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Development of an Interactive E-Module Integrating Islam and Science for 8th-Grade Science Learning in an Integrated Islamic Junior High School

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Abstract:

All This study aims to develop an Islam-Science Integration interactive e-module on the circulatory system material, as well as to test its feasibility and effectiveness in improving the learning outcomes of grade VIII students at SMPIT Bina Masyarakat Mandiri, Bogor Regency. The development of the e-module utilized the Lee and Owens development model integrated with the Rowntree model, consisting of five main stages: analysis and assessment, design, development, implementation, and evaluation. The subjects of this study were 48 grade VIII students, with the following distribution: 3 students participated as respondents in the one-to-one trial, 15 students as respondents in the small group trial, and 30 students as respondents in the field trial and effectiveness test. The results showed that the Islam-Science Integration e-module was successfully developed systematically and declared highly valid, with average validation results of 91.36% from the material expert, 94.19% from the instructional design expert, and 96.19% from the media expert. In the one-to-one trial involving 3 students, an average score of 92.03% was obtained with an "excellent" category; the small group trial involving 15 students achieved an average percentage score of 89.95% with a "good" category; while the field trial involving 30 students reached an average percentage score of 92.58% with an "excellent" category. This indicates that the e-module is highly feasible for use in learning. The utilization of the e-module in learning successfully enhanced student learning outcomes from 57.00 (average pre-test score) to 89.83 (average post-test score), with an average N-Gain value of 0.74, falling into the high and effective category in improving learning outcomes. Consequently, the Islam-Science Integration Interactive E-Module is declared valid, practical, and effective for use in the circulatory system material of grade VIII science learning at SMPIT Bina Masyarakat Mandiri, Bogor Regency.

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Introduction (مقدمة)

The modern educational landscape is currently undergoing a massive paradigm shift along with the rapid penetration of Information and Communication Technology (ICT). This context demands a restructuring of learning methods not only to be adaptive to the dynamics of the times, but also capable of manifesting the latest regulations. In Indonesia, Permendikdasmen Number 1 of 2026 explicitly mandates the implementation of education that is conscious, meaningful, and stimulative for students through a holistic approach that unites thought, feeling, heart, and body. However, in the realm of science education, the challenges faced do not only revolve around cognitive skills alone, but also how to bridge empirical phenomena with spiritual values.

For Islamic educational institutions, the separation between science and religion (scientific dichotomy) is an epistemological problem that must be resolved. The enduring dichotomy between religion and science, rooted in historical conflicts during the heyday of Islam and the Western Renaissance, has persistently challenged efforts to reconcile the two. In Indonesia, thinkers within State Islamic Higher Education (PTKIN) have proposed the integration-interconnection perspective to bridge this gap. Referring to the idea of Islamization of knowledge promoted by Ismail Raji al-Faruqi (1982), Islam is not an instrument that hinders scientific progress, but rather a primary prerequisite in guiding the direction of scientific development itself. Theologically, the Qur'an views the study of the universe (kauniyah verses) as a transcendental medium to strengthen monotheism. This is enshrined in QS. Fussilat verse 53 regarding the manifestation of God's truth in all horizons and within humans, as well as QS. Al-'Ankabut verse 20 which commands humans to conduct empirical observations regarding the beginning of creation. In line with this, the formal juridical basis in Indonesia – namely Article 31 Paragraphs 3 and 5 of the 1945 Constitution as amended – has also stipulated that the development of science and technology must be carried out within the framework of increasing faith, piety, and noble character.

The Research Gap: Between Idealism and Pedagogical Reality

Unfortunately, the reality on the ground often shows a significant gap between regulatory idealism and pedagogical practice. A meta-analysis by Ardi et al. (2024) revealed that while integrating Islam and science in science learning has a significant impact with an effect size of 0.658, implementation remains inconsistent across educational institutions. This finding aligns with research on the reception of Islam-science integration at the Islamic Institute of Kediri, which found that the majority of students perceived only a limited correlation between Islam and science, with their understanding diverging significantly from the intended goals of integration. Furthermore, a study by Muslim et al. (2024) on Merdeka Curriculum implementation in science teaching found that while 70% of learning process aspects met curriculum standards, significant improvements were still needed in meaningful learning (75% achievement) and assessment aspects (60% achievement).

Science lessons, especially on abstract and mechanistic materials such as the Circulatory System in grade VIII, are often considered boring. The results of a preliminary study through interviews with Ustadzah Rita Yuwita, S.TP. at SMPIT Bina Masyarakat Mandiri, Bogor Regency, confirmed these obstacles. Students tend to be passive and have difficulty mastering the complex visualization of heart structure and the dynamics of systemic and pulmonary circulation. Furthermore, she emphasized the urgent need for teaching tools that not only facilitate the transfer of scientific material but also connect it substantially with Islamic values to support the Islamic boarding school-based vision promoted by the school.

