Islamic Literacy-Based Physics E-Module with STEM (Science, Technology, Engineering, and Mathematics) Approach

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Abstract. Lack of Islamic literacy-based physics e-module motivated the researchers to develop said module since education is not only aimed at producing skillful individuals in the scientific and technological fields but also have high religious awareness to face the current global development. This study was intended to produce an Islamic literacy-based physics e-module with a STEM approach through the ADDIE development model which consists of 5 stages, namely Analysis, Design, Development, Implementation, and Evaluation. Data collection techniques used were non-test instruments in the form of material expert validation sheets, media expert validation sheets, religious expert validation sheet, a questionnaire for tenth-grade physics teachers, and a questionnaire for tenth-grade students. This research has succeeded in developing an Islamic literacy-based physics e-module. The average scores obtained from the material, media and religious experts validations were 88%, 89%, and 90% respectively. The recapitulation of the questionnaire's percentage put the developed e-module into a feasible category. The average percentage of the teacher response was 87%. The small group trial obtained an average percentage of 85% while the field trial obtained an average percentage of 86% within the very interesting category.

1. Introduction
The world is currently facing the industrial revolution era 4.0 [1]. It is an industrial revolution with advances in information technology that can integrate the world digitally so that it can fundamentally change the way of life and work processes [2, 3]. The term industrial revolution 4.0 was born from the fourth industrial revolution. The European Parliamentary Research Service states that the industrial revolution had occurred four times where the first industrial revolution was marked by the invention of the steam engine to the fourth revolution which was marked by the rapid development of sensor technology, interconnection, and data analysis [4-7].

This industrial revolution 4.0 is an era where human life is oriented towards digital technology [8–10]. This era is a challenge for the current generation because the problems in the industrial revolution
era are more complex and humans must be able to survive to overcome the problems [11]. In preparing for the challenges, the nation's successors or students must be equipped with quality and effective education [12], one of which is the method or learning model used in the learning process at school [13].

Learning is essentially a process of interaction between teachers and students, both direct interaction such as face-to-face activities and indirect interaction by using various learning media [14]. Physics as part of school subjects is the most basic science because it relates to the behavior and structure of objects. The main goal of all sciences, including physics, is generally considered to be the attempt to find order in human observations of the natural surroundings [15].

E-module is an electronic teaching material that is used to help teachers and students in the learning process [16–18]. E-modules are written so that students can learn independently without direct guidance from the teachers [19]. Teachers do not need to directly teach the students because modules already containing materials, methods, limitations, and evaluations which are systematically designed and interesting to achieve the expected competencies. The module can help students describe abstract through images, photos, charts, schemes, and others.

Literacy is synonymous with comprehensive language skills which consist of the ability to listen, speak, read, and write [20]. Literacy requires sensitivity regarding the relationships between textual conventions and the context of their use. Ideally, this ability is used to reflect critically about these relationships [21,22]. Someone with this ability (literate) possesses the ability to think, analyze, decide, act, and solve problems creatively based on the consideration of scientific information obtained previously [23]. Teaching materials can also be said to be all forms of material that will be used to assist teachers/instructors in carrying out learning activities. The form of teaching materials can be grouped into four, namely: printed teaching materials, audio teaching materials, audio-visuals, and interactive teaching materials [24]. Islamic literacy is a person’s development of spiritual-divine qualities based on strengthening through the study of Islamic noble values. and tauhid uluhiyah and tauhid rububiyah values. A person also can have good Islamic literacy as a form of gratitude to Allah the almighty [23].

E-modules can help schools in realizing quality learning because they are presented in well-structured, independent, and thorough manners as well as has clear output [25]. E-module is an effective teaching material for visual, active, and recreational students [26]. Also, it can be used as an alternative form of presenting teaching materials during learning, including physics learning [27]. The existing physics e-module is linear that contains concepts, principles, examples of problems and their solutions, and practice questions [28]. E-module is less associated with religious values and science because the goal of education is not only to produce skillful individuals in the scientific and technological fields but also to have high religious awareness to face the current global development [29]. The learning process in schools not only requires students to know and understand the material conveyed by teachers but also understand that the order in this universe cannot be separated from the power of Allah the almighty [30].

