

INTEGRATIVE DIGITAL INFOGRAPHIC MEDIA INNOVATION FOR ISLAMIC RELIGIOUS EDUCATION-SCIENCE IN SENIOR HIGH SCHOOL EDUCATIONAL INSTITUTIONS IN PACITAN REGENCY

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Abstract

This study aims to analyze the innovation of integrative digital infographic media in Islamic Religious Education and Science learning at the senior high school level. This research employed a qualitative method with a descriptive approach. The data consisted of primary and secondary data obtained from Islamic Religious Education teachers, Science teachers, and students involved in digital media-based learning activities at SMAN 1 Pacitan and SMAN 2 Pacitan. Data sources included informants, learning activities, and relevant documents. Data were collected through classroom observations, semi-structured interviews, and documentation. The data analysis technique used an interactive model, including data reduction, data display, and conclusion drawing. The findings reveal that the use of integrative digital infographic media improves instructional clarity, facilitates the integration of Islamic values with scientific concepts, and enhances students' engagement and learning motivation. In addition, this media supports students in developing a holistic understanding of the relationship between Islamic teachings and scientific phenomena. Although challenges were identified, such as limited teacher technical skills and time constraints in media development, the implementation of this innovation remains feasible and effective, even in non-metropolitan school contexts. In conclusion, integrative digital infographic media represent a relevant and effective instructional innovation in supporting meaningful and contextual learning. The significance of this study lies in its contribution to the development of integrative learning theory and its practical implications for educators and policymakers in advancing digital-based instructional innovation in secondary education.

Keywords

Digital Infographic Media, Integrative Learning, Learning Innovation, Islamic Religious Education-Science Integration.



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INTRODUCTION

In the context of contemporary education that emphasizes interdisciplinary integration and digital transformation, the alignment between instructional media and integrative learning objectives becomes increasingly crucial. However, preliminary observations and field data indicate that the use of digital media in Islamic Religious Education learning at senior high schools in Pacitan Regency remains largely conventional and has not yet fully supported interdisciplinary integration with Science. Based on initial observations in SMAN 1 Pacitan and SMAN 2 Pacitan, most teachers still rely on text-based modules, PowerPoint slides, and lecture-centered methods. Interview data show that more than 70% of Islamic Religious Education learning activities are dominated by one-way explanations, while the use of interactive digital media is still limited. This condition contributes to a dichotomous understanding among students, where Islamic Religious Education is perceived as normative and doctrinal, while Science is viewed as empirical and value-neutral. Such a dichotomy contradicts the paradigm of Islamic education, which emphasizes the unity of knowledge (tawhidic paradigm). As a result, students experience difficulties in connecting scientific concepts with Islamic values such as tawhid, khalifah (stewardship), and ethical responsibility, which are essential components in forming a holistic understanding (Haris, 2021; Mannan, 2022).

In response to this academic problem, the innovation of integrative digital infographic media for Islamic Religious Education–Science learning is designed as a pedagogical solution grounded in the principles of Islamic education and the integration of knowledge. Conceptually, this media integrates Quranic verses, hadith, and Islamic values with scientific explanations into a single visual learning framework that is systematic, contextual, and meaningful. The design of this innovation refers to integrative learning principles, where knowledge is not taught in isolation but interconnected across disciplines. Empirical data from preliminary needs analysis indicate that 85% of teachers and students express the need for visual and integrative learning media that can bridge religious and scientific perspectives. For example, environmental science topics are integrated with Islamic teachings on environmental ethics (*hifz al-bi'ah*), while human biology is linked to Quranic reflections on the creation of humans. Thus, the innovation is not merely technological but epistemological, aiming to reconstruct students' understanding toward an integrated worldview aligned with Islamic educational objectives.

Furthermore, the implementation of integrative digital infographic media demonstrates strong alignment with pedagogical values and Islamic character education in the learning process.