This understanding crisis is reinforced by quantitative data from summative assessments at the school. It was recorded that 67% of students (32 out of 48 children) had not been able to penetrate the Minimum Learning Objective Mastery Criteria (KKTP) set, with the percentage of students who completed only reaching 33% (16 children). This failure correlates closely with the preference for learning resources used; questionnaire results indicated that 72.92% of students still depended entirely on conventional textbooks. As a result, 68.75% of students felt that the material exposure received was less in-depth, and 58.33% classified science as a difficult subject. Interestingly, although these students were in a boarding school environment that limited personal gadget use, all students (100%) had good digital literacy and were accustomed to accessing the internet using school facilities. The questionnaire also captured massive expectations: 95.83% of students needed innovation in the form of interactive e-modules containing multimedia components (images, audio, video animations, and 3D simulations), and 100% of students wanted Islamic Science Integration content. This urgency is increasingly real considering 93.75% of students stated they had never experienced learning using e-modules.

The Potential of Interactive E-Modules in Science Learning

Recent research trends indicate that e-module development in biology education has gained significant momentum, with researchers predominantly selecting R&D approaches based on needs analysis and using N-gain as the primary data analysis technique for measuring effectiveness. The development of interactive e-modules has been shown to enhance scientific literacy, with studies demonstrating moderate to high improvements in student learning outcomes. Susilawati et al. (2025) found that interactive e-modules enriched with contextual content achieved an N-Gain score of 0.40, categorized as medium improvement in scientific literacy. Similarly, research on problem-based learning e-modules on the digestive system revealed that 56.9% of students reported learning difficulties, with only 41.67% achieving the minimum passing grade, indicating the urgent need for more effective digital teaching materials.

Interactive e-modules offer several advantages over conventional teaching materials. They present content in a more engaging format, incorporating multimedia features such as images, videos, animations, and interactive navigation, making it easier for students to access and comprehend the material. Research on flipbook-based e-modules has shown that using digital interactive materials enhances student motivation, accelerates conceptual understanding, and improves learning independence. The integration of interactive elements such as videos, audio, 3D images, and assignment links in e-modules provides students with flexible, self-paced learning opportunities that address diverse learning styles and reduce cognitive load.

Islam-Science Integration in Science Teaching Materials

The integration of Islam and science in science learning has been identified as a strategic approach to achieving national education goals, which aim to produce dedicated, religious, moral individuals with cognitive intelligence. Several studies have demonstrated the feasibility of Islam-science integrated learning materials. For instance, the development of science comics integrated with Islamic values on energy in living systems material was declared highly valid, with validation scores of 85% from material experts, 93% from teaching material experts, and 92%

from integration expert. Similarly, an Islam-science based science module on pressure material for grade VIII students achieved validation scores of 93 % from material experts, 95.11 % from media experts, and 93.82% from Al-Qur'an and Tafsir experts.

However, despite these promising findings, there remains a gap between theoretical ideals of Islam-science integration and practical implementation in Islamic educational institutions. The integration-interconnection perspective proposed by M. Amin Abdullah, conceptualized as the "Spider's Web" model, offers a framework for systematic integrative scientific development, beginning from philosophical foundations to operational levels of curriculum preparation and learning processes. Yet, the application of this model to specific subject areas, particularly science learning at the junior high school level, remains limited.

Novelty and Significance of the Present Study

As a tactical response to the identified problems, the development of interactive e-modules containing Islam-Science Integration via the Canva platform is a promising alternative solution. The novelty of this study lies in three key aspects: (1) the integration of Islam-science content within an interactive digital format specifically designed for abstract circulatory system material; (2) the use of Canva as an accessible design platform that does not require complex programming skills, allowing teachers to combine scientific texts, anatomical infographics, and simulation videos of blood circulation with Qur'anic verses and hadiths about the wonders of body creation; and (3) the application of a dual-model development approach (Lee and Owens integrated with Rowntree) to ensure both pedagogical substance depth and interactive multimedia quality.

The strategic advantage of this e-module lies in its operational flexibility which can be accessed offline after downloading, thus not burdening the school's internet infrastructure. In addition, this media integrates learning objectives, monitoring instruments, interactive quizzes, and spiritual reflection sheets into one digital document unit. Through this development research, it is hoped that there will be a transformation of the academic climate at SMPIT Bina Masyarakat Mandiri Megamendung, where the Canva platform is utilized not as a technological end goal, but as a pedagogical instrument to foster scientific awareness based on monotheism.