Teachers can improve students' scientific literacy through the STEM approach [31,32]. STEM is a learning approach that has a problem-based approach between science and technology and their application [33,34]. Islamic values seem to be one of the most important forces in the needs of human life today [35] because Islam is a religion that pays great attention to science (science-friendly). The development of scientific literacy alone cannot solve all the problems without good Islamic literacy skills. This understanding can form virtuous, civilized, and developed human beings through the knowledge they have. The understanding of the values of tauhid uluhiyah and tauhid rububiyah is also a person's ability to properly literate in Islam as a form of gratitude to Allah [23]. This is in line to implement the 2013 curriculum to create students with good characters to God and fellow humans [36]. The 2013 curriculum focuses on the scientific education approach which is an approach that emphasizes five steps in obtaining knowledge (observing, asking, reasoning, trying, and managing) [37].
2. Research Method
This study was research and development research to produce a particular product according to needs. It consists of the initial design step, product testing to find weaknesses, and product revision until finally a product that is considered ideal is found [38]. The development model used was the ADDIE model which consisted of five stages, namely Analysis, Design, Development, Implementation, and Evaluation [39].

**Table 1. The Development Procedure of Islamic Literacy-Based E-Module**

| ADDIE Development Model | Development Stages                                      |
|-------------------------|---------------------------------------------------------|
| **Analyze**             |                                                         |
| Teacher Analysis        | Analyzing the results of interviews and preliminary observations |
| Student Analysis        | Analyzing the results of initial interviews with students related to the implementation of learning |
| Curriculum Analysis     | Analyzing the curriculum to find out the curriculum used in school and analyzing the syllabus to find out the suitability of the material to the e-module that will be developed |
| Learning Media Analysis | Learning media analysis aims to find out what media used by teachers in the physics learning process so far |
| **Design**              |                                                         |
| Designing the e-module  | Designing the initial e-module                           |
| **Development**         |                                                         |
| Material Experts Validation | Material experts analyze and view material based on the core competencies and learning objectives. |
Data had been collected through non-test instruments in the form of material expert validation sheets, media expert validation sheets, religious expert validation sheets, questionnaires for the teacher, and questionnaire for students. The data analysis was performed to determine the feasibility of the revised e-module. The questionnaires contained the Likert scale. It was used to measure one's or group’s attitudes, opinions, perceptions toward events, or symptoms social [40].

3. Result and Discussion
At the analysis stage, observation and interviews with teachers had been conducted. This preliminary research included observation of activities during the learning process, the use of learning media, interviews with physics teachers, principals, curriculum representatives, as well as distributing questionnaires to students. The analysis results showed that the curriculum applied at the school had been accompanied by learning media. However, the learning media has not been optimal and rarely associate physics with Islamic values. The teacher only used printed books, PowerPoint, and has never developed an e-module based on Islamic literacy with the STEM approach. After the needs analysis had been carried out, the next stage was designing the e-module. The e-module specifications can help teachers and students in the learning process. At the e-module design stage, the first step was to determine the cover design using Corel Draw, develop components such as text, pictures, sample questions, animation, audio, video, glossary, and evaluation tests. Furthermore, all the components that had been made were put together using Pageflip 3D Professional software. After the e-module had been successfully designed, the next step was the development stage. At the development stage, the researcher conducted a media feasibility test through product validation. The product validation was carried out after initial product creation. The validation was carried out by 8 experts, consisting of 2 material experts, 2 media experts, 2 language experts, and 2 religious experts.

The initial average score given by the material experts was 85%, after revision, the average score improved to 88% within a very feasible category. The measured aspects consisted of the quality of content, language, feasibility, visual appearance, and usefulness. The experts suggested improving the writing according to formal language rules as well as adjustments to verses of the Qur’an. The details of the results of validation by material experts can be seen in Figure 2.
Figure 2. Material Experts Validation Results

The initial average score given by the media experts was 83%, after revision, the average score improved to 89% within a very feasible category. The measured aspects consisted of the media display, sound aspects, media attractiveness, and ease of use. The average overall percentage of all aspects increased because it followed the validators’ input and suggestions. The detail can be seen in Figure 3.

Figure 3. Media Experts Validation Result

The average score obtained from the religious experts was 90% within a very feasible category. The measured aspects consisted of the quality of material content and Islamic literacy, the accuracy of coverage, appropriateness of verses of the Qur’an, tauhid uluhiyah, tauhid rububiyah, and language. The experts suggested correcting the writing to match the Qur’an, the verses should be relevant to physics material, and provide a precise explanation. The results can be seen in Figure 4.
After going through the validation test by experts, the e-module was tested to the teacher and students. The physics teacher scored 87% with a very interesting category. The measured aspects consisted of the media display, the use of e-modules, instructions, appropriateness of images, animations, audio, video, simulation, concept suitability, use of language in the material description, and material delivery. The details are presented in Figure 5.

