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Exploring the Development of Digital Teaching Materials Integrated Quranic with the Canva App

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ABSTRACT
This study aims to develop digital science teaching materials integrated with Quranic verses, particularly those related to the Earth and solar system, to enhance students' scientific literacy and foster character values aligned with the Pancasila Student Profile. The research employed the Borg and Gall research and development (R&D) model, which consists of ten systematic stages ranging from data collection to final product implementation. The research sample comprised 40 students, three expert lecturers, and six science teachers, selected through a non-probability sampling approach using the convenience sampling technique. The developed digital teaching materials demonstrated a high level of validity and were positively received by students. Their use effectively improved students' scientific literacy, as indicated by an N-gain score of 0.44 (medium category) and an effectiveness value of 1.120 (high category). Furthermore, the assessment of the Pancasila Student Profile revealed that 58% of students had developed cultured character traits. These findings suggest that integrating Quranic verses into digital science teaching materials not only enhances students' understanding of scientific concepts but also strengthens their internalization of religious values, thereby supporting holistic character development consistent with the Pancasila Student Profile framework..

Keywords: *digital teaching materials, integration of Quranic verses, science literacy, Pancasila student profile*

INTRODUCTION

Education is a conscious and systematic effort to develop human potential and quality, as well as to shape moral character and intellectual competence (Fardila, Toharudin, & Hendrayana, 2023; Khomsatun, Solehuddin, & Mulyadi, 2023). Through education, a person can hone skills and talents to achieve success in life. Education also plays an important role in shaping attitudes and moral values. Currently, the development of science and technology has influenced the education sector, known as education 4.0. Through education, individuals can cultivate their talents and skills to achieve personal and social success. It also plays a central role in shaping values, attitudes, and moral awareness. The rapid development of science and technology has significantly transformed the educational landscape, giving rise to the concept of Education 4.0, which integrates digital technology and artificial intelligence to enhance flexibility, student-centered learning, and 21st-century skill development in line with the demands of Industry 4.0 (Coello, Albornoz, & Cabrera, 2023; Guerrero-Quiñonez, Bedoya-Flores, Mosquera-Quiñonez, Ango-Ramos, & Mesías-Simisterra, 2023; Singh et al., 2023; Tikhonova & Raitskaya, 2023; Udvaros, Gubán, Gubán, &

Sándor, 2023). Consequently, Indonesia must continue to innovate to prepare its young generation for global competitiveness.

In response to these challenges, the Indonesian government introduced the Merdeka Belajar (Freedom to Learn) curriculum as an innovative step to enhance educational quality and address 21st-century learning demands. This curriculum emphasizes learner autonomy, creativity, and flexibility, allowing students to design their own learning pathways (Hadi, Ngindana, Sulaiman Kurdi, & Sulaiman Kurdi, 2023; Sufyadi et al., 2021). Meanwhile, Islamic-based schools also adopt the Integrated Islamic School (SIT) curriculum, which combines Islamic religious teachings with academic content to develop students' character, knowledge, and skills (Khoiriyati & Daulai, 2023). The integration of Islamic and general education requires the alignment of teaching methods, school culture, and parental involvement to ensure consistency with the institution's vision and mission.

One of the key areas for integration lies in science and Islamic education, where scientific principles can be explored through the lens of Islamic teachings. The integration of science and Islam provides a holistic understanding of the relationship between natural phenomena and spiritual values. This approach not only enhances scientific literacy but also strengthens moral and ethical awareness in society. Previous studies have emphasized that such integration is essential to reconstruct educational paradigms and address students' limited understanding of the interconnectedness between science and Islamic teachings (Budiawan, Riskina, & Vebrianto, 2022; Chasanah, Suryaningsih, & Fairusi, 2019; Rahmah, Rena, & Al-Ghifary, 2021). The integration of Islamic values into science learning has also been shown to improve students' scientific skills and character development, especially in Islamic-based schools (Fahruli et al., 2023). Hence, this approach encourages a comprehensive and balanced perspective, combining scientific inquiry with spiritual reflection to foster holistic learning.