Literature Review

Conceptually, an interactive e-module can be defined as a module (teaching material) presented in electronic/digital format and arranged systematically in easy-to-understand language so that students can learn independently with minimal guidance from the teacher [1]. This e-module is also a module "presented electronically" (electronic delivery) [2].

The word "interactive" in the e-module refers to the strengthening of electronic modules through the integration of information technology and user interaction features, such as navigation buttons and usage instructions, so that e-modules can be used independently in various places and times [3]. This interactivity dimension is also aligned with the emphasis that digital modules can contain interactive content to support easy access and independent learning in flexible/unlimited time [4]. In addition, the aspect of interaction and feedback is one of the design components considered important in the development and evaluation of e-modules [5].

Conceptually, Islam-Science integration can be defined as a process and educational/scientific framework that unifies (synergizes) Islamic sciences (religious/revealed knowledge and Islamic values) with modern science (science, technology, and/or social sciences) coherently, so that both are not treated separately (dichotomously) in objectives, material, learning strategies, and educational evaluation [6]. This definition departs from the finding that theoretically the relationship between religion and science (e.g., social sciences) can be understood integratively, but in educational practice dichotomy often occurs; integration is then

projected to bridge the gap between theoretical ideals and learning realities in Islamic educational institutions [7].

At the pedagogical level, Islam-Science integration means that science/ technology learning is designed to be connected to Islamic values, concepts, and life experiences so that learning is considered meaningful and can influence expected learning outcomes [8], [9].

Learning is a process of interaction between students, teachers, and learning resources in a learning environment where teachers and students exchange information. The learning process can take place directly in the classroom or in modern ways in today's digital era where the learning process can be carried out with the help of technology. Currently, technology has a major impact in various fields, especially in education. In today's education, both teachers and students use advanced technology in the teaching and learning process. Technology has made the learning process in the classroom easier. Learning activities in the classroom can be more varied with the application of technology, so that students do not feel bored with varied learning methods [10].

Science learning at the junior high school level can be understood as a planned learning process that guides teachers in designing and implementing science learning activities for junior high school students, with an emphasis on developing science competencies and their achievement measured through assessment tools aligned with the characteristics of natural science [11], [12].

Junior high school students are at the early adolescent developmental stage characterized by various significant changes in cognitive, social-emotional, and behavioral aspects. This period is a critical transition that affects long-term individual development [13], [14].

Conceptually, the human circulatory system (cardiovascular system) is a functional system composed of the heart and blood vessel system that work together to maintain circulatory function in the body, for example maintaining internal conditions within the intravascular space [15], [16], [17].

Canva is an online-based graphic design platform/software (online design tool) designed so that users, including beginners, can create various visual products relatively easily for various creative and communication needs [18]. In the educational context, Canva is also understood as a graphic design platform that can function as an instructional media, because educators/students use it to compile learning materials that emphasize visual communication [19], [20].



Method (منهج)

This research was conducted at SMPIT Bina Masyarakat Mandiri (BMM), an accredited A boarding school in Bogor Regency that focuses on Qur'an tahfidz education and leadership. The research subjects were 48 grade VIII students of SMPIT Bina Masyarakat Mandiri. This research was conducted in the even semester of the 2025/2026 academic year, for 6 months, starting from December 2025 to June 2026.

This research uses Research and Development (R&D), a research method designed to produce, develop, validate, and test the effectiveness of an educational product through development stages carried out systematically and planned. Sugiyono explains that the Research and Development method is used to produce specific products and simultaneously test the effectiveness of these products in educational practice [21].

The development of the Islam-Science Integration-based interactive e-module on the Circulatory System material uses a mixed method to ensure the resulting product is valid,

practical, and effective. The qualitative approach is applied at the needs analysis stage (observation and interviews) as well as collecting improvement suggestions from expert validators to examine the condition of the object naturally and obtain in-depth data, while the quantitative approach is used to test hypotheses through instrument data collection and statistical analysis at the validation, practicality, and product effectiveness testing stages through N-Gain calculations from pretest and posttest scores [21].

This study uses a mixed model that complementarily integrates the Rowntree model as the basic framework for developing teaching material substance with the Lee and Owens model as a guide for interactive multimedia design (e-module). The product-oriented Rowntree model is applied through the planning, writing, and evaluation stages to ensure that the Islam-Science Integration-based material draft is arranged systematically and has mature pedagogical substance depth [22]. To cover Rowntree's limitations in the visual digital aspect, the Lee and Owens model is integrated as a "driving engine" that focuses on Computer-Based Training development to provide comprehensive guidance regarding user interface engineering, navigation control, and interactivity systems on the Canva platform [23]. The operational synergy of these two models, combined from the needs analysis stage to formative and summative evaluation (theoretical and empirical field feasibility testing), succeeded in creating a Science E-Module on Circulatory System material that is not only strong in Islamic and scientific substance but also aesthetic, adaptive, and user-friendly. The following is the integration of Lee and Owens and Rowntree.

