Development of science e-modules with the STEM (Science, Technology, Engineering, and Mathematics) approach for islamic schools

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Article Info	ABSTRACT
Article history: Received: January 12, 2024 Accepted: July 13, 2024 Published: July 31, 2024 *Keywords:* E-module Islamic school Sains STEM	The current development of education demands students to compete globally with modern technological knowledge. This research aims to develop a science e-module with the STEM approach embedded with religious values for students of madrasas, pesantren, and integrated Islamic schools. The research method used is research and development with the ADDIE model. Data were collected through observation, interviews, documentation, and questionnaires, which were then analyzed using qualitative and quantitative approaches. The results of the material expert validation reached 93% (excellent), and media expert validation reached 92% (excellent). This e-module is considered practical with a practicality test result by educators of 81% (excellent) and attractive according to users with a test score of 80% (very attractive). This module integrates religious values within the science material using the STEM approach to stimulate students and support science learning in the context of Islamic education. This research has implications for developing technology-based learning materials in Islamic educational institutions.

Pengembangan e-modul sains dengan pendekatan STEM (*Science, Technology, Engineering, dan Mathematics*) untuk sekolah islam

Kata Kunci:	ABSTRAK
Kata Kunci: E-modul Sekolah islam Sains STEM	Perkembangan pendidikan saat ini menuntut peserta didik untuk bersaing secara global dengan pengetahuan teknologi modern. Penelitian ini bertujuan mengembangkan e-modul sains dengan pendekatan STEM bermuatan nilai religius untuk peserta didik madrasah, pesantren, dan sekolah islam terpadu. Metode penelitian yang digunakan yaitu research and development dengan model ADDIE. Data dikumpulkan melalui observasi, wawancara, dokumentasi, dan angket kuisioner yang kemudian dianalisis dengan pendekatan kualitatif dan kuantitatif. Hasil validasi ahli materi mencapai 93% (sangat baik) dan validasi ahli media mencapai 92% (sangat baik). E-modul ini dinilai praktis dengan hasil uji kepraktisan oleh pendidik sebesar 81% (sangat baik) dan menarik menurut pengguna dengan nilai uji sebesar 80% (sangat menarik). Modul ini mengintegrasikan nilai-nilai religius yang dikemas dalam materi sains dengan pendekatan STEM untuk menstimulus peserta didik, sehingga mampu mendukung pembelajaran sains dalam konteks pendidikan islam. Penelitian ini berimplikasi bagi pengembangan materi pembelajaran berbasis teknologi di institusi pendidikan Islam.

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1. INTRODUCTION

The current Industrial Revolution 4.0 has succeeded in changing the face of education as a whole [1]–[4]. The massive transformation from offline to online learning is taking place quickly, coupled with the Covid-19 pandemic [5]–[8]. This condition requires educators and students to get used to the learning process using technology and teaching media that also comes into contact with technology and its derivative products [9]–[11]. Teaching materials are not spared from this major change. Books, modules, and media are now transformed into more concise digital forms. We know it as an e-book, e-module, or others.

Developing electronic modules is one of the most rapid [12], [13]. Electronic modules are the latest innovation from printed modules, where these electronic modules can be accessed with the help of computers and other electronic media [14]. Electronic modules are relatively small in file size, so they can be stored on an external drive. They are easy to carry, are equipped with animations, simulations, and learning videos, and can determine learning completion through interactive self-evaluation [15].

In science learning, technology's role is indispensable and has even evolved into a separate scientific discipline combined with other areas, such as technology, engineering, and mathematics, collectively known as STEM [16]–[19]. While there is extensive research on STEM in developed countries, there is a noticeable gap in studies linking STEM education with religious values, particularly in Indonesian contexts. Despite the growing interest in Islamic educational institutions in Indonesia, there remains a significant lack of STEM teaching materials that integrate religious values [20], [21]. The lack of integration between teaching materials and religious values creates various problems in both educational, moral, and social contexts. Combining STEM and Islamic values will become a new strategy in education, aiming to create a generation that masters science and technology, is creative, and possesses positive Islamic character.

Public interest in sending their children to Islamic educational institutions is increasing yearly, characterized by the proliferation of Islamic boarding schools, integrated Islamic boarding schools, madrasas, and the decline in public school interest [22]. Based on this explanation, this research aims to fill this gap by developing the STEM e-module that incorporates religious values, specifically designed for use in Islamic-based schools such as madrasahs, Islamic boarding schools, and integrated Islamic schools. The innovation lies not only in the content that marries scientific and religious education but also in the digital format of the e-modules. These e-modules are eco-friendly alternatives to traditional paper-based materials and provide a platform that offers diverse multimedia learning options, which are not feasible with printed materials. Integrating religious values into STEM education is particularly novel, catering to the unique needs of the growing population attending Islamic educational institutions in Indonesia.

Research on the development of e-modules with a STEM approach has been widely conducted, including the development of STEM-based chemistry e-modules with an ethnoscience approach [23], STEM-based e-modules to foster independent learning [24], STEM-based e-modules to facilitate critical thinking skills [25], STEM-based e-modules for senior high school students [26], and STEAM-based e-modules [27]. However, none of these studies have integrated religious values into STEM-based e-modules for Islamic education.

