Development of Science's e-Module Based on Qur'an Integration-interconnection and Spiritual Intelligence (QISI) for Solar System Learning

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Abstract: This study aims to develop a valid, practical, and effective science e-module based on QISI used in the learning process of the solar system. The research method used in this research is Research & Development (R&D) with the ADDIE development model (Analyze, Design, Development, Implementation, and Evaluation). This research was conducted at SMP IT Luqmanul Hakim Aceh with a sample of 31 seventh-grade students. Sampling using a purposive sampling technique. The results showed that the validity test obtained a percentage of 87.40% with very valid criteria. In addition, the results of the practicality test by the science teachers obtained a percentage of 86.88% with very practical criteria, then the results of the practicality test by students obtained a percentage of 80.78% with practical criteria. Science e-module is effectively used in learning, with the result of obtaining an N-gain value of 0.62. So, it can be concluded that the science e-module based on QISI has been successfully developed which is very valid, practical, and effectively used in solar system learning.

Keywords: E-module, Integration-interconnection, Qur'an and Science, Spiritual Intelligence, Solar System Learning

Introduction

According to the Republic of Indonesia Government Regulation No 74/2008, one of the pedagogic competencies possessed by a teacher is designing learning and developing a curriculum or syllabus. In reality, teachers can develop a curriculum either individually or collaboratively. One thing that the teacher can do to make it easier to give teaching material in the learning process is to organize the teaching material that has been created into teaching materials. The module is one of the instructional tools used in the learning process.

The module is self-instructional, it may be utilized as a learning resource without the need for direct teacher support or direction (Choirunnisya' & Sudira, 2021). Learning modules used in education can be displayed in two ways: paper and electronic (Mulhayatiah et al., 2019). Electronic modules (e-modules) are a type of instructional material that is methodically organized and then presented electronically, including audio, animation, and navigation (Ningsih & Mahyuddin, 2022). E-modules not only assist students in the learning process, but they are also flexible, as they can be used in both online and offline settings (Sofyan et al., 2020).

According to Minister of Education and Culture Regulation No. 35/2018, one of the key skills assessed in

the K-13 curriculum is a spiritual attitude, which is defined as honoring and living up to the principles of the faith to which one belongs. Spiritual fundamental competencies are not defined in science classes but instead, serve as the basis for understanding science. Following this, the Aceh government claimed that the national education system in Aceh was founded on Islamic cultural values, specifically education based on the values found in Islamic teachings, specifically the Qur'an and Hadith (Utama et al., 2019). It means, the Aceh government implements learning that is following the national curriculum, but integrates it with the Qur'an and Hadith. Integration-interconnection is a method of emphasizing the fact that all scientific disciplines are linked and interconnected to one another (Rahmawati & Bakhtiar, 2018). Integration-interconnection is a learning invention that can link different areas of knowledge (Ulwiyah et al., 2022).

Science is a topic that combines biology, chemistry, and physics to explain spiritual, knowledge, social, useful, and artistic values in a unified way (Utama et al., 2019). Science and faith can be linked in four ways, one of which is through integration, which must be applied in a balanced and realistic manner (Suciati et al., 2022). Integration of science and Islam in the learning process can enhance pupil learning results. Previous research has found that science and Qur'an-based learning can boost learning desire and pupil learning outcomes (Agusti et al., 2019; Amin et al., 2022). In addition, the implementation of integrated learning can develop several levels of intelligence, one of which is spiritual intelligence (Munadi & Dewi, 2019).

Spiritual intelligence is intelligence that concentrates on macro-level problems, particularly the significance, and value of various methods of living (Ma & Wang, 2022). Spiritual intelligence emerges as consciousness, then develops into a deeper and deeper knowledge of matter, life, body, mind, soul, and spirit, which can be developed through exercise to aid in distinguishing truth from delusion (Srivastava, 2016). Furthermore, Zohar in (Ma & Wang, 2022) states that education that is oriented towards the principles of spiritual intelligence can build students' curiosity and motivate them to interrogate previous thoughts about values and events to create new experiences. In Islam, spiritual intelligence can be obtained from the Qur'an and As-Sunnah, so it must be implemented in everyday life (Sholehuddin et al., 2023).

The solar system is one of the materials or competencies contained in physics or science lessons that students must understand according to the K-13 curriculum (Saputro & Setyawan, 2020). Because solar system phenomena cannot be explained directly in class, teachers must use multimedia in their delivery (Al Mar'ati et al., 2021). Other pertinent research indicates that the solar system is a difficult object to visualize because it cannot be seen directly, so an innovative learning medium is required (Imronah et al., 2022; Zahara et al., 2020). Therefore, it is necessary to develop a teaching material for solar system learning that is interactive, making it easier for students to visualize phenomena that occur in the solar system.

