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Research Article

Development of e-modules based on science literacy and Islamic values in ecosystem materials

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Abstract: In the reality of general education, many teachers still use conventional teaching materials, namely teaching materials that are ready, can be purchased instantly, without having to plan, prepare and organize themselves. The purpose of this study was to determine the feasibility of developing e-modules based on scientific literacy and Islamic value in biology learning on ecosystem material for class X IPA at MA Mu'allimat NU Kudus. This Study use he 4-D research model which was modified into a 3-D development model by eliminating the disseminate stage so that the research was only carried out until the develop stage. The subjects of the product trial totaling 42 students. Data collection techniques with validation instruments by material expert lecturers, media expert lecturers, practitioners, and the student response questionnaire. The results of the material expert validation were obtained "very feasible", the results of the media expert validation were obtained "very feasible", and the results of the biology teacher's validation were also obtained "very feasible". Student response to the e-module was obtained "very feasible". So that this research succeeded in developing e-modules and is very suitable for use as teaching materials. The results of this study are expected to answer the need for media in learning activities, besides that it is also able to motivate teachers to develop more in class.

Keywords: ecosystem materials; e-modules; Islamic values

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1. Introduction

In accordance with the existing reality, there are still teachers who use conventional teaching materials, namely teaching materials that are purchased instantly and are ready to use, without having to compile them independently. Learning media used such as statements are not appropriate to context, uninteresting, monotonous and not in accordance with students' needs (Puspitarini & Hanif, 2019). Common forms of learning media are usually textbooks sold at bookstores, and worksheets purchased from cheap book bazaars that often come to school (Aminatun et al., 2016). In fact, educators only focus on conventional teaching materials and there is no creativity to develop the media used. Therefore, an innovative e-module is needed to support student learning that can be studied anywhere.

Based on observations at one of the Islamic senior high school *(Madrasah Aliyah)* in Kudus, it shows that the obstacle for class teachers is time constraints. The teacher only uses textbooks in conveying learning to the class, so it needs to be supplemented with other teaching materials as additional material. This becomes important for teachers to develop learning media, because developing learning media can help students, so they don't only have textbooks to use as learning media, but can have several learning media that can help students develop knowledge and help understand information by easier.

whereas, teachers rarely combine biology material with scientific literacy. According to Azimi et al., (2017), scientific literacy is not enough to achieve learning goals such as cognitive, affective, and psychomotor and can also apply learning goals in everyday life so that they can be used by themselves and for society.

UU no. 2 of 2003 concerning the National Education System has stated the functions and objectives of education listed in Chapter II Article 3, which states that national education functions to develop capabilities and form dignified national character and civilization in the context of educating the nation's life, aiming at developing the potential of students so that become a human being who has faith and is devoted to God Almighty, has noble character, is healthy, knowledgeable, capable, creative, independent, and becomes a democratic and responsible citizen (Khunaifi & Matlani, 2019). In order to achieve educational goals, Islamic-based institutions must instill Islamic values contained in the *Al-Qur'an* and *As-Sunnah* to students. Students are not only trained and required to be academically intelligent, but also required to be spiritually intelligent, so that educational goals can be achieved. In an effort to achieve educational goals, media/teaching materials are needed that support the learning activities of students who develop their academic abilities and spiritual attitudes (Bachtiar et al., 2018).

Scientific literacy is important in the world of education. Education is the main thing that can support the progress of a country and is a standard that is used as a reference for the quality of the current education system (Dragoş & Mih, 2015). The country will be far behind from other countries if it does not prioritize the quality of education. So far, the quality of education in Indonesia still needs to be improved. This can be seen from the development index and the results of the PISA (Program for International Student Assessment) report. According to PISA data, Indonesia is ranked 6th or 74th out of 79 countries. Along with the low literacy of students in Indonesia, this will also lead to low students' ability to think critically. In Indonesia, students' reading skills are still in the low category with scores ranging from 397 to 371, followed by mathematics scores from 386 to 397 and science from 403 to 396. Nationally, skills in mathematics are 77.13%, reading is 46.83%. and science ability 73.16% (Avvisati et al., 2018; Liansari et al., 2021). The results of the survey prove that problems with reading preferences and literacy in Indonesian society can be serious. Therefore, currently the Indonesian people are required to be able to play an active role and cultivate life with literacy. Literacy is not only understood as the reader's ability to use what he reads for life skills (Tiarina et al., 2022). Therefore, learning literacy in the context of reading and writing is a requirement that must be met.