This study aims to develop a science e-module with a STEM approach that integrates religious values for students in madrasahs, pesantren, and integrated Islamic schools. Unlike previous studies, the e-module developed in this research not only focuses on science and technology aspects but also incorporates religious values that are essential in

Islamic education. By integrating these religious values, it is expected that the resulting e-module can provide more holistic and profound learning and improve the quality of science education within the context of Islamic education.

Contribution to the literature

This research contributes to:

- This research can serve as a reference for developing other technology-based teaching materials in Islamic educational institutions, supporting innovation in teaching with a holistic approach that integrates scientific knowledge and religious values.
- It makes an important contribution to the literature on the use of digital technology in Islamic education, particularly in the context of STEM-based e-modules.

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2. METHOD

The research was conducted in April until November 2022. This type of research is research and development (R&D), adopting the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model [28]. The researchers developed the STEM e-module containing religious values based on investigating issues arising in classroom activities in several Madrasahs in Bandar Lampung. Preliminary research revealed that students used printed modules as learning media.
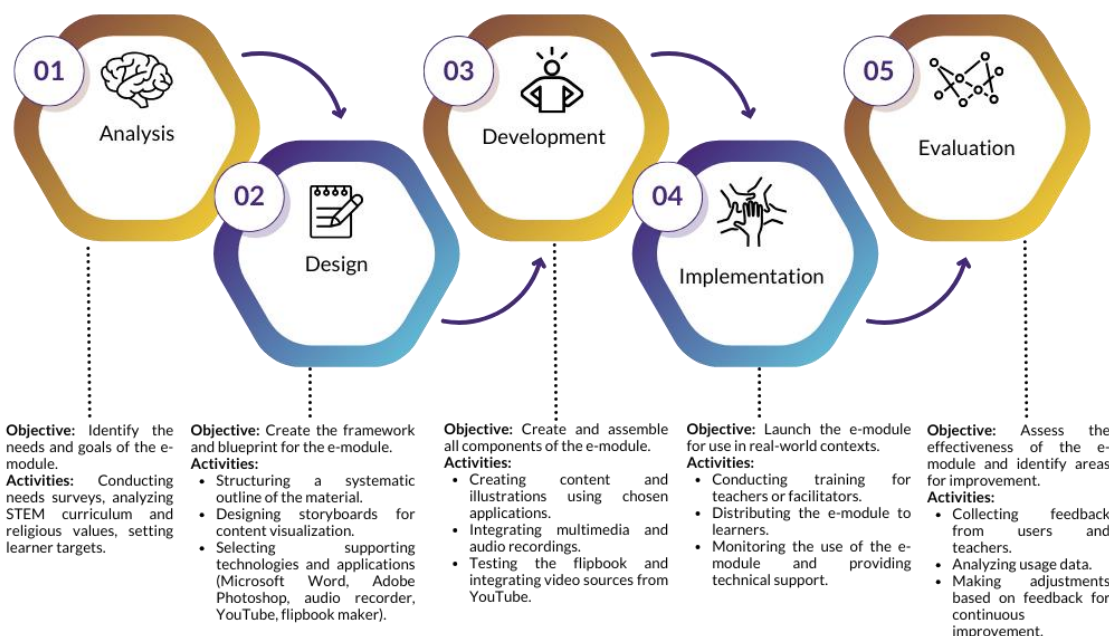

01 Analysis
Objective: Identify the needs and goals of the e-module.
Activities: Conducting needs surveys, analyzing STEM curriculum and religious values, setting learner targets.

02 Design
Objective: Create the framework and blueprint for the e-module.
Activities:
- Structuring a systematic outline of the material.
- Designing storyboards for content visualization.
- Selecting supporting technologies and applications (Microsoft Word, Adobe Photoshop, audio recorder, YouTube, flipbook maker).

03 Development
Objective: Create and assemble all components of the e-module.
Activities:
- Creating content and illustrations using chosen applications.
- Integrating multimedia and audio recordings.
- Testing the flipbook and integrating video sources from YouTube.

04 Implementation
Objective: Launch the e-module for use in real-world contexts.
Activities:
- Conducting training for teachers or facilitators.
- Distributing the e-module to learners.
- Monitoring the use of the e-module and providing technical support.

05 Evaluation
Objective: Assess the effectiveness of the e-module and identify areas for improvement.
Activities:
- Collecting feedback from users and teachers.
- Analyzing usage data.
- Making adjustments based on feedback for continuous improvement.

Figure 1. Research Process

Interviews with Madrasah educators indicated using learning media, such as educational animations, and methods like demonstrations and lectures to explain the material. However, these explanations have not resolved the problems. The media and material validation questionnaires for the STEM e-module containing religious values include written statements to three expert media validators and three expert science material validators. The validation questionnaire aims to obtain responses from the validators regarding the teaching materials being developed by the researcher. Educator and student response questionnaires are used to gather opinions about the practicality of

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the STEM e-module containing religious values. The ADDIE model is relevant because it is structured, systematic, comprehensive, and complete with evaluation at each stage. The research process is presented in Figure 1.

This type of research data includes qualitative data and quantitative data. To collect research data, we used several instruments, including documentation guidelines, interview guidelines, validation sheets, and questionnaires. The assessment was completed by filling out an assessment sheet adjusted to the product development indicators. After the scores were obtained, they were transformed according to the criteria [29].