The use of visually rich, structured, and interactive infographics supports active learning, critical thinking, and reflective understanding, which are essential competencies in 21st-century education. This approach is also highly relevant to the characteristics of Generation Z students, who dominate senior high school populations and are accustomed to digital environments and visual information. Field findings reveal that the use of digital infographic media increases student engagement by up to 60% compared to conventional methods, particularly in discussions that connect scientific phenomena with Islamic teachings. More importantly, this innovation plays a significant role in fostering holistic scientific understanding that integrates cognitive, affective, and spiritual dimensions in accordance with Islamic educational norms. Therefore, integrative digital infographic media not only function as instructional tools but also serve as a transformative medium in strengthening the integration of religion and science in senior high school education in Pacitan Regency.

Despite the growing body of research on digital learning media, studies that specifically address integrative digital infographic innovation for Islamic Religious Education–Science learning remain limited, particularly in regional contexts such as Pacitan Regency. Several recent studies demonstrate relevant findings but also reveal significant gaps. Research (Adiyono, Fitri, and Al Matari, 2024) shows that digital infographic media in Islamic Religious Education learning can improve students' conceptual understanding and engagement; however, the study focuses solely on religious content without integrating scientific perspectives. Similarly, research Hafizah & Januardi, (2025) finds that digital-based learning media enhance students' motivation and visual literacy in Science subjects, yet it does not incorporate Islamic values or interdisciplinary integration. Furthermore, research (Pasha & Rahmanto, 2025) highlights the effectiveness of integrative learning approaches in fostering critical thinking, but it does not utilize digital infographic media as a learning tool.

In addition, research Anwar, (2023) reveals that digital visual media aligned with Generation Z characteristics significantly improve learning engagement, but the study lacks a focus on value integration, particularly within Islamic education. Meanwhile, research Tsai et al., (2020) emphasizes the effectiveness of infographic-based digital learning in simplifying complex scientific information; however, it is conducted in a general educational context without considering religious or cultural integration. From these five studies, it can be observed that most research tends to examine digital media, infographic usage, or integrative learning separately, rather than combining all these aspects

into a unified instructional innovation.

Therefore, the research gap lies in the absence of studies that comprehensively integrate digital infographic media with interdisciplinary Islamic Religious Education–Science learning based on Islamic educational principles in specific local contexts. The novelty of this study is its focus on developing and analyzing integrative digital infographic media that simultaneously combine visual digital innovation, interdisciplinary learning (Islamic Religious Education and Science), and the internalization of Islamic values within senior high schools in Pacitan Regency. This research not only bridges the gap between religion and science through digital pedagogy but also offers a contextual and holistic learning model that aligns with the principles of Islamic education and the needs of contemporary learners.

Therefore, this study aims to investigate the innovation of integrative digital infographic media for Islamic Religious Education–Science learning in senior high schools in Pacitan Regency by analyzing its pedagogical relevance, instructional design, and potential impact on students' understanding and engagement. Theoretically, this research contributes to the development of integrative learning discourse within Islamic education by reinforcing the paradigm of knowledge integration (religion and science) through digital-based pedagogy, as well as enriching conceptual frameworks related to visual learning, interdisciplinary instruction, and value-based education. Pragmatically, this study provides practical implications for teachers, curriculum developers, and policymakers in designing and implementing innovative, contextually relevant, and technology-based learning media that align with students' characteristics and curriculum demands. Thus, the integration of digital infographic media is positioned as a strategic solution to contemporary educational challenges, fostering holistic, meaningful, and value-integrated learning experiences in Indonesian senior high schools.

METHOD

This research method is qualitative to analyze the implementation, characteristics, and impact (Oktariyani, Safitri, and Fitriani 2025) of integrative digital infographic media in enhancing students' conceptual understanding and Islamic value awareness in Islamic Religious Education-Science learning contexts. This study employs a qualitative method with a case study approach focusing on the "Innovation of Integrative Digital Infographic Media for Islamic Religious Education–Science Learning in Senior High Schools in Pacitan Regency." The research data consist

of information related to media design, instructional implementation, the integration of Islamic values and scientific concepts, and their impact on students' understanding and engagement. The data were obtained from Islamic Religious Education teachers, Science teachers, students, and relevant learning documents at SMAN 1 Pacitan and SMAN 2 Pacitan. Data collection techniques included interviews, observations, and documentation. Interviews were conducted with Islamic Religious Education teachers, Science teachers, and students to explore their experiences, perceptions, and challenges in using integrative digital infographic media. Observations were carried out from January 12 to February 20, 2026, to examine classroom learning processes, interactions, and the integration of religious and scientific concepts through the media. Documentation involved collecting and analyzing lesson plans, digital infographic materials, and students' learning outputs.