The results of a small group trial with a total of 10 respondents obtained an attractiveness percentage of 85% within a very attractive category. The measured aspects included the media display, the use of e-modules, the instructions, image compatibility, animation, audio, video, simulation, concept compatibility, the use of language in the description of the material, and the material delivery. Furthermore, the results of a field trial with 40 respondents obtained a percentage of 86% within a very interesting category. The measured aspects included the media display, the use of e-module, the
instructions, image compatibility, animation, audio, video, simulation, concept compatibility, the use of language in the description of the material, and the delivery of the material. Students responded enthusiastically. These results indicated that the Islamic literacy-based physics e-module with the STEM approach can be accepted by the students to serve as independent learning materials in learning activities in the classroom. The details are presented in Figure 6.

An evaluation had been conducted based on the revision and the results of trials. Some of the suggestions were adding attractive and up-to-date pictures and animations. Based on the results of product revision, the product was retried which resulting in positive responses from teachers and students. They stated that the e-module was appropriate and interesting, it can be said that the e-module had been completely developed to produce the final product. Table 2 represents the final product of the e-module.

**Table 2. Islamic Literacy-Based E-Module with STEM Approach**

| No | E-Module Display and Information | Description |
|----|----------------------------------|-------------|
| 1  | ![Image](E-Module.png)            | The front page contains the solar system material. The e-module using the 3D Pageflip professional software that can be viewed in 3d. |
Display the image sphere 3D effect. This display contains a summary of material on the solar system and Islamic literacy so that readers can immediately understand the explanation.

The zoomed-in slide which explains the phenomenon of a solar eclipse. If you want to read it, you have to enlarge it to make it clearer.

Display of Islamic literacy Material. Islamic literacy is associated with the material of the earth’s rotation and its revolution. It contains an explanation of the Qur’anic verses accompanied by its meaning.
5 The display of 3D space video. This video can be viewed from all directions with an attractive appearance. It describes the phenomenon of a total solar eclipse that has occurred in Indonesia.

6 The display of 3D space animation. This animated video contains the rotation of the solar system that is very interesting and can explain the various planets in the solar system.

7 The e-module is equipped with audio of Qur'an recitation to be used in explaining a phenomenon in the solar system.

8 The evaluation contains exercises to see students' solar system knowledge after listening to the explanation.
The research has succeeded in developing a physics e-module based on Islamic literacy for the solar system material. The research results were in line with several previously done types of research. One of which is research on the development of Flash Kvisotv Flipbook on a straight motion for the tenth-grade senior high school students which obtained a feasible category with a percentage of 84.31% [41] Development research of student worksheet on static electricity material oriented to the value of the Qur'an for the ninth-grade students made learning easier led students to the spiritual attitude with the percentage of 83.59% in the very feasible category [42]. Furthermore, research on Islamic literacy & scientific literacy as quality assurance of Indonesian people in the era of globalization found that a high-quality society is shown by good scientific literacy skills and good Islamic literacy skills as a form of gratitude to Allah [23]. Research on the application of STEM-based integrated chemistry learning media has previously been carried out to assess the feasibility of the media before it is applied. The validation results showed that learning media was valid [43]. Research on interactive electronic module (e-module) obtained a very proper assessment based on the aspects of appearance, design, programming, and utilization [44]. Then, the web-based e-module research is suitable for use as a medium for high school physics learning with generally excellent categories [45]. Furthermore, interactive multimedia development research on the implementation of STEM-based outdoor learning was developed based on the learning design that had been created by the development team [46]. The STEM model is widely used in research because it is currently an alternative to science learning and can develop the potential of the younger generation to face the challenges of the 21st-century. The STEM approach has several benefits, including solving several problems, making students become innovators, inventors, independent, logical thinkers, and literate towards technology [47].

4. Conclusion
An Islamic literacy-based physics e-module has been successfully developed through the ADDIE development model. The results of the validation by the material, media, and religious experts obtained average scores of 88%, 89%, and 90% respectively. The recapitulation of the questionnaire at the product validation stage put the e-module in the very feasible category. The average score obtained from the teacher's response was 87%, the average score obtained from the small-group trial was 85%, and the average score obtained from the field trial was 86% in the very interesting category.

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