Table 1. Scoring Rules

Category	Score
Very Valid	5
Valid	4
Fairly Valid	3
Less Valid	2
Invalid	1

After the score is calculated, the feasibility percentage for each aspect is searched using the following formula.

$$x_i = \frac{\sum S}{S_{max}} \times 100\ \%$$

(1)

Information:

S_{max}　= Maximum score

$\sum S$　= Total score

x_i　= Questionnaire feasibility value for each aspect

The scores are then interpreted into a design feasibility score with the following assessment criteria [30].

Table 2. Learning Media Feasibility Scale

Learning Media Feasibility Score	Criteria
0 - 20 %	Very not feasible
20.01% - 40%	Not feasible
40.01% - 60%	Fairly feasible
60.01% - 80%	Feasible
80.01%-100%	Very feasible

3.　RESULTS AND DISCUSSION

In this section, the research results are explained and a comprehensive discussion is given. The results can be presented in figures, graphs, tables, and other formats that make the reader understand easily. The discussion can be divided into several sub-sections.

3.1　*The Stages of Developing the STEM E-module Containing Religious Values*

The stages in developing e-modules with a STEM approach containing religious values include the needs analysis, design, development, implementation, and evaluation stages.

3.1.1 Analysis Stage

Electronic modules are the latest innovation from printed modules, where these electronic modules can be accessed with the help of computers and other electronic media. The electronic module has the characteristics of a relatively small file size so that it can be

stored on a flash disk, is easy to carry and, is equipped with animations, simulations, learning videos, and can determine learning completion through interactive self-evaluation.

In science learning, the role of technology cannot be separated. It has even become a separate scientific discipline. In developed countries, science is even combined with other scientific disciplines, namely technology, engineering, and mathematics. We know it as STEM. STEM has become a separate scientific discipline closely related to one another.

In Indonesia, research on STEM has been widely carried out. However, throughout the preliminary study, there has been no development of STEM teaching materials that link them to religious values. Teaching materials like this are a primary need in Indonesia, especially in Islamic-based schools (Madrasahs, Islamic Boarding Schools, and Integrated Islamic Schools). The public's interest in sending their children to Islamic educational institutions is increasing every year, marked by the increasing proliferation of Islamic boarding schools, integrated Islamic schools, madrasas and the decline in public interest in attending public schools.

3.1.2 Design Stage

The design stage included preparing the structural framework for STEM e-module teaching materials containing religious values, determining the systematic presentation of material, illustrations, and visualizations, and writing storyboards for STEM e-module products containing religious values. To carry out product design, researchers used several supporting applications, including Microsoft Word, Adobe Photoshop, an audio recorder, a YouTube video source, and a Flipbook maker.
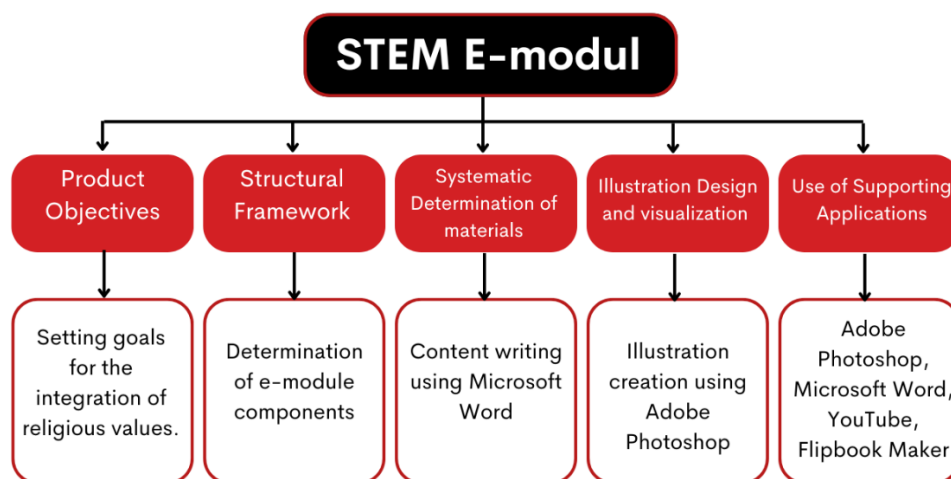

Figure 2. Storyboard of the STEM E-module

3.1.3 Development Stage

At this product development stage, teaching materials were created in the form of interactive e-modules, including adjustments to core competencies, basic competencies, objectives, instructions for use, material descriptions, projects based on STEM, sample questions, discussion, and practice questions. Furthermore, validation of the e-module was carried out using a questionnaire. The purpose of validation was to determine the feasibility of the product to get suggestions for improving the e-module before the field testing.
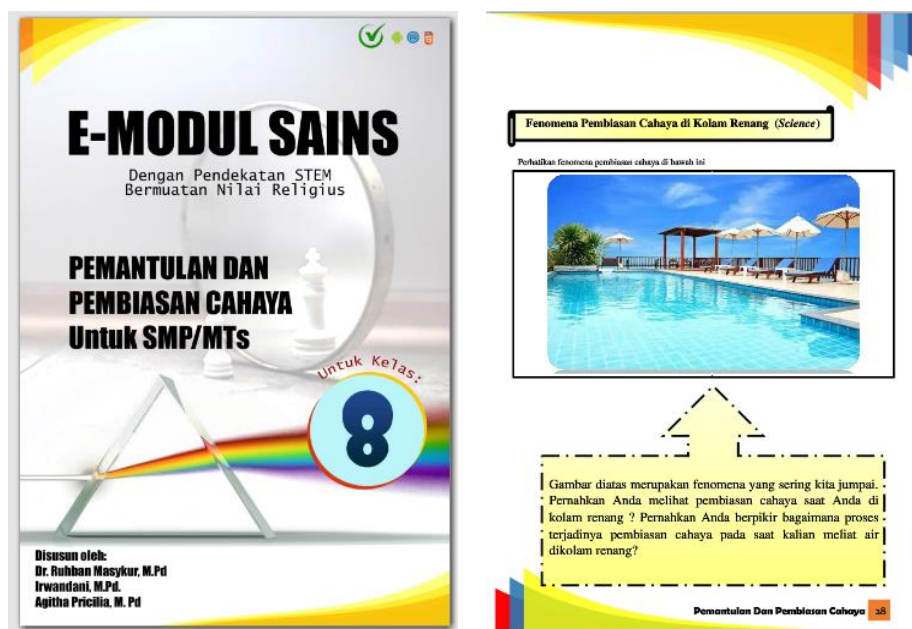
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Figure 3. Product Developed