Literacy is a fundamental competency that enables individuals to understand, analyze, and critically evaluate information from multiple perspectives. It encompasses reading and writing literacy, numeracy, science literacy, digital literacy, financial literacy, and cultural and civic literacy. These competencies serve as a foundation for developing both practical and soft skills necessary for students' lifelong learning (Anggraena et al., 2021; Irbah, Ichsan, & Fauziah, 2022; Marisa, 2021; Wiraputra, Suastra, & Sudiana, 2023). Among these, science literacy is a crucial goal in educational development, as it contributes to producing scientifically literate, innovative, and responsible citizens (Drake & Reid, 2018; Fortus, Lin, Neumann, & Sadler, 2022).

However, Indonesian students' science literacy remains a significant challenge. Although the PISA 2022 results showed an improvement in ranking compared to 2018, the average science score was 383, a decline of 13 points from 2018 (OECD, 2023). This indicates that further efforts are needed to enhance students' understanding of scientific concepts and literacy skills. Limited access to high-quality learning resources and facilities continues to hinder students' academic achievement and character formation. Therefore, the use of appropriate learning models and innovative teaching materials is essential to improve science education quality (Jansen, Knippels, & van Joolingen, 2019; Liu et al., 2022; Panebianco et al., 2023; Rusilowati, Astuti, & Rahman, 2019).

Teaching materials play a vital role in facilitating learning, improving engagement, and enhancing learning outcomes. When designed effectively, they promote meaningful, interactive, and student-centered learning (Ayuningtyas, Jayatri, & Rohmayanti, 2019). Observations in schools reveal that science instruction primarily relies on textbooks aligned with the Merdeka Curriculum, supplemented by worksheets and teacher-developed learning modules. Several studies have highlighted the need for creative and innovative digital teaching materials that integrate scientific content with Quranic verses. Integrating Islamic values into science learning can enhance students' holistic understanding of the interrelationship between religion and science, strengthen character

formation, and cultivate positive attitudes toward learning and community engagement (Khomsatun et al., 2023; Latipah, Khosiin, Candrawati, Ulum, & Niam, 2020; Nurhayati, 2023).

Despite these advancements, there remains a lack of systematic exploration and implementation of Quranic-integrated teaching materials aimed at improving science literacy and supporting the Pancasila Student Profile. This gap underscores the need for innovative instructional strategies and curriculum designs that effectively combine scientific knowledge with Islamic values. The scarcity of digital learning resources also poses a challenge to achieving optimal outcomes in science literacy and character development.

Therefore, this research aims to develop digital science teaching materials integrated with Quranic verses, particularly those related to Earth and Solar System topics, to enhance students' science literacy and foster character values consistent with the Pancasila Student Profile. Utilizing the Canva application, this study seeks to provide an accessible, visually engaging, and pedagogically sound learning resource aligned with 21st-century educational needs. The findings are expected to contribute to the development of integrated science education that harmonizes technological innovation, scientific reasoning, and Islamic values in Indonesia's modern learning context.

METHODOLOGY

This study employed a research and development (R&D) approach based on the Borg and Gall model (Sugiyono, 2019), which includes ten systematic stages ranging from data collection to product dissemination. The research aimed to develop digital science teaching materials integrated with Quranic verses to enhance students' scientific literacy and strengthen their character in accordance with the Pancasila Student Profile. The process involved 40 students, three expert lecturers, and six science teachers selected through a non-probability sampling method using the convenience sampling technique (Baltes & Ralph, 2022; Creswell, 2013; Etikan, Musa, & Alkassim, 2016). Data were collected through expert validation, student response questionnaires, and pre-test and post-test assessments, then analyzed using N-gain and effectiveness indices to determine learning improvement. The integration of Quranic verses, particularly in the topics of Earth and the Solar System, was designed to create a balanced understanding between scientific concepts and spiritual values. Overall, this R&D process produced valid, practical, and effective digital learning materials that support the development of scientific literacy, religious understanding, and faith-based character.

