. Further exploration of its adaptability across diverse cultural and educational contexts will also help ensure broader applicability. The integration of *maqāṣid shariah* into environmental education offers a distinctive perspective by merging ecological awareness with

spiritual and ethical obligations, fostering a more comprehensive and value-driven understanding of sustainability that transcends material concerns.

Acknowledgements: Our gratitude goes to the Rector of IAIN Ternate, who has given us assistance with research funding. We also express our gratitude to all parties who have given us the opportunity and convenience to complete this research.

Conflicts of Interest: This research has no conflict of interest.

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