3.1.4 Evaluation Stage

The evaluation stage is carried out during the analysis, design, development, and implementation stages. It covered internal and external evaluation. Internal evaluation was carried out to determine product quality. The evaluation results were used as feedback to improve the product. Internal evaluation stages consisted of problem analysis, design improvement, validation from content and construct experts, and responses from educators and students. External evaluation was intended to determine the practicality of the product.

In recent years, the shift towards digital educational tools has brought electronic modules to the forefront, especially in the realm of science learning, where the integration of technology is indispensable [2], [31]–[34]. The analysis stage of developing the module highlights its advantages, such as compact file sizes, portability, and rich multimedia features, including animations and simulations that enrich the learning experience. Additionally, these modules facilitate interactive self-evaluations, allowing learners to gauge their understanding and progress independently. Integrating STEM into education has been widely recognized and implemented in developed countries and is gradually gaining traction in developing regions like Indonesia. However, despite the widespread research on STEM in Indonesia, there is a notable gap in integrating these disciplines with religious values, which is particularly relevant in a country with a significant interest in Islamic educational institutions. This gap presents an opportunity to develop the STEM e-module that not only caters to educational needs but also aligns with the religious and cultural context of the learners.

During the design stage, the focus was on creating a robust framework for the STEM e-module that incorporates religious values, including meticulous planning of the material's presentation, employing various digital tools like Adobe Photoshop for illustrations, and using storyboards to guide the module's structure. These tools are essential for creating engaging and visually appealing content that resonates with the intended audience, bridging the gap between complex STEM concepts and foundational religious values. The development stage is critical as it involves creating and adjusting the e-module to meet educational standards and objectives. This stage also included creating interactive components, such as projects and quizzes, essential for a hands-on learning

experience in STEM education [35]–[37]. Validation through questionnaires was an important part of this stage, providing preliminary feedback on the module's effectiveness and areas for improvement before its wider implementation.

Finally, the evaluation stage ensured the continuous improvement of the e-module through internal and external evaluations. These evaluations assessed everything from the content's relevance and pedagogical effectiveness to its practical implementation in educational settings. Feedback from these evaluations was crucial for refining the e-module, ensuring it met the educational needs while also resonating with the students' religious values.

3.2 The Feasibility of the STEM E-module Containing Religious Values

The product feasibility stage was carried out before implementation to determine the product's feasibility.

3.2.1 Material Expert Validation Results

The material experts in this research were Validator 1 and Validator 2, lecturers at the Tarbiyah and Teacher Training Faculty, UIN Raden Intan Lampung. The validation of product suitability by material experts was carried out on July 20, 2022, along with the results of individual test evaluations by material experts.
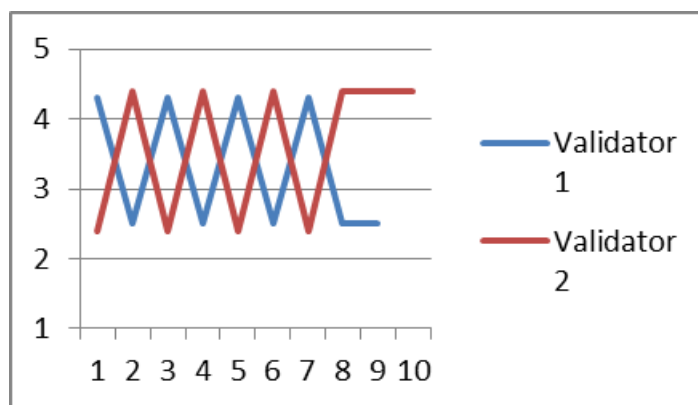

Figure 4. Feasibility Test Assessment Results by Learning Material Experts

Based on Figure 4, validation results were obtained from the two material experts, with assessment results of 90% for the material completeness, 90% for the material breadth indicator and sample questions, 90% for the material completeness and the depth of material and example questions, 90% for accuracy of terms, 100% for the accuracy of data and facts, 90% for the accuracy of example questions, 90% for the accuracy of images, diagrams, and illustrations, 100% for the accuracy of terms, 90% for the accuracy of reference literature, and 100% for the suitability of material to developments. So, the average assessment obtained for all indicators in the STEM e-module containing religious values is 93% in the very good category.

The final draft STEM e-module containing religious values can be categorized as very suitable for use. Field trials will continue to determine its effectiveness. However, according to material experts, more examples of questions from the material and discussion were needed before testing the field.