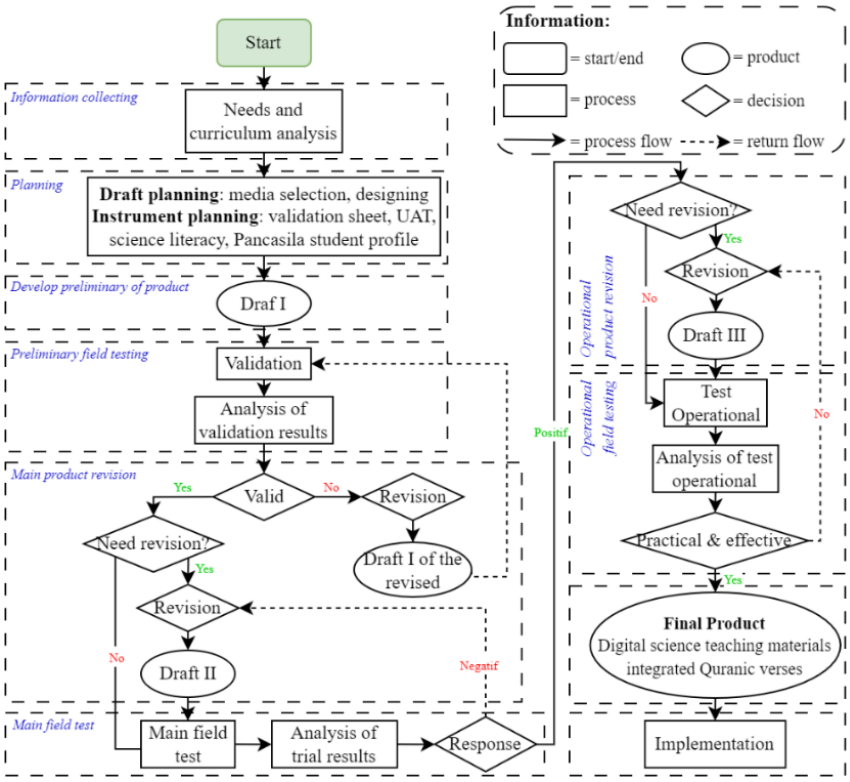


Figure 1. Research Flow

The research process began with the research and data collection stage, which included analyzing students' needs, curriculum requirements, learning materials, and identifying student characteristics relevant to the integration of science and Quranic content. This stage aimed to provide a foundational understanding of the educational context and ensure that the developed materials aligned with both pedagogical goals and spiritual values. The second stage involved planning, during which the researchers designed the conceptual framework for the digital teaching materials. The design process included determining the relevant scientific content, selecting appropriate Quranic verses, formulating student learning activities, and developing competency tests that measure both conceptual understanding and value-based learning outcomes.

Following the planning stage, the researchers proceeded with three key stages of product development, beginning with the initial development of the product design, followed by preliminary field testing. During this stage, the draft of the digital teaching materials was reviewed by expert validators to assess its quality before being implemented in small-scale trials with students. Expert validation focused on evaluating the content, design, integration of Quranic elements, and overall pedagogical feasibility. The experts completed structured validation questionnaires prepared by the researchers, and the results were analyzed using the Aiken's V formula (Equation 1) to determine the validity index of each aspect assessed. This process ensured that the developed digital teaching materials met high standards of content validity, instructional design quality, and spiritual integration, thereby providing a strong foundation for subsequent field implementation and broader dissemination.

$$V = \frac{\Sigma s}{[n(c-1)]} \quad (1)$$

V is Aiken's value, s is (r – Lo), where Lo is the lowest validity assessment number, r is the number given by the rater, dan c is the highest assessment number. The V value is compared with the V table based on the number of raters and the scale used with probability of 5%. It is posited

that digital teaching materials are valid if the V value is equal to or greater than the V table (Aiken, 1980).

Subsequent to expert validation, revisions to the teaching materials were made prior to conducting the field trials. During the field trial phase, a user acceptance test was administered to students to evaluate the practicality, clarity, and engagement level of the developed materials. Feedback obtained from this phase was used to further refine the digital teaching materials, ensuring alignment with both instructional goals and student learning needs. After revisions were completed, operational field testing and implementation were conducted to assess the overall level of student acceptance and the effectiveness of the improved digital teaching materials in real classroom settings. The effectiveness of the developed digital science teaching materials was measured using students' N-gain scores, which were calculated based on the results of pre-test and post-test assessments designed to evaluate science literacy improvement. The test instrument consisted of ten two-tier multiple-choice questions, enabling the measurement of both students' conceptual understanding and reasoning skills. The N-gain value served as an indicator of learning effectiveness, reflecting the extent to which students' scientific literacy improved following the implementation of the Quranic-integrated digital teaching materials. Hake, (1998) formulated the N-gain using the following equation 2.