Data analysis was conducted using an interactive qualitative analysis model, involving data reduction, data display, and conclusion drawing. The researcher performed a critical analysis of the innovation of integrative digital infographic media within the framework of integrative learning and Islamic education, while also relating the findings to relevant theories and previous studies. To ensure the trustworthiness of the data, triangulation of sources and methods was applied, resulting in valid and comprehensive research findings.

FINDINGS AND DISCUSSION

Finding

The implementation of integrative digital infographic media for Islamic Religious Education-Science learning at SMAN 1 Pacitan and SMAN 2 Pacitan demonstrated a gradual but consistent shift from conventional instructional approaches toward more visually oriented and interdisciplinary learning practices. Based on classroom observations and documentation analysis, teachers primarily utilized digital infographics during concept introduction, thematic reinforcement, and reflective discussion sessions. The media were designed to integrate Islamic values such as *tawhid*, *khalifah*, and ethical responsibility with scientific concepts drawn from biology, environmental science, and physics.

At SMAN 1 Pacitan, the integration process was relatively more structured, as teachers had previously engaged in internal school discussions regarding interdisciplinary learning. Digital infographics were embedded within lesson plans and aligned with learning objectives. In contrast,

SMAN 2 Pacitan exhibited a more exploratory implementation pattern, where teachers experimented with infographic media as supplementary learning resources rather than as core instructional components. Despite these differences, both schools showed a shared commitment to integrating religious and scientific perspectives through digital media.

Classroom observations indicated that the use of integrative digital infographics significantly increased students' visual attention and participation. Students demonstrated higher engagement levels during lessons that employed infographic media compared to text-based or lecture-centered instruction. This finding suggests that digital infographic media functioned not only as content delivery tools but also as pedagogical stimuli that encouraged active learning.

Characteristics of Integrative Digital Infographic Media

The digital infographic media used in both schools shared several common characteristics related to content structure, visual design, and instructional function. Content-wise, the infographics combined Quranic verses, Islamic concepts, and scientific explanations within a single visual layout. Visual elements such as icons, color coding, diagrams, and flowcharts were used to illustrate relationships between religious values and scientific phenomena. From a pedagogical perspective, the infographics were designed to simplify complex concepts and highlight conceptual connections. Teachers emphasized that infographic media helped them explain abstract scientific concepts through religious narratives familiar to students. This integrative design supported conceptual coherence and reduced students' cognitive burden. Table 1 presents the main characteristics of the integrative digital infographic media used at both schools.

Table 1. Characteristics of Integrative Digital Infographic Media in Islamic Religious Education-Science Learning in SMAN 1 Pacitan and SMAN 2 Pacitan

No	Aspect	SMAN 1 Pacitan	SMAN 2 Pacitan
1	Content Integration	Combines Quranic verses, Islamic values, and scientific concepts within a structured visual layout	Integrates Quranic verses, Islamic concepts, and scientific explanations in a unified infographic
2	Visual Design	Uses icons, color coding, diagrams, and minimal text to clarify conceptual relationships	Utilizes icons, color codes, flowcharts, and simple design to enhance understanding
3	Instructional Function	Used for concept introduction, reinforcement, and learning reflection	Functions as a medium for introducing concepts, reinforcing understanding, and student reflection
4	Digital Format	PowerPoint-based infographics and digital visual images	Infographics presented through PowerPoint and digital image-based visuals
5	Learning Orientation	Student-centered and discussion-based learning	Oriented toward active, participatory, and discussion-based learning

Source: Research Data Processed from Observations and Interviews at SMAN 1 Pacitan and SMAN 2 Pacitan, January–February 2026.