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3.2.2 Media Expert Validation Results

The media expert in this research was a lecturer at the Tarbiyah and Teacher Training Faculty of UIN Raden Intan Lampung. Based on validation results from the media expert, the obtained scores were 100% for the initial display in the module, 80% for the material presentation display indicator, 80% for the question display indicator in the module, 100 % for module flexibility, 80% for module color collaboration, 80% for module effectiveness & efficiency, 100% for module practicality, 100% for module language clarity, 100% for suitability of language use, 100% for module attractiveness, and 100% for clarity of material and the questions in the module. Therefore, the average assessment of material expert validators for all indicators in the STEM e-module containing religious values is 92% in the excellent category.

The STEM e-module containing religious values could be categorized as very suitable for use and could be continued with field trials to determine its effectiveness. However, according to media experts, before the field testing, it was necessary to revise or improve the font size and background color and provide a video to make it more interesting.

3.3 Practicality and Students' Responses to the STEM e-module Containing Religious Values

Educators' responses to products were investigated to determine the product's practicality. The practicality test consisted of an analysis of the readability of the e-module, an analysis of the implementation of learning using the e-module, and an analysis of the results of student responses. The readability analysis was shared with educators via Google Forms. The educator assessment was carried out in two schools, namely (1) SMP IT Permata Bunda Bandar Lampung, which consisted of three eighth-grade educators, (2) MTs Muhammadiyah Bandar Lampung, which consists of two eight-grade educators, and (3) Al-Hikmah Bandar Lampung Islamic Boarding School which consisted of two eighth-grade educators. The readability test consisted of ten statements. Each analysis result is explained as follows.

Table 3. The Results of Practicality Assessment by Educators

Aspect	No	Statement Items	Percentage
Readability	1	E-modules can make it easier to understand the science found in everyday life.	74%
	2	The e-module structure is arranged systematically/sequentially so that it is easy to understand.	77%
	3	The type and size of the letters on the e-module are comfortable to read	80%
	4	The language used is easy to understand.	80%
	5	The phenomena presented in the e-module are easy to understand.	80%
	6	The ideal e-module layout makes it easier to understand the sequence of material	86%
	7	Instructions for using the e-module and its features are easy to understand.	77%
	8	Practice questions help make it easy to understand.	80%
	9	The questions, commands, and steps given lead to conclusions from the experiments and problems presented	82%
	10	Complete instructions for working on the e-module	82%
Implement ability	11	Identify concepts and make predictions	90%
	12	Make representations	77%

13	Carrying out experiments/experiments	100%
14	Analyze and draw conclusions	80%
15	Solve reflection questions	77%
Average Percentage		81%
Category		Excellent

Based on Table 3, validation results were obtained from media experts. It was found that the E-module can be used to make it easier to understand science that can be found in everyday life (74%), the structure of the e-module is arranged systematically/sequentially so that it is easy to understand (77%), the type and size of the letters in the e-module are comfortable to read (80%), the language used is easy to understand (80%), the phenomena presented in the e-module easy to understand (80%), the ideal layout of the e-module makes it easier to understand the sequence of material (86%), the instructions for using the e-module and its features are easy to understand (77%), the practice questions help to make it easy to understand (80%), the questions, commands, and steps provide guidance to get conclusions from the experiments and problems presented (82%), complete instructions for working on the e-module (82%), identifying concepts and making predictions (90%), making representations (77%), carrying out experiments/experiments (100%), analyzing and making conclusions (80%), and contain reflection questions (77%). So, the average educator assessment for all indicators in the STEM e-module containing religious values was 81% in the excellent category. Therefore, the product could be categorized as suitable for use and continued with field trials to determine its effectiveness.

The testing stages in this research were divided into a small-group trial and a large-group trial. The small-group trial consisted of 15 eighth-grade students at SMP IT Permata Bunda Bandar Lampung, and the statement instrument sheet consisted of 2 assessment aspects: readability and implementation. The questionnaire instrument in this research was analyzed using the Rasch Model to determine its reliability, function, and validity. The following are the results of the instrument analysis.

```
-------------------------------------------------------------------------
| Person    163 INPUT    163 MEASURED            INFIT       OUTFIT     |
|          TOTAL     COUNT    MEASURE  REALSE    IMNSQ  ZSTD  OMNSQ  ZSTD|
| MEAN      39.7      10.0      1.67      .62     1.00  -.3    .99   -.3|
| P.SD       6.6       .0       1.63      .38      .79  1.8    .77   1.8|
| REAL RMSE   .72 TRUE SD   1.45  SEPARATION  2.01  Person RELIABILITY  .80|
|------------------------------------------------------------------------|
| Item       10 INPUT     10 MEASURED            INFIT       OUTFIT     |
|          TOTAL     COUNT    MEASURE  REALSE    IMNSQ  ZSTD  OMNSQ  ZSTD|
| MEAN     647.5     163.0       .00      .12     1.01   .0    .99   -.1|
| P.SD      24.6       .0        .31      .01      .12  1.0    .14   1.1|
| REAL RMSE   .12 TRUE SD    .29  SEPARATION  2.50  Item    RELIABILITY  .86|
-------------------------------------------------------------------------
```
Figure 5. Reliability of Respondents and Items