Implementation of integrated learning on the creation of the universe and the solar system can increase student motivation in the learning process (Rahmawati & Bakhtiar, 2018). The use of modules based on Islamic integration assists students in learning autonomously, offers real-world problem-solving experience, and trains students' higher-order thinking skills while developing scientifically accurate ideas (Khairiyah & Faizah, 2019). However, the present reality is that the use of learning resources that integrate Islam and science is still very low (Adawiyah & Kartika, 2020). Resources and teaching materials that integrate general knowledge and Islamic values have not been fully implemented, and are even very difficult to find in Aceh (Agusti et al., 2019; Husna et al., 2020).

Based on some of the research results above, it is concluded that it is necessary to develop a science e-module based on Qur'an integration-interconnection and spiritual intelligence (QISI) for solar system learning. Therefore, this research aims to: (1) Develop a science e-module based on QISI, (2) Analyze the validity of a science e-module based on QISI, (3) Analyze the practicality of a science e-module based on QISI, and (4) Analyze the effectiveness of science e-module based on QISI.

Method

The method used in this research is Research and Development (R&D). The science module was developed using the ADDIE model. This model consists of five steps, namely Analyze, Design, Development, Implementation, and Evaluation.

Sampling was done by purposive sampling technique. The sample in this study was 31 seventh-grade students of SMP IT Luqmanul Hakim. Data collection was carried out through interviews, documentation studies, product validation sheets, response questionnaires, and tests. Product validation sheets and response questionnaires were constructed using a Likert scale. Data were analyzed qualitatively and quantitatively. Quantitative data analysis was carried out to see the validity, practicality, and effectiveness of the product validity and practicality test is calculated using the formula:

$$P = \frac{\sum x}{\sum x_i} x100\% \tag{1}$$

Tables 1 and 2 show the criteria for product validity and practicality adapted from (Riduwan, 2010).

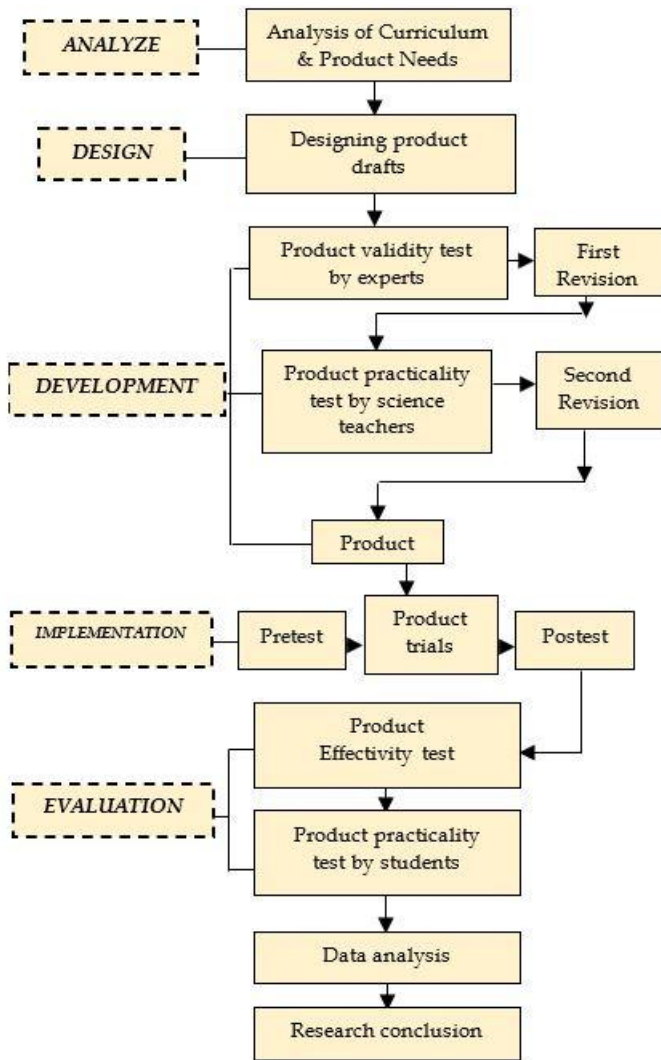**Figure 1**. Research Flowchart

Table 1. Validity Criteria of Product

Percentage (%)	Criteria
0-20	Invalid
21-40	Less valid
41-60	Valid enough
61-80	Valid
81-100	Very valid