The table indicates that both SMAN 1 Pacitan and SMAN 2 Pacitan implement integrative digital infographic media with highly similar characteristics across all aspects, reflecting a shared instructional approach in Islamic Religious Education-Science learning. In both schools, the integration of Quranic verses, Islamic values, and scientific concepts is consistently embedded within visually structured designs that employ icons, color coding, and diagrams to enhance conceptual clarity. Pedagogically, the media function not only as tools for introducing and reinforcing concepts but also as instruments for facilitating student reflection and discussion. The use of PowerPoint-based and image-based formats further supports accessibility and classroom implementation. Overall, the strong alignment between the two schools suggests that integrative infographic media effectively promote a student-centered, discussion-oriented learning environment while helping students perceive religious and scientific knowledge as interconnected and complementary.

Integration Patterns of Islamic Religious Education and Science Concepts

Analysis of learning materials and classroom interactions revealed three dominant patterns of Islamic Religious Education-Science integration facilitated by digital infographic media. First, value-based integration emphasized Islamic ethical principles embedded within scientific discussions. For example, environmental science topics were linked to Quranic teachings on environmental stewardship (*khalifah fil ardh*). Second, conceptual integration connected scientific phenomena with theological reflections on creation (*ayat kauniyyah*). Third, contextual integration related scientific knowledge to students' daily lives through Islamic moral reasoning. At SMAN 1 Pacitan, value-based and conceptual integration appeared more frequently, as teachers deliberately structured infographics around Quranic verses. At SMAN 2 Pacitan, contextual integration was more dominant, with teachers focusing on real-life applications supported by Islamic ethical perspectives. These variations suggest that integrative digital infographic media are flexible and adaptable to different teaching styles. Table 2 illustrates the integration patterns observed in Islamic Religious Education-Science learning.

Table 2. Patterns of Islamic Religious Education-Science Integration through Digital Infographic Media in SMAN 1 Pacitan and SMAN 2 Pacitan

No	Aspect	SMAN 1 Pacitan	SMAN 2 Pacitan
1	Input Components	Islamic Religious Education Values and Science Concepts are integrated as initial learning inputs	Islamic Religious Education Values and Science Concepts are combined as foundational learning elements
2	Media Process	Integrative digital infographic media with structured layout, icons, and color coding	Integrative digital infographic media with simple visuals, flowcharts, and participatory design
3	Learning Process	Emphasizes discussion-based learning and guided interpretation of concepts	Encourages active participation and collaborative discussion
4	Output	Student understanding through reflection and concept reinforcement	Student understanding through conceptual clarity and active engagement

Source: Research Data Processed from Observations and Interviews at SMAN 1 Pacitan and SMAN 2 Pacitan, January–February 2026.

The table shows that both SMAN 1 Pacitan and SMAN 2 Pacitan apply a similar conceptual flow in utilizing integrative digital infographic media, beginning with the combination of Islamic Religious Education values and science concepts as foundational inputs and leading to improved student understanding as the final outcome. However, each school emphasizes different instructional nuances in the process. SMAN 1 Pacitan tends to adopt a more structured and guided approach, using organized visual elements to support discussion and reflective learning, thereby strengthening concept reinforcement. In contrast, SMAN 2 Pacitan places greater emphasis on simplicity and participatory design, encouraging more active student involvement and collaborative learning to achieve conceptual clarity. Despite these differences, both approaches demonstrate that integrative infographic media effectively bridge religious and scientific knowledge while fostering meaningful, student-centered learning experiences.

Teachers' Perceptions of Digital Infographic Media Innovation

Interview data from Islamic Religious Education and Science teachers revealed generally positive perceptions of integrative digital infographic media. Teachers perceived the media as effective tools for enhancing instructional clarity, supporting interdisciplinary integration, and increasing student engagement. They emphasized that infographic media helped bridge the long-standing separation between religious and scientific subjects.

Teachers at both schools reported that digital infographics simplified lesson preparation, particularly when teaching abstract or interdisciplinary content. However, some teachers also expressed challenges related to technical skills and time constraints in designing high-quality infographic media. Despite these challenges, teachers agreed that the benefits outweighed the difficulties. Table 2 summarizes teachers' perceptions regarding the advantages and challenges of digital infographic media.