Figure 5 shows that the reliability of the questionnaire respondents is within the moderate criteria. Furthermore, the items from the questionnaire are within the high criteria. The Figures 6 show that the rating scale on the questionnaire is functioning well, as indicated by respondents who chose a choice between (1 – 5). In the category measure section, a consistent increase is seen, meaning that there are no items that are confusing, and the rating scale works fine.
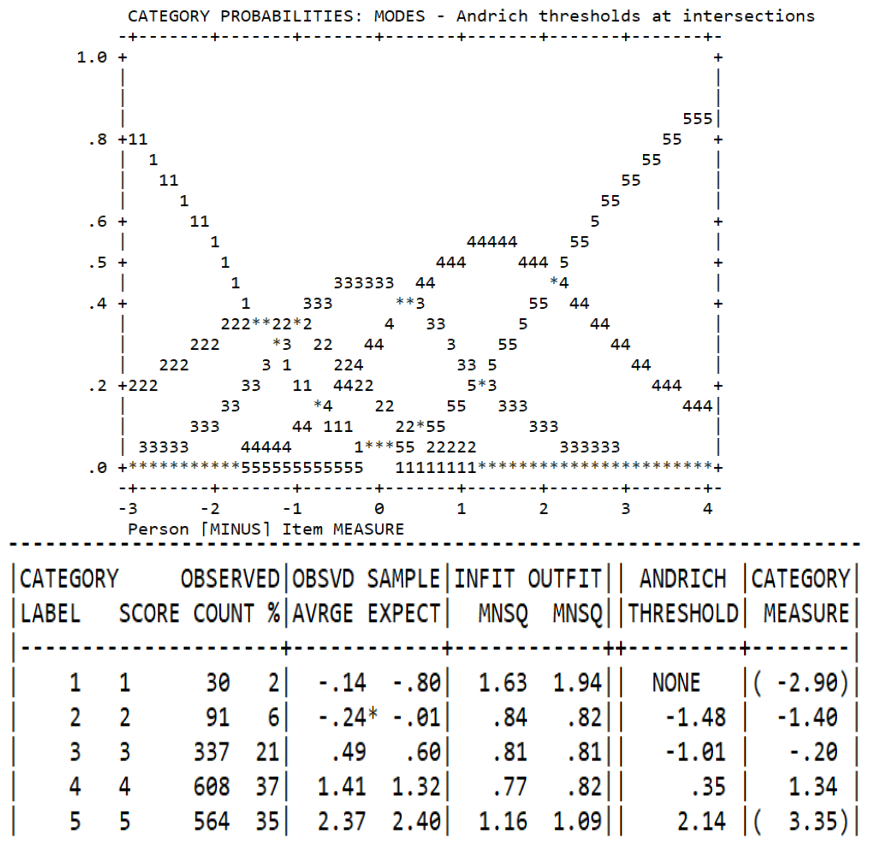
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CATEGORY PROBABILITIES: MODES - Andrich thresholds at intersections
    -+-------+-------+-------+-------+-------+-------+-------+-
1.0 +                                                         +
    |                                                         |
    |                                                 555|
 .8 +11                                            55  +
    | 1                                             55   |
    |   11                                        55     |
    |    1                                      55       |
 .6 +     11                                   5         +
    |      1                  44444        55            |
 .5 +       1               444      444  5             +
    |        1           333333  44      *4             |
 .4 +         1      333     **3        55  44           +
    |       222**22*2      4     33    5      44         |
    |     222      *3  22   44     3    55      44        |
    |    222      3 1    224      33 5        44       |
 .2 +222        33   11  4422      5*3            444    +
    |       33      *4    22    55   333          444|
    |     333      44 111    22*55      333           |
    | 33333      44444    1***55 22222       333333   |
 .0 +***********555555555555   11111111*******************+
    -+-------+-------+-------+-------+-------+-------+-------+-
    -3      -2      -1       0       1       2       3       4
    Person [MINUS] Item MEASURE
```

```
--------------------------------------------------------------------
|CATEGORY     OBSERVED|OBSVD SAMPLE|INFIT OUTFIT|| ANDRICH |CATEGORY|
|LABEL   SCORE COUNT %|AVRGE EXPECT| MNSQ  MNSQ||THRESHOLD| MEASURE|
|--------------------+-----------+-----------++--------+-------|
|   1   1      30   2|  -.14  -.80| 1.63  1.94||  NONE   |( -2.90)| 1
|   2   2      91   6|  -.24* -.01|  .84   .82||  -1.48  |  -1.40 | 2
|   3   3     337  21|   .49   .60|  .81   .81||  -1.01  |   -.20 | 3
|   4   4     608  37|  1.41  1.32|  .77   .82||   .35   |  1.34  | 4
|   5   5     564  35|  2.37  2.40| 1.16  1.09||  2.14  |( 3.35)| 5
--------------------------------------------------------------------
```

Figure 6. Rating Scale Function in Questionnaires

Based on the Figure 7, in the Outfit Mean Square (MNSQ) section, statement items 1 to 10 are in the range of 0.5 – 1.5, no more and no less. Therefore, the statement items are valid. The validity of the statement items can also be seen based on their conformity with the Rasch model.