Biology learning needs to be packaged into interesting learning, and biology lessons can also make students more active. Can use e-modules to help teachers make their students more active and independent. E-modules are the result of developing print modules into digital modules (Sugihartini & Jayanta, 2017). Electronic modules can display text, images, animations and videos through electronic devices such as computers and Android. Current technological advances can allow e-modules to be accessed via a smartphone (android)(Adriani & Sabekti, 2018). Electronic modules can reduce paper consumption in the learning process. In addition, this electronic module must be used interactively and as an efficient and effective learning alternative (Imansari & Sunaryantiningsih, 2017). This module is expected to equip students with new learning resources and improve understanding of concepts and student learning outcomes.

Teaching materials used by teachers often present content without examples or everyday questions, so the selection of materials used can also harm students' academic abilities and integrity. As a result, students most often read without understanding how to apply the concepts they have learned in their environment. The advantage of e-module material is that students can easily access learning anytime, anywhere using various devices and computers so that participants can receive direct feedback and fully master the material (Syamsurizal et al., 2015). Choosing media in the form of an Android application has many advantages: it is efficient and easy to carry anywhere.

Ecosystem e-modules that contain material related to everyday life will be used as a reason for developing literacy-based ecosystem e-module materials. The e-modules

created will contain material on scientific literacy and Islamic values, which are related to daily life and linked to Islamic values so that students can easily understand the contents of the e-module.

Learning biology is considered to be one of the most difficult subjects to learn. Biology is a natural science subject that has concrete and abstract material concepts (Halimah et al., 2022; Imansari & Sunaryantiningsih, 2017). This is one of the causes of students' difficulties in learning. As for one material that often causes misconceptions in students, namely the concept of ecosystem (Asih & Saptono, 2021; Gulcan et al., 2015). The existence of misconceptions about the concept of ecosystems among students at the SMA/MA level, the researchers developed an e-module on ecosystem material. So, the purpose of this study was to determine the feasibility of developing e-modules based on scientific literacy and Islamic value in biology learning on ecosystem material for class X IPA at MA Mu'allimat NU Kudus.

2. Material and Methods

This type of research is Research and Development (R&D). This research aims to produce a product, which will then be tested for the quality of the product. This research produces learning media in the form of e-modules based on scientific literacy in biology subjects on ecosystem material. The e-module will be tested for feasibility through validation by material expert lecturers, validation by media expert lecturers, validation by material expert teachers, and will be tested on students. The referenced development research model is the 4-D model (Gorbi Irawan et al., 2018) with slight modifications due to research limitations so that it only reaches the 3-D stage by eliminating the disseminate stage.

The subjects for this e-module product trial were 42 students of class X IPA 1 at MA Mu'allimat NU Kudus. The technique of taking this subject is done by using random sampling technique by means of a spinner to determine the subject. The data collection instruments used in this study were interview guides, questionnaires or questionnaires used to test the feasibility of e-modules based on scientific literacy and Islamic values in ecosystem material, as well as research documentation.

The data analysis technique used in this research is qualitative data analysis and quantitative data analysis. The qualitative data analysis technique refers to the Miles and Huberman analysis model with several stages, namely data reduction, data display, and conclusion drawing (Hashimov, 2015). Quantitative data analysis techniques Product feasibility data were obtained from questionnaires filled in by material expert lecturers, media expert lecturers, biology teachers and trials on students. The systematics of writing this feasibility questionnaire includes: title, respondent's identity, subject matter, subject matter, general instructions for filling out and scoring, as well as question items using a Likert scale such us Table 1.

Table 1. Likert scale assessment score

No	Criteria	Score
1	Very good	4
2	Good	3
3	Not good	2
4	Very poor	1

The value given uses a scale of one to four for the response "very poor, poor, good, to very good". The level of measurement of this data scale uses an interval scale. The media expert validation questionnaire test can be carried out by comparing the total score of respondents (∑) with the total ideal score (N). The formula used is as follows (1).

$$P = \frac{\sum R}{N} \times 100\% \quad (1)$$

Information:

P = Percentage score (rounded)
∑ = The total score of the answers given by each respondent
N = Total ideal score in one item"
The validation criteria in media research are presented in Table 2.

Table 2. Criteria for data validity questionnaire of media experts and material experts

No	Achievement Level (%)	Qualification	Description
1	81-100	Very good	Very fesible/ Very valid/ does not need to be revised
2	61-80	Good	Eligible/ valid/ does not need to be revised
3	41-60	Not good	Less feasible/ less valid/ Need to be revised
4	21-40	Very poor	Notfeasible/ invalid/ Need to be revised

Based on the Table 2, product development will end when the assessment score for this learning media meets the eligibility of the material, media in the product and product quality. Thus, e-modules based on scientific literacy and Islamic values in ecosystem material are categorized as feasible.