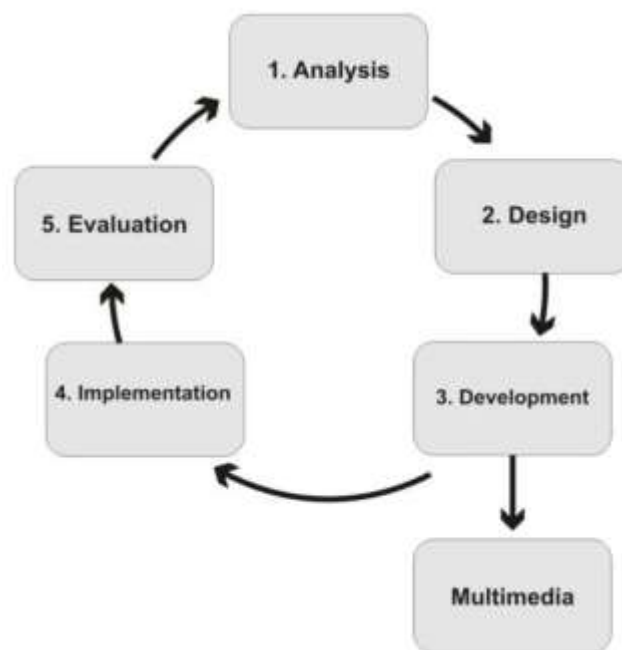


Figure 1. Integration of Lee and Owens and Rowntree Development Models [22], [23]
Modified by Researcher

Research Participants

One-to-One Trial (3 students): Students selected for initial product testing to identify basic usability issues, navigation problems, and content comprehension before wider testing. **Small Group Trial** (15 students): Students participating in the practicality testing phase to evaluate media usability and gather feedback for product revision. **Field Trial** (30 students): Students participating in large-scale testing and effectiveness evaluation through pretest-posttest design.

Instruments

The research instruments included: (1) expert validation sheets for material experts, instructional design experts, and media experts; (2) student response questionnaires; and (3) pretest and posttest learning achievement tests. Expert Validation Instruments. Material Expert Validation: Assessed five basic characteristics of teaching materials: self-instructional, self-contained, stand alone, adaptive, and user friendly [24]. Instructional Design Expert Validation: Assessed learning design aspects [25], as well as content design and e-module display design [23]. Media Expert Validation: Focused on format, organization, attractiveness, font form and size, spacing, and media consistency aspects [26]. Student Response Questionnaires: Used to measure the level of practicality response from students after using the learning media. Learning Achievement Tests: Consisted of pretest and posttest instruments to measure and compare the improvement of students' cognitive competencies, especially on the Circulatory System material.

Data Analysis Techniques

Qualitative Analysis: Used to process data in the form of criticism and suggestions from expert validators and student responses through the stages of data reduction, data presentation, and conclusion drawing as a basis for product improvement. Quantitative Analysis: Applied to measure the level of validity and practicality of the media using the Likert scale-based feasibility percentage [21], as well as measuring product effectiveness through pretest and posttest scores.

Instrument Validity and Reliability Testing

To ensure the accuracy of effectiveness measurement, the test instrument was first tested for validity (Pearson Product Moment) and reliability (Cronbach Alpha). The improvement in student cognitive learning outcomes was then analyzed and categorized using the Normalized Gain (N-Gain) test.

Result (نتائج)

Product Development Process

At the initial stage of this development research, Assessment/Analysis was conducted which included Need Assessment to compare ideal conditions with real learning conditions through observation and interviews with teachers at SMPIT Bina Masyarakat Mandiri, Bogor Regency, as well as Front-End Analysis to examine the characteristics of grade VIII students, technology availability, data collection, and cost estimation. After analyzing the curriculum (Core Competencies and Basic Competencies) to determine relevant material, activities continued to the Planning stage which included formulating General and Specific Instructional Objectives, creating the Media Content Outline (GBIM), and determining the type of learning media. Based on this series of analyses and planning, it was concluded that the development of an Islam-Science Integration Interactive E-Module for Grade VIII Science Learning at SMPIT Bina Masyarakat Mandiri, Bogor Regency, was highly necessary to answer the teaching material needs at the school. The second stage in this development research was the Design stage (product design). At this design stage, steps were arranged systematically including the Writing Preparation stage which included activities of ordering the main ideas of science material, developing learning activities along with their feedback, determining relevant examples that combine scientific concepts and Islamic values, determining graphic elements, and determining the supporting equipment needed. This design process then ended with the Writing and Editing stage, where the researcher began creating the initial draft of the e-module, making draft improvements, and compiling learning assessment instruments specifically designed for students. Furthermore, design was conducted for preparation to become electronic media starting with schedule determination, team formation, determination of Islam-Science Integration interactive e-module media specifications, and creation of media design flowcharts. The third