```
-----------------------------------------------------------------------------------------
|ENTRY   TOTAL   TOTAL   JMLE   MODEL|   INFIT  |  OUTFIT  |PTMEASUR-AL|EXACT MATCH|      |
|NUMBER  SCORE   COUNT  MEASURE  S.E. |MNSQ ZSTD|MNSQ ZSTD|CORR.  EXP.| OBS%  EXP%| Item |
|-----------------------------------+---------+---------+-----------+-----------+------|
|    3    630    163     .23    .11|1.14 1.19|1.25 1.94|A .62   .66| 53.6  51.5| P3   |
|    5    661    163    -.16    .11|1.21 1.65|1.18 1.37|B .61   .62| 52.3  53.4| P5   ||
|   10    687    163    -.52    .12|1.09  .71| .97 -.20|C .60   .59| 58.3  55.9| P10  |
|    2    653    163    -.06    .11|1.06  .49|1.08  .67|D .58   .63| 53.6  53.1| P2   |
|    4    602    163     .55    .10|1.06  .57|1.06  .57|E .65   .68| 62.3  49.2| P4   |
|    6    629    163     .24    .11| .96 -.33| .90 -.81|e .67   .66| 60.3  51.5| P6   |
|    8    659    163    -.13    .11| .93 -.51| .91 -.72|d .65   .63| 58.9  53.2| P8   |
|    1    643    163     .07    .11| .90 -.83| .92 -.64|c .64   .64| 62.9  52.1| P1   |
|    9    681    163    -.44    .12| .89 -.87| .83 -1.28|b .65   .60| 59.6  54.8| P9   |
|    7    630    163     .23    .11| .82 -1.60| .81 -1.62|a .70   .66| 65.6  51.5| P7   |
|-----------------------------------+---------+---------+-----------+-----------+------|
| MEAN  647.5  163.0     .00    .11|1.01  .05| .99 -.07|           | 58.7  52.6|      |
| P.SD   24.6    .0     .31    .01| .12  .98| .14 1.11|           |  4.2   1.8|      |
-----------------------------------------------------------------------------------------
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Figure 7. Validity of Statement Items in the Questionnaire

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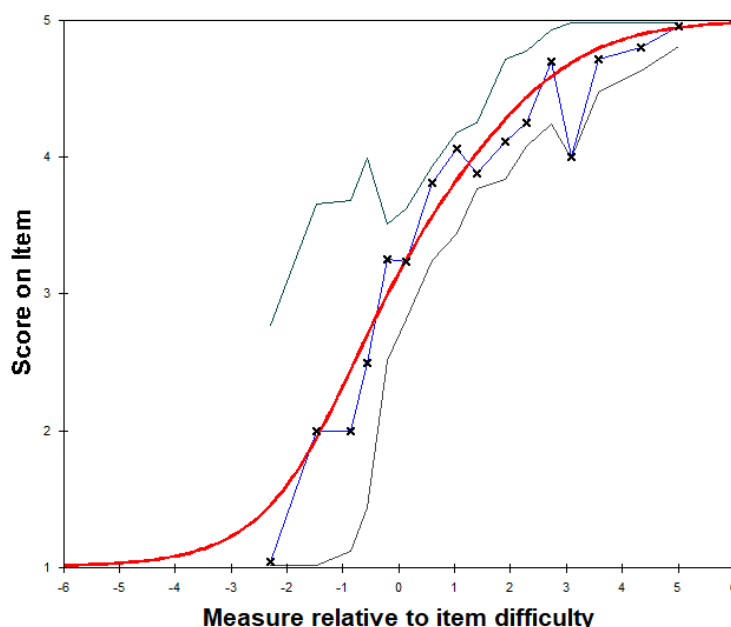Rubhan Masykur, et al. | *Development of science e-modules with* ….

Figure 8. The Validity of Statement Items in the Questionnaire

Based on the Figure 8, the red line pattern is the ideal line pattern of the Rasch model. A model is valid if the pattern is close to or the same as the ideal pattern of the Rasch model (red line). The questionnaire model is depicted in a blue pattern in the image above. The blue line pattern looks similar to the Rasch model pattern.

Student assessment aims to determine students' responses to the developed product. The results of the small-group trial at SMP IT Permata Bunda Bandar Lampung are presented in Table 4.

Table 4. Student Responses at SMP IT Permata Bunda Bandar Lampung

Aspect	No	Statement Items	Percentage
Readability	1	The language used in this e-module is simple and easy to understand	83%
	2	The letters used are simple and easy to read	83%
	3	The material presented in this e-module is easy for me to understand	83%
	4	With picture and video illustrations it can make it easier for me to understand the lesson	80%
	5	The appearance of this e-module is attractive	83%
Implement ability	6	This learning e-module makes me more enthusiastic about learning	91%
	7	Using this e-module can make learning science less boring.	80%
	8	This e-module supports me in mastering science lessons, especially about light	91%
	9	This e-module contains an evaluation test that can test my understanding	80%
	10	This e-module contains examples of events containing religious values that can increase my faith	83%
Average Percentage			84%
Category			Very interesting

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Based on Table 4, it can be seen that 83% of students feel that the language used in this e-module is simple and easy to understand; 83% of students think that the letters used are simple and easy to read; 83% of students think that the material presented in this e-module is easy for me to understand; 80% of students think that picture and video illustrations can make it easier for me to understand the lesson; 83% of students think that the appearance of this e-module is interesting; 91% of students think that this learning e-module makes me more enthusiastic about learning; 80% of students think that using this e-module can make learning science less boring; 91% of students think that this e-module supports me in mastering science lessons, especially about light; 80% of students think that this e-module contains evaluation tests that can test my understanding; 83% of students think that in this e-module there are examples of events containing religious values that can increase my faith. So the average media suitability value was obtained, namely 84% or in the very interesting category.