3. Results

This research is the development of the R & D model with reference to the 4-D development model with a slight modification to 3-D without the disseminate stage so that the research is carried out up to the develop stage because it is included in the unlimited research stage. The product results in this study are e-modules based on scientific literacy and Islamic values in ecosystem material.

The results of the validation of the material expert lecturer, media expert lecturer, and biology teacher are in accordance with the provisions of the validity criteria from Suharsimi Arikuto. And the feasibility indicators for e-modules based on scientific literacy and Islamic values in this ecosystem material refer to the BSNP from Urip Purwono 2008. The validation results of material expert lecturers can be seen in Table 3, for the material expert questionnaire with as many as 52 statements consisting of 5 aspects, namely aspects content feasibility, presentation feasibility aspects, contextual assessment, scientific literacy, and Islamic values. The results of the material expert validation of e-modules based on scientific literacy and Islamic values in the ecosystem material above obtained a total of 170 with a maximum score of 208 with a percentage of 81% and stated in very feasible criteria. This shows that the e-module based on scientific literacy and Islamic values used is very feasible to be tested on students through prior suggestions and revisions from the material expert validator.

Table 3. Material expert validation results

Aspect	Total of Aspect	Maximum score	Percentage (%)	Criteria
Content feasibiliti aspect	52	68	76	Feasible
Aspects of presentation feasibility	44	52	84	Very feasible
Contextual assessment	31	36	86	Very feasible
Science literasy	19	24	79	Feasible
Islamic values	24	28	85	Very feasible
Total number		170		
Maximum score		208		
Precentage		81		
Criteria		Very feasible		

The results of the media validation can be seen in Table 4, for the media expert validation questionnaire as many as 41 statements consisting of 2 aspects, namely the aspect of graphic feasibility and the aspect of language feasibility. The results of the validation of media experts on e-modules based on scientific literacy and Islamic values in the ecosystem material above get a total of 157 with a maximum score of 164 with a percentage of 95% and are stated in very decent criteria.

Table 4. Results of media expert validation

Aspect	Total of Aspect	Maximum score	Precentage (%)	Criteria
Graphic feasibility aspects	112	76	100	Very feasible
Aspects of language feasibility	45	48	93	Very feasible
Total number		157		
Maximum score		164		
Precentage		95		
Criteria		Very feasible		

The results of the validation by practitioners, namely the biology teacher were asked to fill out a validation questionnaire totaling 17 statements covering 7 aspects, namely the writing approach, correctness of the material and concepts, language and clarity of sentences, attractiveness, format, evaluation, and glossary. And it can be seen in Table 5, the results of the biology teacher's validation of e-modules based on scientific literacy and Islamic values get a total of 59 with a maximum score of 68 with a percentage of 86% and is stated in very decent criteria.

Table 5. Biology teacher validation results

Aspect	Total of Aspect	Maximum score	Precentage (%)	Criteria
Writing approach	4	4	100	Very feasible
Material truth and concept	13	16	81	Very feasible
Language and clarity of sentences	19	20	95	Very feasible
Attractiveness	11	12	91	Very feasible
Format	6	8	75	Feasible
Evaluation	3	4	75	Feasible
Glossary	3	4	75	Feasible
Total number		59		
Maximum score		68		
Precentage		86		
Criteria		Very feasible		

This revision stage is carried out when the validation process by material expert lecturers, media expert lecturers, and biology teachers has been completed. The results of this validation are in the form of assessments and suggestions from the validator to improve the weaknesses and deficiencies of the e-module product. The e-module will be repaired so that it is feasible to be tested on students. For revisions of material expert lecturer validators and media experts can be seen in Table 6.

Table 6. Suggestions and input of all validators

No	Suggestions and feedback	Follow-up
	Material Expert Validator	
1	It is necessary to add Islamic values in each sub-chapter related to the material.	Islamic values have been added in each sub-chapter.
	Material Expert Validator	
1	The location of KI and KD is separated into upper and lower parts.	Improvements have been made in accordance with suggestions and input from the validator.

After validation by material expert lecturers, media expert lecturers, and biology teachers, it was declared very feasible to be tested on students. This limited trial involved 42 students of class X IPA 1 MA Mu'allimat NU Kudus which was held on August 6 2022. Data was collected through a response questionnaire to e-modules based on scientific literacy and Islamic values in ecosystem material directly in class. Student response questionnaires to e-modules based on scientific literacy and Islamic values totaling 14 statements covering 3 aspects, including aspects of interest, material, and language. The results of students' limited trials of e-modules can be seen in Table 7.