$$\langle g \rangle = \frac{(\%\langle S_f \rangle - \%\langle S_i \rangle)}{100 - \%\langle S_i \rangle} \quad (2)$$

In this context, $\langle g \rangle$ is the magnitude of the gain factor, $\langle S_f \rangle$ is the final (post) value, and $\langle S_i \rangle$ is the initial (pre) value of the class average. Subsequently, the effectiveness of digital science teaching materials was evaluated according to the following criteria: a) high effectiveness: $\langle g \rangle \geq 0.7$; b) moderate effectiveness: $0.3 \leq \langle g \rangle < 0.7$; c) low effectiveness: $\langle g \rangle < 0.3$. It can thus be concluded that digital science teaching materials integrated with Al-Quran verses developed by researchers can be considered to be effective if $\langle g \rangle \geq 0.3$.

To strengthen the validity of the findings, an independent samples t-test was conducted to ensure that the control and experimental groups possessed equivalent levels of science literacy prior to the intervention. Additionally, an effect size test was employed to determine the magnitude of the impact resulting from the use of the developed digital science teaching materials. According to Cohen (1988), an effect size value of ≥ 0.5 indicates a medium category, signifying a practically meaningful improvement in learning outcomes. This statistical analysis provided a more comprehensive understanding of the effectiveness of the developed materials beyond simple mean comparisons. Based on these criteria, the digital science teaching materials integrated with Quranic verses were considered effective in enhancing students' science literacy, thereby equipping them with the critical thinking and problem-solving skills required to meet the challenges of 21st-century education.

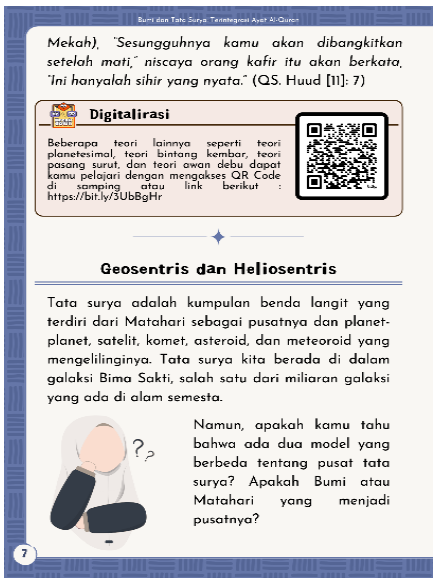
RESULT AND DISCUSSION

The results of this development research produced digital science teaching materials on the topic of Earth and the Solar System that are integrated with Qur'anic verses, designed for use by both teachers and students at the junior high school level or its equivalent. These digital materials aim to support science learning that not only improves conceptual understanding but also strengthens students' faith and appreciation of the harmony between scientific phenomena and divine revelation.

The developed teaching materials possess several key characteristics. First, the content aligns with the Phase D learning outcomes of the Merdeka Belajar curriculum, ensuring relevance to the current national education framework. Second, the materials are developed using the Canva application, designed to be interactive, visually engaging, and suitable for self-paced learning. Third,

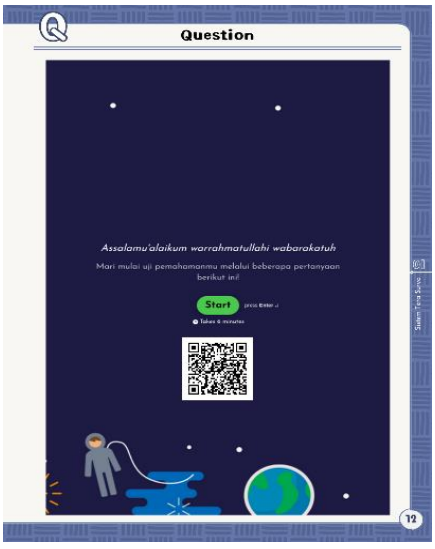
the content is enriched with multimedia elements, including educational videos from YouTube, Instagram, and X (Twitter), as well as images, animations, and simulations from NASA and Stellarium, all of which enhance students' conceptualization of astronomical concepts. Fourth, the materials include formative assessments featuring Asesmen Kompetensi Minimum (AKM)-based questions, enabling teachers to evaluate students' science literacy and comprehension effectively. Overall, the integration of Qur'anic verses within the scientific context not only bridges the relationship between faith and knowledge but also encourages students to view natural phenomena as manifestations of divine creation. This holistic approach supports the development of both scientific literacy and spiritual intelligence, aligning with the broader goals of 21st-century education and the Islamic worldview.