Table 2. Practicality Criteria of Product

Percentage (%)	Criteria
0-20	Unpractical
21-40	Less practical
41-60	Practical enough
61-80	Practical
81-100	Very practical

Product effectiveness is measured through tests. The test was carried out twice, namely before product application (pretest) and after product application (post-test). The pretest and posttest results were then compared using the N-gain test. The N-gain value is calculated using the following formula and is guided by the criteria adapted from (Hake, 1998).

$$N\text{-gain} = \frac{S_{posttest} - S_{pretest}}{S_{maks} - S_{pretest}} \tag{2}$$

Table 3. N-gain Value Criteria

Gain	Criteria
(g) ≥ 0.70	High
0.30 ≤ (g) < 0.70	Medium
(g) < 0.30	Low

The research steps can be presented in Figure 1.

Result and Discussion

Analyze

The preparation of teaching materials starts with a preliminary study, which includes needs analysis, context analysis, literature review, and the development of a conceptual framework (Puspita et al., 2022). At this point, the researchers did a curriculum analysis as well as an analysis of the needs of teaching materials and students' learning difficulties in science learning, particularly in the solar system material. The questionnaires were given to ten seventh-grade students and two science teachers by the researchers. Table 4 shows the results obtained at this point.

Design

A module draft is created at this point. The module draft is divided into three sections: an introduction (cover, table of contents, and study guide), a core part (introduction and material description), and a conclusion (evaluation, glossary, and bibliography). The design of the module draft can be seen in Figure 2.

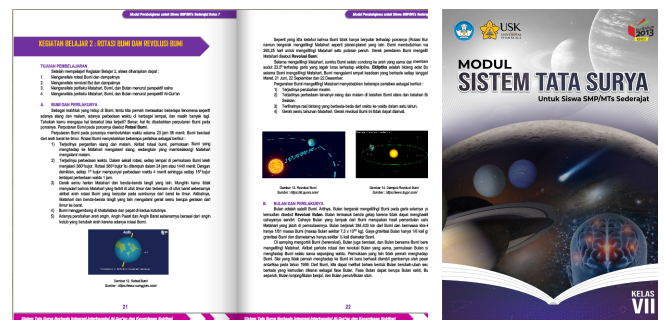**Figure 2**. E-Module Draft

The module draft is prepared by taking into account core competencies, and basic competencies, as well as indicators from solar system material integrated with the Qur'an and aspects of spiritual intelligence adapted from (Zohar & Marshal, 2000). At this stage, the e-module is designed carefully by paying attention to the principles of learning and interactive, because it is

presented with GIFs, audio, and video so that learning is more interesting according to the characteristics of the e-module (Kemendikbud, 2017).

Development

At this stage, product validity and practicality tests were carried out. Validity and practicality tests are carried out step by step. The validity test of the experts was carried out first rather than the practicality test. This validity test is carried out to measure the validity of the learning module (Sari et al., 2021). A validity test is done by distributing validity sheets to experts. The experts consist of one media expert, one material expert, and two Qur'an interpretation experts. While the practicality test was carried out by distributing response questionnaires to two science teachers. The results of the validity test by experts are presented in the following Tables 5, 6, and 7.

Table 4. Results of Curriculum Analysis, Teaching Material Needs, and Learning Difficulties

Research Object	Findings
Curriculum	(1) SMP IT Luqmanul Hakim Aceh implements an integrated curriculum (national curriculum and modern pesantren curriculum, and (2) Qur'an learning is one of the school's flagship programs
Science Teachers	(1) The teachers know about integrated learning, (2) Integrated learning is implemented at SMP IT Luqmanul Hakim Aceh, (3) Teachers have difficulty finding natural science teaching materials that integrate verses from the Qur'an, (4) Schools do not provide science teaching materials that integrate verses from the Qur'an, (5) Teachers need teaching materials that integrate verses from the Qur'an, (6) Teachers and students still use printed teaching materials, and (7) Students find it difficult to understand foreign terms and calculations in learning science
Students	(1) Science learning is difficult to understand, (2) There is a subject matter that is presented in the abstract because it cannot be seen directly, (3) There are too many calculations and formulas to memorize, (4) Some students have difficulty studying the solar system because it cannot be observed directly, and (5) Students still use printed teaching materials

Table 5. Product Validation Results by Media Expert

Aspect	$\sum x$	$\sum x_i$	Percentage (%)	Criteria
Interface	39	40	97.50	Very valid
Navigation	16	16	100.00	Very valid
Robustness	13	16	81.25	Very valid
Average			92.92	Very valid

