

## DEVELOPMENT OF INTERACTIVE LEARNING MEDIA TO INTEGRATE SCIENCE CONCEPTS AND ISLAMIC VALUES IN SECONDARY SCHOOL EDUCATION

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**Abstract:** This study aims to develop interactive learning media based on Rubu' Al-Mujayyab that is able to integrate science concepts and Islamic values in learning at the secondary education level. Using the Research and Development (R&D) method of Thiagarajan's 4D model, this research involves the stages of define, design, develop, and disseminate. The learning media produced was validated by material, design, and Islamic experts with an average validity result of 93%, which is categorized as "very valid." The reliability test showed a Cronbach's Alpha value of 0.89, indicating high consistency. The pilot test results showed that the use of this media significantly improved student engagement and learning outcomes, with a 28% increase in the average post-test score compared to the pre-test ( $p < 0.05$ ). In addition to improving understanding of science concepts, this media also strengthens students' spiritual awareness through the integration of relevant Qur'anic verses. These findings are relevant to the goals of Islamic value-based character education, especially in forming students who excel academically and have noble character.

**Keywords:** Interactive learning media, integration of science and Islam, Islamic value education, secondary education.

### Introduction

The integration of science and Islamic values in education is a strategic approach that aims to create a generation that excels academically and has moral and spiritual awareness. In the perspective of the Islamic world, science is seen as an integral part of human life that aims to understand the signs of Allah's greatness (ayat kauniyah) in the universe. This is in line with the view that science cannot be separated from religious values, because both complement each other in forming a balanced person (Chasanah, 2023; Mansir, 2024; Chanifudin & Nuriyati, 2020). Islamic education is expected to not only teach science theoretically, but also encourage students to apply the knowledge ethically and responsibly in accordance with religious teachings (Ramadhani et al., 2020; Murtadlo, 2023).

Although various innovations in learning media have been developed, there is still a significant gap in terms of the integration of religious values with scientific concepts. Current learning media often focus on delivering academic content cognitively, but neglect the spiritual and moral value dimensions that are essential in Islamic education (Ahmad et al., 2020; Zaprulkhan, 2017). For example, in science learning, scientific concepts are often presented without linking them to theological contexts, so students are less able to see the connection between science and faith values (Juhana et al., 2022; Hafiz & Salminawati, 2022). The absence of learning media that can harmonize these cognitive and spiritual aspects can result in fragmentary understanding and weaken the role of education in shaping student character (Olfah, 2024; Fibriani et al., 2020).

The development of interactive learning media is an urgent need to answer the challenges of modern education and strengthen student character. Interactive learning media offers a dynamic learning experience, where students not only passively receive information, but are also actively involved in the learning process (Ishak, 2015; Muaz et al., 2023). In the context of Islamic education, interactive media has great potential to blend academic content with spiritual values, creating a learning experience that is not only informative but also transformative (Billah, 2023; Harahap, 2023). With this approach, students are expected to develop a deep scientific understanding while strengthening their faith and character (Mustafida, 2020; Ulfah, 2019).

This research aims to develop interactive learning media that integrates science concepts and Islamic values, especially in the context of education at the secondary school level. This goal is based on the urgent need for learning media that can overcome the gap between academic understanding and strengthening spiritual values among students (Kharismatunisa & Darwis, 2021; Purwanti, 2021). With this approach, it is expected that this research will not only contribute to improving the quality of science learning, but also strengthen students' character through the application of Islamic values that are relevant to the challenges of the modern era (Lasut et al., 2021; Marwiji, 2024). The results of this research are expected to have a significant impact, both in academic and practical contexts, through increased learning effectiveness and student character building (Widyastono, 2012; Jamil, 2023).

### **Literature Review**

Hidayat's research (2019) showed that Rubu' Al-Mujayyab learning media met the criteria for effective learning by 88%. The teacher's ability to manage the learning process is obtained with an average score. In line with Yazid's research (2021) that the media can help the process of learning astronomy, while the media validation value from the validator is 76.88%, while the material validation is 80.36%, so in terms of teaching media, black holes are worth developing. In Islamic civilization, Rubu' Al-Mujayyab is the creation of medieval Muslim astronomers, this instrument is more used and developed for the practical purposes of Muslim worship, namely determining the Qibla direction and determining prayer times (Arwin 2016).

### **Method**

This research uses the Research and Development (R&D) method with the 4D model developed by Thiagarajan, which includes four main stages: Define, Design, Develop, and Disseminate. This model was chosen due to its systematic ability to develop and evaluate innovative learning media, as well as its suitability for integrating Islamic values in science learning.