(a) Jelajah Al-Quran



(b) Digitalirasi

(c) Eksplorasi



(d) Question

Figure 2. Features of Digital Teaching Materials

The developed digital science teaching materials incorporate a variety of features designed to enhance students' science literacy and foster the core values of the Pancasila Student Profile. Before engaging with the main content, students are introduced to the "Pendahuluan" section, which provides reading materials aimed at stimulating learning motivation and encouraging critical

thinking. This introductory component serves as a cognitive and affective bridge, helping students connect new scientific knowledge with existing experiences and beliefs.

A distinctive feature of the materials lies in the "Jelajah Al-Qur'an" section, which integrates relevant Qur'anic verses to deepen students' understanding of scientific concepts while simultaneously strengthening their faith and spiritual reflection. The "Eksplorasi" section emphasizes experiential learning through both independent and collaborative activities, enabling students to apply scientific principles in contextual and meaningful ways. Additionally, the "Digitalisasi" section provides curated digital resources, including supplementary readings and multimedia content, to expand students' knowledge horizons and promote self-directed learning. At the end of each chapter, the "Question" section presents formative assessments that evaluate students' mastery of knowledge, comprehension, and skills, as well as their attitudes, values, and habits aligned with the Pancasila character framework.

The validation process of the digital teaching materials was conducted to ensure their quality, feasibility, and instructional relevance. Validation was performed by three experts (covering content, media, and pedagogical perspectives) and seven practitioners (science teachers), focusing on key aspects such as cover design, format and organization, content substance, writing style, readability, user-friendliness, and the degree of Qur'anic integration. A product is considered valid for instructional use if it attains a minimum validity score of 0.83, categorized as valid. The results of the validation are summarized in Table 1, demonstrating that the developed digital materials meet the established criteria for effective and meaningful science learning integration.

Table 1. Aiken's V results

No.	Aspects assessed	Assessment	Criteria
1	Cover Section	0.900	Valid
2	Format and Systematics	0.927	Valid
3	Substance of Teaching Materials	0.922	Valid
4	Writing Style	0.833	Valid
5	Readability	0.933	Valid
6	User-friendliness	0.900	Valid
7	Integration	0.933	Valid
Average		0.907	Valid

The acquisition of validation scores from all aspects of the assessment of 0.907 is classified as valid, because the process of preparing this digital teaching material pays attention to analyzing the needs of students and teachers by selecting activities and presenting material tailored to the curriculum, learning objectives, learning models as well as science literacy competency domains and Pancasila student profile elements. The user acceptance test was conducted twice. The first test was conducted to identify the need for improvement and adjustment, while the second test was conducted after the implementation of improvements to evaluate the improvement of the quality of digital teaching materials for science integrated with Al-Quran verses.

Table 2. Results of Main Field Test and Operational Test

No.	Indicator	Main Field Test		Operational Test	
		Assessment	Criteria	Assessment	Criteria
1	Design	83.99	Good	92.50	Excellent
2	Ease	81.25	Good	91.25	Excellent
3	Efficient	80.92	Simply	91.04	Excellent
4	Integration	74.34	Simply	90.21	Good
Average		83.78	Good	91.25	Excellent

The results of the first user acceptance test showed that students gave positive responses to teaching materials with an average assessment of 83.78. Based on this first test, it is necessary to improve the efficiency and integration of Al-Quran verses in teaching materials. Efficiency in teaching materials is needed to ensure students can understand the material well and effectively improve learning outcomes (Susilaningsih et al., 2022). In addition, the integration of teaching materials with Al-Quran verses also needs to be improved so that religious values can be conveyed thoroughly in science learning (Miriam, Salam M, Dewantara, Hidayati, & Azhary, 2022). The results of the second test with an average rating of 91.25 showed a significant increase in student satisfaction with the digital science teaching materials that had been improved and optimized based on feedback from the first test. Based on the second test, most students stated that the digital teaching materials developed were good and easy to access.