Furthermore, the large-group trial consisted of 164 students from MTs Darul Huda Bandar Lampung with a statement instrument sheet consisting of 2 assessment aspects: readability and implementation. Student assessment aims to determine students' responses to the developed product. The results of student responses at MTs Darul Huda Bandar Lampung are presented in Table 5.

Table 5. Student Responses at MTs Muhammadiyah Bandar Lampung

Aspect	No	Statement Items	Percentage
Legibility	1	The language used in this e-module is simple and easy to understand	78%
	2	The letters used are simple and easy to read	80%
	3	The material presented in this e-module is easy for me to understand	77%
	4	With picture and video illustrations it can make it easier for me to understand the lesson	73%
	5	The appearance of this e-module is attractive	81%
Implement ability	6	This learning e-module makes me more enthusiastic about learning	77%
	7	Using this e-module can make learning science less boring.	80%
	8	This e-module supports me in mastering science lessons, especially about light	83%
	9	This e-module contains an evaluation test that can test my understanding	83%
	10	This e-module contains examples of events containing religious values that can increase my faith	86%
Average Percentage			80%
Category			Very interesting

Based on Table 5, it can be seen that 78% of students feel that the language used in this e-module is simple and easy to understand; 80% of students think that the letters used are simple and easy to read; 77% of students think that the material presented in this e-module is easy for me to understand; 73% of students think that picture and video illustrations can make it easier for me to understand the lesson; 81% of students think that the appearance of this e-module is interesting; 77% of students think that this learning e-module makes me more enthusiastic about learning; 80% of students think that using this e-module can make learning science less boring; 83% students think that this e-module supports me to master science lessons, especially about light; 83% of students think that this e-module contains evaluation tests that can test my understanding; 86% of students think that in this e-module there are examples of events containing religious values that

can increase my faith sSo,the average media suitability value is 80% or in the very interesting category.

This research supports existing findings in the literature that show that integrating STEM into education can enhance the quality of learning and student engagement. The study by Margot and Kettler [38] emphasizes the importance of teachers' values and beliefs in applying STEM pedagogy and the challenges faced in the implementation process. The results of this study are consistent with those findings, wherein the developed STEM-based e-module demonstrated high validation from subject matter and media experts and was rated as very practical and engaging by educators and students.

However, this research adds a new dimension by integrating religious values into the STEM e-module, which has not been extensively explored in previous literature. Fan and Yu's [39] study highlights the need for a culturally and value-relevant STEM curriculum. This research goes further by incorporating religious values in the context of Islamic education, providing a holistic approach that enhances students' academic abilities and strengthens their character and spiritual values. Thus, this research contributes significantly to the existing literature and paves the way for further research on integrating religious values in STEM education.

This research utilizes STEM in developing educational products in the form of the STEM e-module containing religious values, aiming to provide students with a more meaningful learning experience by connecting disciplines of knowledge and skills with personal and real-world experiences. This approach enables students to comprehend material concepts and solve problems in learning. Integrating religious values into the content stimulates both the learning process and the character development of students. Consequently, students do not only receive science learning materials but also gain stimulus towards their religious values. The components within the STEM e-module containing religious values have been tailored to the indicators needed by both students and educators in the learning process, including materials, example questions, and problem-solving related to scientific phenomena integrated with religious values. Students are then instructed to study and understand the material in the STEM e-module containing religious values. After studying the material, students are instructed to work on practice questions. While students learn and work on practice questions, the STEM e-module containing religious values also facilitates students in studying materials related to daily life issues, ranging from common everyday problems to experiments related to the surrounding environment and religious values. The difference between this research and previous studies lies in the integration of religious values into the components of the material delivered through the STEM e-module containing religious values. This incorporation of religious values aims to enhance the students' faith. The limitation of this research is that it only reaches the development stage, with the expectation that future research will proceed to the implementation or effectiveness testing stage. The success of this research is hoped to serve as a reference and inspiration for developing technology-based learning materials in Islamic educational institutions.

4. CONCLUSION

The science E-module with the STEM approach containing religious values for Madrasahs, Islamic boarding schools, and integrated Islamic schools was developed using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) development model. The developed product is suitable for use, proven by expert validation results showing excellent value. The value of material expert validation is 4.65 or 93% (excellent), and the value of media expert validation is 4.6 or 92% (excellent).

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Furthermore, the product is practical to use, proven by the results of the practicality test assessment by educators of 81% (excellent). The developed product is also interesting to use, as proven by the results of the test assessment by users of 80% (very interesting). Additionally, the integration of religious values into the components of the material delivered through the STEM e-module containing religious values includes religious principles that can enhance the students' faith.

AUTHOR CONTRIBUTION STATEMENT

RM contributed to conceiving and designing the research framework and methodology, conducted the main data collection and analysis, and wrote the initial draft of the manuscript. I contributed to the design and development of the STEM-based e-module, provided expertise on integrating religious values into the STEM curriculum, and assisted in data collection and interpretation. AP contributed to leading the development and implementation of the qualitative and quantitative data analysis techniques, prepared the questionnaire and interview guides, and managed the documentation and reporting of the research findings. MA contributed to supporting the project by overseeing the technical aspects of the e-module development, including integrating multimedia elements and interactive features, and assisted in the final editing and proofreading of the manuscript.

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