stage was development carried out independently by the researcher as the main developer. After the module structure design was ready, the next stage was e-module production using the Canva platform with the following activities: 1) Creating attractive homepage and cover designs, 2) Arranging material layout, 3) Entering Grade VIII Science material into the e-module by inserting Islam and Science integration content, 4) Adding interactive elements such as video, audio, 3D images and assignment links to each learning activity, 5) Adding evaluation to the e-module, and 6) Conducting final checks on the functionality of interactive features on Canva.

Media Feasibility

Based on the development of the Islam-Science Integration e-module in science learning that has been conducted, data on theoretical feasibility validation results from material experts, learning design experts, and media experts were obtained as presented in the following diagram.

The theoretical feasibility test conducted in this study included validation tests by 3 experts. The validation results from the three experts showed that this media met very good feasibility standards. The material expert gave an average of 91.36% ("Excellent" qualification), the instructional design expert gave an average of 94.19% ("Excellent" qualification), and the media expert gave an average of 96.19% ("Excellent" qualification). The overall average from the three expert validation results was 93.91%. The Islam-Science interactive e-module was very good and very valid for use in learning activities [27], [28].

Table 2. One-to-One Trial Results

No	Aspect	Score (Σx)	Percentage	Qualification	Description
1	Material Aspect	18.33	91.65%	Excellent	No revision needed
2	Learning Design Aspect	18.33	91.65%	Excellent	No revision needed
3	Media Aspect	18.67	93.35%	Excellent	No revision needed
Average		55.33	92.22%	Excellent	

The one-to-one trial conducted with 3 students showed an average achievement percentage of 92.03% which fell into the Excellent qualification. In per-aspect review, the media aspect obtained the highest score of 92.86%, followed by the material aspect of 92.50%, while the learning design aspect obtained a score of 90.29%.

Small Group Trial Results

The small group trial (15 students) was used to measure media practicality. The average percentage in the small group trial was 89.95% ("Good" qualification) approaching excellent, with the highest material aspect (92%), learning design (90%), and interactive media (87.75%). Based on these data, the researcher found that the high percentage in the material aspect (92%) at the initial stage proved that the Islam-Science Integration concept was designed very well [29]. The combination of Qur'anic verses or Islamic values with biological science facts on the circulatory system material was considered very relevant, easy to understand, and aligned with the characteristics of students at SMPIT Bina Masyarakat Mandiri, Bogor Regency.

Field Trial Results

The final e-module empirical feasibility test or field group trial (30 students) was used to measure media feasibility. The average percentage in the media feasibility test was 92.58% ("Excellent" qualification), with material aspect (92.33%), learning design (93%), and media (92.75%). Overall, there was an increase in feasibility test results: material aspect rose from 91.33% to 92.33%, learning design aspect rose from 90% to 93% (the highest result), media aspect rose from 88.1% to 92.75%. The feasibility test results of the Islam-Science Integration interactive e-module in Science subjects showed very feasible results for use [30]. The significant increase in all aspects showed that the revision process conducted by the researcher based on input from the small group trial had been effective. The researcher emphasized that the highest score in the learning design aspect (93%) reflected that the Islam-Science integration flow in this e-module was very systematic and in accordance with the learning rhythm of grade VIII students at SMPIT Bina Masyarakat Mandiri.

Instrument Validity and Reliability

The effectiveness testing stage was tested on 30 grade VIII students of SMPIT Bina Masyarakat Mandiri, Bogor Regency. This process was conducted through testing learning outcomes before and after using the Islam-Science Integration interactive e-module on the human circulatory system material. To ensure the accuracy of effectiveness measurement, the test instrument was first tested for validity with the following results.

Table 3. Test Instrument Validity Results

Item No	r-calculated	r-table ($\alpha=0.05$)	Description	Decision
1	0.542	0.361	Valid	Used
2	0.210	0.361	Invalid	Dropped
3	0.481	0.361	Valid	Used
4	0.115	0.361	Invalid	Dropped
5	0.612	0.361	Valid	Used
6	0.523	0.361	Valid	Used
7	0.301	0.361	Invalid	Dropped
8	0.439	0.361	Valid	Used
9	0.518	0.361	Valid	Used
10	0.654	0.361	Valid	Used
11	0.288	0.361	Invalid	Dropped
12	0.712	0.361	Valid	Used
13	0.199	0.361	Invalid	Dropped
14	0.477	0.361	Valid	Used
15	0.601	0.361	Valid	Used
16	0.089	0.361	Invalid	Dropped
17	0.592	0.361	Valid	Used
18	0.312	0.361	Invalid	Dropped
19	0.415	0.361	Valid	Used
20	0.567	0.361	Valid	Used
21	0.245	0.361	Invalid	Dropped
22	0.488	0.361	Valid	Used
23	0.633	0.361	Valid	Used
24	0.154	0.361	Invalid	Dropped
25	0.555	0.361	Valid	Used