The effectiveness of the developed digital science teaching materials was evaluated through an assessment of students' science literacy improvement during the implementation phase at MTs Negeri 1 Pekanbaru. The evaluation process involved both experimental and control classes, aiming to determine the extent to which the integration of Qur'anic verses within the digital learning environment influenced students' learning outcomes. To measure the improvement, students were administered pre-test and post-test assessments, which were designed in accordance with the science literacy competency domains. These domains encompass three key competencies: (1) explaining scientific phenomena, (2) evaluating and designing scientific investigations, and (3) interpreting scientific data and evidence. The assessment instrument consisted of ten two-tier multiple-choice items, allowing for the evaluation of both students' conceptual understanding and reasoning processes. The differences between pre-test and post-test results were then analyzed to determine the effectiveness and impact of the digital teaching materials in enhancing students' science literacy performance.

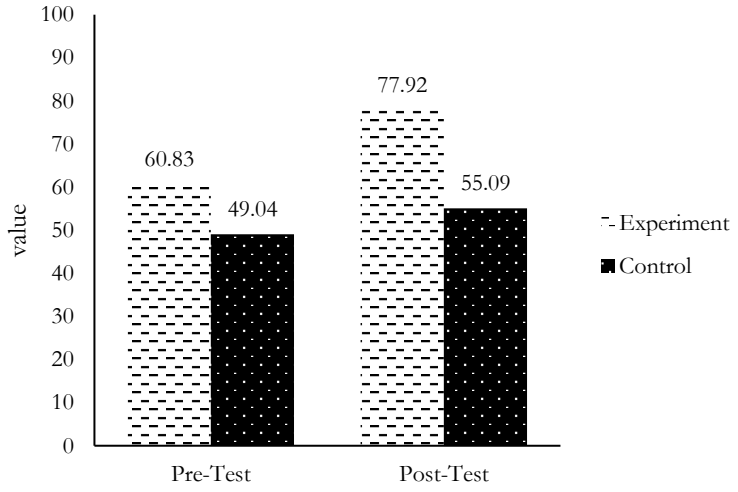


Figure 3. Results of Students' Science Literacy Pretest and Posttest

The overall results of the students' pre-test and post-test in science literacy were analyzed using statistical tests to determine the effectiveness of the digital science teaching materials integrated with Qur'anic verses. The findings showed that the average pre-test score for the experimental class was 60.83, while the control class achieved an average of 49.09. A homogeneity test confirmed that there was no significant difference in the initial science literacy abilities between the two groups. Following the intervention, the post-test analysis demonstrated a marked improvement in the science literacy performance of students in the experimental class, with an average score of 77.92, compared to 55.09 in the control class. These results indicate that the

integration of Qur'anic verses within digital science materials effectively enhanced students' science literacy. Furthermore, the analysis of normalized gain (N-gain) revealed an increase of 0.44 in the experimental class, categorized as a moderate improvement, while the control class, which used conventional learning methods, showed only a modest increase of 0.11. This suggests that the implementation of Qur'an-integrated digital science teaching materials developed through Canva significantly contributed to improving students' conceptual understanding and literacy in science learning.

Based on the research that has been done, it shows that the science literacy of experimental class students is better than the control class. This is because the learning process applied in both classes is different. Learning in the control class uses the lecture method (direct instruction), with this model making it easier for students to understand learning concepts (Habibi, Zainuddin, & Misbah, 2017). The use of teaching materials can also affect students' science literacy, the teaching materials used in the control class have been well developed by the teacher. This teaching material familiarizes students to fill in the tables provided, so that students' ability to interpret data/graphics/tables is also limited. Students are not accustomed to working on science literacy test questions (Fuadi, Robbia, Jamaluddin, & Jufri, 2020).