Table 6. Product Validation Results by Material Expert

Aspect	$\sum x$	$\sum x_i$	Percentage (%)	Criteria
Content	33	36	91.67	Very valid
Presentation	13	16	81.25	Very valid
Language	25	28	89.29	Very valid
Integration of spiritual intelligence	11	12	91.67	Very valid
Average			88.47	Very valid

Table 7. Product Validation Results by Qur'an Interpretation Experts

Aspect	$\sum x$		$\sum x_i$	Percentage (%)		Average Percentage (%)	Criteria
	Exp 1	Exp 2		Exp 1	Exp 2		
Integration-interconnection of the Qur'an to the solar system material	17	16	20	85.00	80.00	82.50	Very valid
Qur'an integration-interconnection to aspects of spiritual intelligence	10	9	12	83.33	75.00	79.17	Valid
Average						80.83	Valid

Note:
Exp: Expert

According to Table 5, validation by media experts got an average percentage of 92.92% with very valid criteria. The interface element receives a high percentage, 97.50%, with very valid criteria. This aspect is very influential on student involvement in the learning process because an attractive interface design can increase student engagement and performance and influence student pedagogical principles in learning

(Hamid et al., 2021). Then, in terms of navigation, a perfect percentage of 100.00% is achieved. It means, all the features and buttons that are presented make it easy for users (Rahmawati et al., 2022). While on the aspect of robustness, a percentage of 81.25% is obtained with very valid criteria. This aspect obtains a lower percentage than the previous two aspects. This is because there are several suggestions and comments from media experts, one of which is the need to anticipate virus attacks on e-modules and the need for further testing in the field to test the resilience of e-modules.

According to Table 6, validation by material experts yields an average percentage of 88.47% with very valid criteria. The aspect of presentation has a lower percentage than the other three aspects, with 81.25%. This is because there are several suggestions and comments from material experts, one of which is the need for consistency in the use of terms and consistency in the use of case examples related to learning materials. Consistency in presenting material is necessary to avoid misconceptions and is expected to motivate students to understand the material being taught (Rahmawati et al., 2022).

According to Table 7, validation by two Qur'an interpretation experts yielded an average proportion of 80.83% with valid criteria. When compared to the validation results of media experts and material experts, the validation results of Qur'an interpretation experts received a lesser percentage. This is because the two experts made several recommendations and comments, particularly regarding the use of references and the application of language rules in the e-module. They stated that the use of reference and language is very important in the interpretation of the Qur'an. Therefore, the use of references must be valid, and the language used must be meaningless and ambiguous. Table 8 shows the total product validation by media, material, and Qur'an interpretation experts.

Table 8. Recapitulation of Product Validity Results

Expert	Percentage (%)	Criteria
Media	92.92	Very valid
Material	88.47	Very valid
Qur'an Interpretation	80.83	Valid
Average	87.40	Very valid

Based on Table 8, it can be concluded that the average percentage of validation by media experts, material experts, and Qur'an interpretation experts is 87.40% with very valid criteria. Even so, there are some suggestions and comments that have been given by experts on the draft e-module to be revised. Therefore, the researchers revised the module (first revision) according to suggestions and comments from experts. After carrying out the first revision, a product practicality test was then carried out on two science teachers. This practicality test is carried out to see how practical the e-module is before it is used in the learning process. Researchers distributed modules as well as response questionnaires to two science teachers to respond to. The results of product practicality tests by two science teachers are presented in Table 9.

Table 9. Product Practicality Test Results by Science Teachers

Aspect	$\sum x$		$\sum x_i$	Percentage (%)		Average Percentage (%)	Criteria
	Teacher 1	Teacher 2		Teacher 1	Teacher 2		
Benefits	14	16	16	87.50	100.00	93.75	Very practical
Appearance	14	16	16	87.50	100.00	93.75	Very practical
Material presentation	6	6	8	75.00	75.00	75.00	Practical
Practicality	16	18	20	80.00	90.00	85.00	Very practical
Average						86.88	Very practical

Based on Table 9, it is known that the responses by the two science teachers obtained an average percentage of 86.88% with very practical criteria. Aspects of material presentation get an average percentage that is lower than other aspects. This is because there are several suggestions and comments from the science teacher regarding the presentation of the language which still needs to be improved so as not to give a wrong interpretation of the verses of the Qur'an by junior high school students. Therefore, researchers made a second revision of the e-module.