26	0.341	0.361	Invalid	Dropped
27	0.422	0.361	Valid	Used
28	0.509	0.361	Valid	Used
29	0.680	0.361	Valid	Used
30	0.463	0.361	Valid	Used

The r-table value for the number of participants (n) = 30 is 0.361 at a significance level of $\alpha = 0.05$. The criterion used is that the item is declared valid if r-calculated is greater than r-table, and invalid (dropped) if r-calculated is lower than or equal to r-table. Of the 30 items tested, 20 items were declared valid and 10 items were declared dropped. Valid items had significant correlation coefficients with the total score, with the highest r-calculated value given to item number 12 ($r = 0.712$) and item number 29 ($r = 0.680$), indicating that these two items had very large discriminatory power. Conversely, several items namely numbers 2, 4, 7, 11, 13, 16, 18, 21, 24, and 26 were declared dropped because they had r-calculated values below 0.361. This indicates that these items were not able to optimally distinguish students who understood the material from students who did not understand the material.

Table 4. Reliability Test Results

Cronbach's Alpha	N of Items
0.832	20

The reliability coefficient (based on Cronbach's Alpha / KR-20) obtained was 0.832, as shown in Table 4. According to Guilford's reliability coefficient interpretation criteria [31], the value of 0.832 is in the range between 0.80 and 1.00, which falls into the very strong reliability category.

Media Effectiveness

Product effectiveness testing was conducted by examining student learning outcomes by comparing pre-test and post-test scores. The following is the N-Gain calculation formula:

$$N\text{-Gain} = \frac{\text{Post Test Score} - \text{Pre Test Score}}{\text{Ideal Score} - \text{Pre Test Score}}$$

$$N\text{-Gain} =$$

$$\frac{\text{Post Test Score} - \text{Pre Test Score}}{\text{Ideal Score} - \text{Pre Test Score}}$$

$$\frac{\text{Post Test Score} - \text{Pre Test Score}}{\text{Ideal Score} - \text{Pre Test Score}}$$

Table 5. Pretest and Posttest Results

No	Name	Pretest	Posttest	N-Gain	%
1	Abdul Aziz	45	90	0.82	82%
2	Abdullah 'Azam	65	90	0.71	71%
3	Aisyah Kamilah Darmawan	60	85	0.63	63%
4	Alfian Rizqie Zaidan	50	95	0.90	90%
5	Althaf Rasiin Gaus	60	85	0.63	63%
6	Arshia Ghaisani Aysel Mulyawan	55	95	0.89	89%
7	Aulia Nur Hanifah	50	80	0.60	60%
8	Ba'adillah Hafiz Zein	60	85	0.63	63%
9	Betari Tsurayya Indana Sofie	65	85	0.57	57%
10	Danish Althaf Dhiyaulhaq	55	95	0.89	89%
11	Fadlan Finanda Hanania	60	85	0.63	63%
12	Faqiha Khoirun Nasuha	60	80	0.50	50%
13	Fayrazita Putri Syaban	45	80	0.64	64%

14	Hani Humaida	55	100	1.00	100%
15	Hasya Nazifa Lubna	85	100	1.00	100%
16	Hud Nur Ashr	65	100	1.00	100%
17	Husna Aulia Taher	65	95	0.86	86%
18	Khaylila Wafiyy Setiawan	60	90	0.75	75%
19	Maryam	65	95	0.86	86%
20	Muhammad Alfatih	45	85	0.73	73%
21	Muhammad Ziyad Ilmi	65	100	1.00	100%
22	Muhammad Zufar Azmi Jamil	25	80	0.73	73%
23	Najwa Tsabita	50	85	0.70	70%
24	Raihan Tony Oktavian	55	80	0.56	56%
25	Regina Yulianti	60	100	1.00	100%
26	Subhaanaa Syariel Haram	45	80	0.64	64%
27	Syahid Syarif Alfarabi	65	85	0.57	57%
28	Syamil Fadhlán Nabil	65	95	0.86	86%
29	Zahra Ayasha Nadhirah	65	100	1.00	100%
30	Zaskya Nur Izzaty	45	95	0.91	91%
Average		57.00	89.83	0.77	77%

Based on the above results, the average pretest score was 57.00 and the average posttest score was 89.83, with an N-Gain of 0.77, which means there was a very significant increase, indicating that the Islam-Science Integration interactive e-module on the human circulatory system material can be used in learning for Grade VIII students of SMPIT Bina Masyarakat Mandiri, Bogor Regency.