The learning process implemented in the experimental class utilized digital science teaching materials integrated with Qur'anic verses. The learning sequence began with a pre-test in the first session, followed by five instructional meetings that employed the developed digital materials, and concluded with a post-test session. The learning activities in the experimental class were more effective compared to those in the control class, as the use of Qur'an-integrated digital science materials provided a combination of reading resources, informative content, and engaging activities that successfully captured students' interest and motivation. This approach encouraged active participation and facilitated deeper conceptual understanding, resulting in a significant improvement in students' science literacy and overall engagement in the learning process.

Table 3. Independent Sample t-test

	Test	Statistic	df	p-Value	Effect Size	SE Effect Size
Gain	Student	4.875	74	<.001	1.120	0.262

Note. For the Student t-test, effect size is given by Cohen's d.

The improvement of students' science literacy was analyzed using an independent samples t-test, as presented in Table 3. The test results showed a p-value of 0.000 (sig. < 0.05), indicating a significant difference between the experimental and control classes. These findings confirm that the use of digital science teaching materials integrated with Qur'anic verses was effective in improving students' science literacy, with an effectiveness value of 1.120, categorized as high. The effectiveness can be attributed to the informative and interactive nature of the digital materials, which were designed to engage students through multimedia elements and inquiry-based activities. Expert evaluations, as shown in Table 1, further confirmed the validity and quality of these materials. Consequently, the integration of Qur'anic verses within the science teaching materials proved to be an important pedagogical approach for enhancing students' conceptual understanding and literacy skills.

Beyond literacy outcomes, the findings also highlight the cultivation of Pancasila Student Profile values, which play a crucial role in shaping students to be confident, innovative, creative, and capable of making independent and ethical decisions. The results showed that 58% of students at MTs Negeri 1 Pekanbaru demonstrated a cultured character, indicating that they had internalized the Pancasila values in their school environment. These values foster competitiveness aligned with global competencies and correspond closely to the 21st-century skills framework (6C)—character, citizenship, critical thinking, creativity, collaboration, and communication (Amir, Nursalam, &

Mustafa, 2022). Learning activities that integrate Pancasila values and 6C competencies encourage a more holistic educational experience that develops both intellectual and moral dimensions.

The integration of two disciplines—science and Islamic studies—within the curriculum enhances students' interdisciplinary understanding and encourages them to establish meaningful connections between scientific concepts and spiritual perspectives. The developed digital teaching materials help students comprehend Earth and Solar System topics from both scientific and Qur'anic viewpoints using an informative integration-interconnection model (Putri & Aprison, 2023). This model enables the transfer of information across disciplines, broadening students' insight and deepening their understanding. Similarly, Pearce et al. (2021) emphasized that interdisciplinary and holistic approaches in science education can effectively address misconceptions and foster critical thinking in exploring the relationship between religion and science.

Overall, this study demonstrates that science learning integrated with Qur'anic verses can serve as a practical and meaningful approach for teachers to achieve national education goals—developing students' knowledge, skills, and character in a balanced manner. The findings are consistent with Suhandri and Syahwela (2024), who reported that implementing Islamic value-integrated teaching materials fosters character development and improves student learning outcomes. Therefore, continued efforts to incorporate Qur'anic integration into science education are essential to strengthen character formation and enhance students' academic achievement holistically.

CONCLUSION

The findings of this research and development study indicate that digital science teaching materials integrated with Qur'anic verses effectively enhance scientific literacy and foster the Pancasila Student Profile among seventh-grade students. The feasibility of implementing these materials in the classroom is supported by expert validation results with an average score of 0.907, a field trial showing a student acceptance rate of 83.78%, and operational testing results with 91.25% student approval, all of which confirm the high suitability and practicality of the developed product. Statistical analysis using an independent samples t-test revealed a significant difference between the experimental and control groups (t-count = 4.875 > t-table = 1.666, $p < 0.05$), affirming the effectiveness of the teaching materials in improving students' scientific literacy. The N-gain value of 0.44 (medium category) and an effectiveness index of 1.120 (high category) further validate this improvement. Additionally, 58% of students demonstrated cultured character traits, reflecting the successful integration of Pancasila values within the learning process. Overall, the integration of Qur'anic verses into digital science teaching materials not only strengthens students' conceptual understanding but also supports character formation aligned with the goals of holistic education in the 21st century.

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