Table 7. Student response results

Aspect	Total of Aspect	Maximum score	Percentage (%)	Criteria
Interest	837	1.008	83	Very feasible
Theory	685	840	81	Very feasible
Language	414	502	82	Very feasible
Total number		1.936		
Maximum score		2.350		
Precentage		82		
Criteria		Very feasible		

The results of the limited trial of class X IPA 1 MA Mu'allimat NU Kudus students consisted of three aspects that became e-module assessments based on scientific literacy and Islamic values in ecosystem material, namely interest with a percentage value of 83%, material with a percentage value 81%, and language with a percentage value of 82%. Thus, from all these aspects an average score of 82% is obtained, which means that e-modules based on scientific literacy and Islamic values are very suitable for use as teaching materials.

4. Discussion

The results of preliminary observations explained that there was a lack of teaching materials that applied material to everyday life and Islamic values, and limited time for teachers to conduct biology lessons. This is because this madrasa is based on a pesantren which balances religious learning and general learning, so there is a need for opportunities for independent learning with supporting teaching materials. The difference in the application of the types of learning methods causes learning objectives that are difficult to reach(Coman et al., 2020), and learning methods that are applied are not optimal if they do not vary, especially the use of technology (Mahmud, 2019). The challenge in the learning process using technology is that it is difficult to detect and respond to the media used by students, where equipment is increasingly sophisticated but the use of digital technology is not yet mastered, ultimately affecting the content to be learned (Lodge et al., 2018).

Furthermore, the initial design of e-module products based on scientific literacy and Islamic values in ecosystem material is in accordance with the indicators in the syllabus. After that, collect sources from books or others to develop e-modules, as well as collect images and videos that are relevant to ecosystem material. A good presentation will make it easier for students to deepen the material presented and the e-module (Kurniawan & Syafriani, 2021). Technology-based learning presents innovations and challenges for its implementation such as connectivity, portability, flexibility, and the autonomy of students (Howe et al., 2018; Zaheer et al., 2018). Clarity and ease in exploring e-module content makes it easier for students to operate and obtain the information to be learned(Wijaya & Vidianti, 2020).

After that, create a module design through the Canva application which is saved in pdf format. Next, the module will be converted into an e-module using Flip PDF Professional. The results of e-module product planning based on scientific literacy and Islamic values were then validated by material expert lecturers, media expert lecturers, and high school biology teachers. After being validated, e-modules based on scientific literacy and Islamic values in ecosystem material will be tested on students. The development of e-modules is categorized as feasible because it combines various professional programs to improve the quality of science and student literacy (Perdana et al., 2017). the connection between the hardware and software of technology-based learning media can affect educational information in accordance with the goals to be achieved (Sung et al., 2016).

The results of the feasibility test of e-modules based on scientific literacy and Islamic values in ecosystem material by material expert lecturers, media expert lecturers, and biology teachers stated that e-modules based on scientific literacy and Islamic values in ecosystem material were declared very feasible. The e-module by the validator gets very good qualifications because the content presented is in accordance with learning. this can be achieved because of the clarity of identity, indicators, and learning objectives contained in the E-module, so that students understand learning material(Salfia, 2021). material that is clear and easily understood by students helps them to learn and achieve good learning outcomes (Rajabalee & Santally, 2021).

From the results of the student responses showed a very good response to the e-module. after being tested on students, and getting a good response because the advantage of e-modules based on scientific literacy and Islamic values that are developed is that they are effective when used anywhere and anytime (Diani et al., 2021; Parinduri et al., 2022). In the subject matter there are materials, pictures, videos, exercises, information related to the material, and quizzes which are then combined with daily life and Islamic values contained in each material in accordance with the arguments of the *Qur'an* and *hadith*. Developing complete features and providing convenience in accessing e-modules will give students the opportunity to explore learning materials that complement their needs (Istuningsih et al., 2018; Murniyanto et al., 2022). The drawback of the e-module being developed is that it requires tools in the form of cellphones/computers/laptops and internet networks to access e-modules based on scientific literacy and Islamic values in ecosystem material because they are not available offline.

5. Conclusions

Based on the results of validation by material expert lecturers, media experts, and biology teachers. The validation results by material expert lecturers were obtained from the feasibility assessment of 81% with the criteria "very feasible", the validation results by media expert lecturers obtained a feasibility assessment of 95% with the criteria of "very feasible", and the biology teacher validation results obtained an eligibility assessment of 86% with the criteria " very worth it". The results of students' trials on e-modules based on scientific literacy and Islamic values in ecosystem material, obtained an assessment of 82% with the criteria of "very feasible" from the aspects of interest, material, and language. So, in this study it was successful in developing e-modules with validation results and student responses showing that e-modules based on scientific literacy and Islamic values

in ecosystem material for class X IPA at the high school level were very suitable for use as teaching materials.

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