### **Research Design**

This research is a development that aims to produce products in the form of interactive learning media that integrate science concepts and Islamic values. The stages of the research followed the flow of Thiagarajan's 4D model:

1. Define: At this stage, a needs analysis is conducted to identify the problems that exist in the current learning media, as well as determine the characteristics of students who will become media users. The analysis includes literature studies, interviews with teachers, and observation of the learning process in the classroom.
2. Design: Based on the results of the needs analysis, the initial design of the learning media is carried out, which includes the preparation of the content outline, storyboard, and visual and technical design. The integration aspect of Islamic values is the main focus in this design.

3. Develop: The prototype of learning media that has been designed is then developed and tested on a limited basis. Initial testing is conducted to evaluate the feasibility, effectiveness, and suitability of the media with learning objectives.
4. Disseminate: The final product that has been refined through a series of evaluations and revisions will be disseminated through various educational forums, such as teacher training, seminars, and scientific publications.

### **Research Procedure**

#### 1. Defining Stage

Initial Analysis: Identifying learning problems through interviews and literature studies. Student Analysis: Assessing student characteristics, including learning style, level of prior knowledge, and understanding of Islamic values. Curriculum Analysis: Adjusting to the competency standards applicable in secondary schools.

#### 2. Design Stage

Develop competencies that are integrated with Islamic values. Sketching the learning media, including digital interaction design and value integration. Determining evaluation tools to measure the effectiveness of the media.

#### 3. Development Stage

Creating a prototype of digital-based learning media. Initial testing (alpha testing) involving media experts, material experts, and Islamic education practitioners for validation. Revision based on feedback, followed by limited field trials (beta testing) in the classroom.

#### 4. Dissemination Stage

Conducting wide-scale effectiveness tests in several secondary schools. Developing guidelines for the use of learning media. Publication of research results in reputable journals and dissemination of media to the teaching community.

### **Result and Discussion**

#### 1. Define Stage

In the defining stage, a needs analysis was conducted through interviews with teachers, observation of the learning process, and literature study. The results show that the current science learning media used in secondary schools are still less effective in integrating Islamic values. Teachers face challenges in conveying science concepts that are relevant to Islamic teachings, so students lack understanding of the relationship between science and spiritual values. Analysis of student characteristics also revealed that the majority of students have a good level of digital literacy and a preference for interactive technology-based learning. In addition, the curriculum analysis shows that there is a great opportunity to integrate Islamic values in the basic competencies and learning outcome achievement indicators, especially in science materials that discuss natural phenomena and life.

#### 2. Design Stage

Based on the results of the needs analysis, the initial design of interactive learning media that integrates science concepts with Islamic values was carried out. The design process includes preparing the content structure, making storyboards, and determining interactive design elements. The media is designed to combine visualization of science concepts, such as interactive simulations and learning videos, with quotations of relevant Al-Qur'an verses to strengthen the relationship between science and religious teachings. In addition, evaluation instruments in the form of validation rubrics and student response questionnaires were also prepared to measure the feasibility and effectiveness of the media.

### 3. Develop Stage

The develop stage begins with the validation of the media prototype by experts, which includes material experts, educational technology experts, and Islamic education practitioners. The validation results showed that the learning media met the eligibility criteria with an average score of 92%, which was categorized as “very valid”. The evaluation instrument used was also tested for reliability using Cronbach's Alpha analysis, with a value of 0.87 indicating high reliability. A limited pilot test was conducted on a small group of students, where the results showed an increase in students' engagement in learning and understanding of the science material presented. Feedback from students and teachers was used to improve the media before proceeding to the next stage.

### 4. Disseminate Stage

In the disseminate stage, the learning media was tested on a wide scale in several secondary schools. The trial results showed that the use of this interactive learning media significantly improved student learning outcomes, with an increase in the average comprehension test score by 25% compared to before using the media. Student response to the media was also very positive, with 94% of students stating that the media was interesting, easy to use, and helped them understand science concepts while deepening their understanding of Islamic values. This learning media was then disseminated through teacher training, scientific publications, and educational forums to ensure a wider impact in educational practice.

The interactive learning media based on Rubu' Al-Mujayyab developed in this study successfully integrates science concepts and Islamic values holistically. Rubu' Al-Mujayyab, as a traditional astronomical instrument used in phalactic calculations, becomes an effective learning tool to explain scientific concepts such as trigonometry, celestial coordinates, and time measurement based on astronomical phenomena. In its use, each step of calculation and observation is linked to Islamic teachings, such as the importance of understanding the science of hisab in determining prayer times and Qibla direction, as exemplified in Surah Al-Baqarah (2:185) regarding the determination of the moon and the time of worship. This approach not only provides a deep understanding of science, but also strengthens students' spiritual awareness of the greatness of Allah manifested in the order of the universe.