Table 6. N-Gain Score Categories

N-Gain Value	Category
$g > 0.7$	High
$0.3 \leq g \leq 0.7$	Medium
$g < 0.3$	Low

Based on these data, the N-Gain of 0.77 is included in the high category. Furthermore, the N-Gain results obtained were converted into percentages after the above calculations were completed. These percentage results will be converted based on the effectiveness of learning activities, as shown in the following table:

Table 7. N-Gain Effectiveness Interpretation Categories

N-Gain Value	Category
< 40	Not effective
40 - 55	Less effective
56 - 75	Quite effective
> 76	Effective

The data shows a significant increase from the average pre-test score of 57.00 to the average post-test score of 89.83. The average N-Gain value is 0.77 or 77%, which represents an effectiveness interpretation at the Effective level. This shows that the Islam-Science Integration interactive e-module learning tool can effectively improve students' cognitive abilities in the human circulatory system subject.

The data shows a very sharp increase between the average pre-test score of 57.00 (low



Discussion (مناقشة)

category) to 89.83 in the post-test (very high category). This increase of 32.83 points indicates that the intervention through the Islam-Science Integration e-module successfully helped students understand complex concepts in the Circulatory System material. The improvement in posttest results in this study is consistent with the results of research by Meryastiti et al. (2023) which developed e-modules resulting in positive improvement from pretest to posttest.

This effectiveness is reinforced by the average N-Gain value of 0.77, which falls into the High category (High > 0.7). When compared with similar studies, this finding demonstrates superior effectiveness. For instance, research on interactive "Enasel" e-modules equipped with crossword puzzles for grade VIII students achieved an N-Gain of 0.70 (medium category), while flipbook-based problem-based interactive e-modules for junior high school science obtained an N-Gain of 0.70, also in the medium category. Similarly, interactive e-modules using Storyboard Chemistry Flash media for high school students showed an N-Gain in the moderate to substantial range. The N-Gain of 0.77 achieved in this study surpasses these findings, placing it in the effective and high category. When converted into percentages, this 77% value is at the Effective level, consistent with research by Herlina et al. (2025) which found an N-Gain of 78.10% for interactive science e-modules in differentiated learning.

In individual distribution, the majority of students (63.3%) achieved high effectiveness levels, with several students such as Hani Humaida, Hasya Nazifa Lubna, Hud Nur Ashr, Muhammad Ziyad Ilmi, Regina Yulianti, and Zahra Ayasha Nadhirah achieving maximum N-Gain scores of 1.00 with perfect post-test scores (100). A student named Muhammad Zufar Azmi Jamil deserves special note. He started with the lowest pretest score (25), but was able to catch up and achieve a posttest score of 80 (N-Gain 0.73). This proves that the learning method is also very friendly and effective for students with minimal initial understanding.

Several key factors underlie this significant improvement

Islam-Science Integration as a Spiritual and Cognitive Motivator. The alignment of circulatory system material with Islamic values (such as the greatness of heart creation and blood as a form of Sunnatullah) proved to increase student cognitive engagement. Students not only learn to memorize organs but also understand the meaning behind these biological mechanisms, which is highly relevant to the characteristics of students at SMPIT. This finding aligns with the theoretical framework proposed by Purwati et al. (2023), who mapped Basic Competencies in science and religious subjects at Madrasah Tsanawiyah, demonstrating how one science basic competency can be related to several fundamental religious competencies across grade levels. Their research provides a systematic foundation for integration, showing that science subject matter can be integrated with religious subject matter while considering linkages between Basic Competencies.

Furthermore, the integration approach in this study resonates with the desecularistic-implementative curriculum model implemented in Indonesian Islamic universities, which aims to unify religious-Islamic values with modern science. This approach is built upon frameworks such as the "Spider Web" integration-interconnection model and the "Tree of Knowledge" paradigm, which narrate the educational direction of Islamic institutions through curriculum design that emphasizes the unification of religious and scientific knowledge. The success of this e-module in improving learning outcomes provides empirical evidence that such integration can be effectively operationalized at the junior high school level.