Implementation

After the second revision of the e-module was carried out, the e-module was then tested in the field. However, previously the researcher conducted a pretest on 31 students. The test aims to measure students' prior knowledge before using the science e-module based on QISI. The pretest consists of 20 questions. Six questions are regular (not based on QISI), while the other fourteen questions are based on QISI. Questions based on QISI were prepared and developed based on indicators of spiritual intelligence from (Zohar & Marshall, 2000). The preparation of questions based on QISI aims to see the level of spiritual intelligence of students before and after implementing the science e-module based on QISI. After conducting the pretest, the researcher then carried out the learning process using the e-module that had been developed and revised according to the suggestions and comments of science experts and teachers. The learning process using e-modules lasts for three meetings. After that, the researcher ended the learning by doing a

posttest. The posttest aims to see changes in knowledge and the level of spiritual intelligence of students after using the Science e-module based on QISI in classroom learning. The questions given at the pretest and posttest are questions of the same type and number.

Evaluation

After the post-test results are obtained, the N-gain value is calculated from the pretest and post-test results. The calculation of the N-gain value aims to measure the effectiveness of e-modules in learning. The results of the N-gain calculation can be seen in Table 10.

Table 10. Product Effectiveness Test Results

Average Pretest	Average Postest	N-Gain	Percentage (%)	Criteria
35.32	77.58	0.62	62	Medium

Based on Table 10, it is known that the results of the e-module effectiveness test obtained an N-gain value of 0.62 with medium criteria. That is, the use of a science e-module based on QISI can improve student learning outcomes. These results are relevant to research from (Misbah et al., 2020) which states that the effectiveness of the module with an N-gain value of 0.62 has indicated an increase in student learning outcomes and is classified as moderate criteria because the module is said to be effective if it achieves the expected learning objectives. In addition, these results are relevant to the results of the study (Muflihah et al., 2020), that the integrated learning model with the Qur'an can significantly increase students' understanding during the learning process. Other research conducted by (Suhendi et al., 2022) indicates that the integrated module of the Qur'an values greatly influences students' problem-solving abilities and spiritual abilities.

After conducting the effectiveness test, the final step in the e-module development stage is the practicality test of the e-module to students. This activity was carried out in the same way as the e-module practicality test for science teachers. The results of practicality tests on students are presented in Table 11.

Table 11. Product Practicality Test Results by Students

Aspect	$\sum x$	$\sum x_i$	Percentage (%)	Criteria
Attractiveness	101.00	124.00	81.45	Very practical
Appearance	305.00	372.00	81.99	Very practical
Language	96.00	124.00	77.42	Practical
Practicality	510.00	620.00	82.26	Very practical
Average			80.78	Practical

Based on Table 11, it is known that the product practicality test results by students obtained an average percentage of 80.78% with practical criteria. That is, e-modules are practically used by students in the learning process of the solar system. Overall, the results of testing

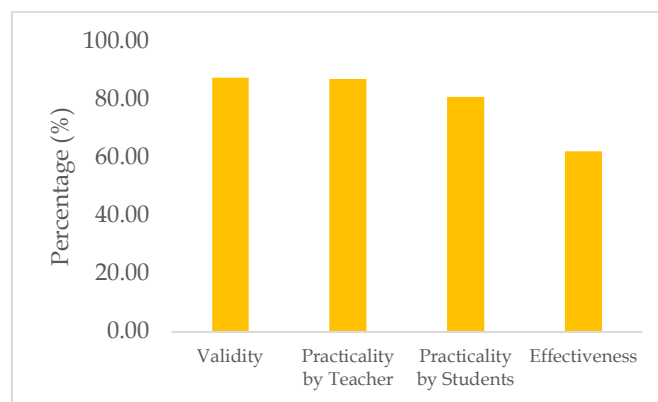the validity, practicality, and effectiveness of the Science e-module based on QISI are shown in Figure 3.

Figure 3. Science e-module based on QISI Feasibility Recapitulation

Conclusion

Based on the results and discussion, it can be concluded that: (1) a Science e-module based on QISI has been successfully developed, (2) a Science e-module based on QISI is very valid, with an average percentage of 87.40%, (3) Science e-module based on QISI is very practical according to science teachers, with an average percentage of 86.88% and practical according to students with an average percentage of 80.78%, and (4) The science e-module based on QISI is effectively used in solar system learning, with an N-gain value of 0.62.

Author Contributions

Conceptualization, ideas, formulation or evolution of overarching research goals and aims; investigation, conducting a research and investigation process, specifically performing the experiments, or data collection; software, programming, software development; validation, verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results.

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