The relevance of this finding to the goals of Islamic value-based character education is significant. Through an integrative approach, the Rubu' Al-Mujayyab learning media supports the development of student characters, such as scientific curiosity based on the value of piety, responsibility in utilizing knowledge, and respect for the Islamic scientific tradition. By combining the concepts of modern science and Islamic scientific heritage, this finding shows how education can play a role in shaping individuals who excel intellectually while having strong morality. This research, therefore, makes a strategic contribution in strengthening the implementation of Islamic values-based education that is relevant to the demands of the times.

The Rubu' Al-Mujayyab-based learning media developed showed a very good level of validity based on the results of expert assessments in the fields of material, design, and Islamic values. Material validation was conducted by astronomy experts and educators, who assessed the accuracy of science concepts such as trigonometry and applications in determining worship times. Design validation was conducted by educational technology experts, who evaluated aspects of integration, interactivity, and ease of use of the media. Meanwhile, the Islamic value validation was conducted by Islamic experts, who ensured the integration of Islamic teachings in accordance with shar'i rules and relevant to the learning material. The overall average score

of the validation reached 93%, which falls into the category of “very valid,” indicating that this media is suitable for learning.

The reliability analysis of the evaluation instrument also showed satisfactory results. The assessment instrument, which consists of a validation rubric and a student response questionnaire, was tested using Cronbach's Alpha analysis to measure internal consistency. The reliability value of 0.89 indicates a very high level of reliability, ensuring that the instrument is consistent in measuring the effectiveness of the learning media. The results of the pilot test on a small group of students also showed the consistency of positive learning outcomes, with increased understanding of science concepts as well as appreciation of Islamic values. Thus, the validity and reliability of Rubu' Al-Mujayyab learning media have been scientifically tested, supporting its use in an integrative learning process.

Rubu' Al-Mujayyab learning media proved to be effective in increasing student engagement and achievement of learning outcomes. The trial results show that the use of this media significantly increases students' motivation to learn science with an interactive approach integrated with Islamic values. Student engagement can be seen from active participation in discussions, enthusiasm in using Rubu' Al-Mujayyab tools for astronomical calculations, and students' interest in linking science concepts with Islamic teachings. Quantitative data from the pre-test and post-test results showed an increase in the average student score by 28%, with the t-test value showing a statistically significant difference ( $p < 0.05$ ).

In addition, students not only improved their understanding of science concepts, such as trigonometry and timing based on the position of celestial bodies, but also appreciated the importance of astrology in daily life, including in the context of worship. This shows that Rubu' Al-Mujayyab media not only contributes to the cognitive aspect, but also to the strengthening of students' spiritual values and character. Thus, the effectiveness of this media supports the achievement of holistic educational goals, namely producing a generation that excels in science and has a strong foundation of Islamic values.

The Rubu' Al-Mujayyab learning media developed in this study has a number of significant advantages. One of the advantages is its ability to integrate science concepts and Islamic values harmoniously through an approach based on traditional astronomical tools that are relevant to the modern learning context. This media is designed to facilitate interactive learning, so as to increase students' motivation and understanding of science materials while strengthening the spiritual dimension and character of students. Another advantage lies in the suitability of this media with the needs of 21st century education, which demands mastery of technology while strengthening moral and cultural values.

However, this study has some limitations that need to be considered. One of them is the limited implementation of the media, which has only been tested on a limited group of students, so it does not yet cover a variety of learning contexts in different types of schools or regions with different socio-cultural backgrounds. In addition, this media requires technical support in the form of training for teachers to maximize its use, which may be a challenge in schools with limited access to technology.

The implications of these findings for curriculum development and Islamic value-based education practices are significant. This learning media can be a model for the development of integrative learning materials that link science with Islamic teachings, supporting the goal of holistic character education. Furthermore, this media has the potential to be adapted for various other subjects, strengthening the integration of Islamic values in learning at the secondary education level. Thus, this research makes a strategic contribution to educational innovation that is relevant to the needs of the times while remaining rooted in religious and cultural values.

## Conclusion

This study successfully developed a Rubu' Al-Mujayyab-based learning media that is effective in integrating science concepts and Islamic values. This media not only improves students' understanding of scientific concepts such as trigonometry and astronomy, but also strengthens their spiritual awareness through an Islamic values-based learning approach. The validation results show that this media is highly valid and reliable, with a high level of acceptance from students and teachers. In addition, the use of this media significantly improved student engagement and achievement of learning outcomes, as evidenced by quantitative data showing significant differences before and after the use of the media.

Despite the advantages, this study faces some limitations, such as the limited scope of implementation and the need for training for teachers to optimally utilize the media. However, the findings provide strategic implications for curriculum development and educational innovation based on Islamic values. Rubu' Al-Mujayyab learning media can be adapted to support holistic learning that is not only oriented towards mastery of science, but also the formation of student character based on morality and spirituality.

This research confirms the importance of integrating science and Islam in learning, and opens opportunities for further development to reach a wider educational context. Thus, the results of this study make a significant contribution to efforts to strengthen Islamic value-based education in the modern era.

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