The Qur'anic verses and Islamic values embedded in the e-module serve not merely as decorative additions but as meaningful pedagogical tools that Provide spiritual motivation that

enhances cognitive engagement. Create meaningful connections between scientific facts and students' religious worldview. Support the development of holistic understanding that integrates empirical observation with transcendental reflection. Foster character development alongside cognitive growth, consistent with the principles of Tawhid, Tarbiyah, Ta'lim, and Tazkiyah

Interactive Media and 3D Visualization. Circulatory system material is abstract (the process of blood flow in the body). The use of interactive elements such as videos, 3D illustrations, and audio in the e-module compiled through Canva helped visualize these concepts concretely. This is in accordance with Multimedia Learning theory which states that students learn better from words and pictures than from words alone. The effectiveness of interactive multimedia in enhancing student comprehension is well-documented in the literature. Naimah et al. (2026) found that incorporating visual components, animation, and narrative in e-modules effectively converted abstract concepts into tangible and meaningful learning experiences. Similarly, STEM-based e-module research emphasizes that interactive digital learning materials improve student engagement and understanding of complex scientific concepts.

Flexible Independent Learning. The e-module structure that presents material sequentially and attractively allows students to learn at their own pace (self-paced learning), thus reducing the external cognitive load that often occurs in one-way conventional learning. This finding aligns with research showing that interactive e-modules are highly practical because they can be accessed by students anytime and anywhere, providing flexibility for students to learn and understand material according to their learning speed and style. The self-paced nature of the e-module also supports differentiated learning, accommodating various learning styles including visual, auditory, and kinesthetic learners.

Systematic Integration of Content and Pedagogy. The successful development and validation of this e-module (93.91% average expert validation) reflects the effectiveness of the integrated Lee and Owens and Rowntree development models. The high scores across material (91.36%), instructional design (94.19%), and media (96.19%) aspects indicate that the e-module achieves excellence in substance: Accurate science content integrated with appropriate Islamic values. Design: Pedagogically sound learning structure and flow. Media: Engaging and accessible multimedia presentation

This multi-aspect excellence contributes to the effectiveness of learning outcomes, as students are exposed to content that is both academically rigorous and pedagogically engaging. However, the researcher noted that approximately 33.3% of students were in the medium to low effectiveness category. This is largely influenced by internal student factors, such as differences in initial ability (pre-test scores below 40) and varying levels of learning independence. This indicates the need for additional scaffolding for students with lower learning speeds, a finding consistent with broader research on differentiated instruction in interactive e-module implementation.

How Islamic Values Support Science Learning

The integration of Islamic values in this e-module supports science learning through multiple mechanisms. **Cognitive Engagement:** By connecting scientific concepts to students' religious beliefs and worldview, the e-module creates cognitive hooks that enhance interest and motivation. Students are not merely learning about biological structures; they are engaging with these structures as signs (ayat) of divine creation, which aligns with Qur'anic teachings that encourage reflection upon natural phenomena. **Meaningful Learning:** The integration helps students see science not as isolated facts but as part of a coherent worldview where empirical observation and spiritual reflection complement each other. This addresses the challenge of scientific dichotomy and helps students understand the purpose and significance of scientific knowledge. **Character Development:** By incorporating Islamic ethical values alongside scientific

content, the e-module supports the development of character and spirituality alongside cognitive skills. This holistic approach is consistent with the objectives of Islamic education that aim to develop balanced individuals capable of applying Islamic principles and scientific knowledge to contemporary problems. Contextual Relevance: For students in Islamic educational institutions, the integration of science and Islamic values makes learning more relevant and personally meaningful, which research has shown to enhance engagement and retention.



Conclusion (خاتمة)

The Canva-based Islam-Science Integration interactive e-module was successfully developed using the Lee and Owens model integrated with the Rowntree model through five main stages: (1) Analysis/assessment, including needs analysis, front-end analysis, curriculum analysis, and objective analysis; (2) Design, involving writing preparation, draft creation, and media design including flowchart development; (3) Development, consisting of e-module production on the Canva platform with interactive elements (video, audio, 3D images, and assignment links); (4) Implementation through one-to-one trials, small group trials, and field trials; and (5) Evaluation, including formative and summative evaluation. The final product is an interactive digital teaching material that combines scientific visualization of the circulatory system with Qur'anic verses, hadiths, and Islamic values, accessible via web link and operable offline after download.

The Islam-Science Integration interactive e-module was declared highly feasible for use in learning, with an overall average validation score of 93.91% from material experts (91.36%), instructional design experts (94.19%), and media experts (96.19%). Student trials confirmed its practicality, with one-to-one trial results of 92.03% ("Excellent"), small group trial results of 89.95% ("Good"), and field trial results of 92.58% ("Excellent"). These findings demonstrate that the e-module meets the criteria for valid, practical, and high-quality learning media suitable for implementation in Islamic educational institutions.

The e-module effectively improved student learning outcomes, as evidenced by the significant increase from pretest scores (57.00) to posttest scores (89.83), with an average N-Gain of 0.77 (77%) in the "Effective" and "High" category. This indicates that the e-module successfully enhances students' cognitive understanding of the circulatory system material through its integrated Islam-Science approach.



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