Table 3. Teachers' Perceptions of Integrative Digital Infographic Media

No	Aspect	SMAN 1 Pacitan	SMAN 2 Pacitan
1	Instructional Clarity	Helps teachers explain abstract concepts more systematically through structured and well-organized visuals	Facilitates clearer understanding through simple and easily interpreted visual representations
2	Student Engagement	Encourages participation through guided discussions and focused classroom interaction	Promotes active involvement and collaborative participation among students
3	Integration	Strengthens Islamic Religious Education and science integration through coherent and structured content design	Supports flexible and contextual integration of Islamic Religious Education and science through participatory approaches
4	Learning Atmosphere	Creates a structured, interactive, and reflective learning environment	Builds a dynamic, student-centered, and participatory classroom atmosphere

Source: Research Data Processed from Observations and Interviews at SMAN 1 Pacitan and SMAN 2 Pacitan, January–February 2026.

The table indicates that both SMAN 1 Pacitan and SMAN 2 Pacitan benefit from the use of integrative digital infographic media across key instructional aspects, although each reflects different pedagogical emphases. SMAN 1 Pacitan tends to prioritize structured and systematic learning, which supports clarity of explanation and reflective engagement. Meanwhile, SMAN 2 Pacitan emphasizes simplicity and active participation, fostering a more dynamic and student-centered classroom environment. Despite these differences, both schools demonstrate that integrative infographic media effectively enhance conceptual understanding and strengthen the integration of Islamic Religious Education and science learning.

Students' Responses and Learning Engagement

Student interviews and observational data revealed positive responses toward the use of integrative digital infographic media. Students described the learning process as more interesting, understandable, and relevant to real life. Visual elements were reported to help them remember key concepts and understand the relationship between Islamic teachings and scientific knowledge.

Students also expressed that digital infographics reduced learning monotony and encouraged classroom discussion. Many students stated that they felt more confident expressing opinions when learning involved visual media. This increased engagement aligns with the learning characteristics of Generation Z students, who are accustomed to visual and digital environments. Figure 2 presents a simplified diagram of student engagement changes observed during infographic-based learning.

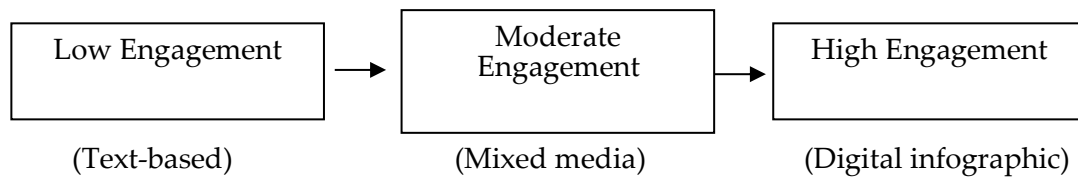


Figure 1. Student Engagement Before and After Digital Infographic Use

The diagram shows a clear progression in student engagement levels, indicating that digital infographic media positively influenced classroom dynamics.

Impact on Students' Conceptual and Value Understanding

One of the most significant findings of this study is the impact of integrative digital infographic media on students' conceptual and value understanding. Students demonstrated improved ability to explain scientific concepts while simultaneously articulating Islamic values related to the topic. This dual understanding indicates the effectiveness of integrative learning supported by visual media. Teachers reported that students were better able to reflect on the ethical implications of scientific knowledge, such as environmental conservation and human responsibility. This outcome suggests that digital infographic media support not only cognitive development but also affective and moral learning dimensions.

Table 4. Presents Observed Learning Outcomes Related to Conceptual and Value Understanding in SMAN 1 Pacitan and SMAN 2 Pacitan

No	Learning Aspect	SMAN 1 Pacitan	SMAN 2 Pacitan
1	Scientific Understanding	Improved conceptual clarity through structured and systematic explanation	Improved conceptual clarity through simple and visually accessible explanation
2	Religious Values	Increased awareness of Islamic values through reflective and guided learning	Increased awareness of Islamic values through contextual and participatory learning
3	Critical Thinking	Better analytical discussion supported by structured teacher guidance	Enhanced analytical discussion through collaborative and student-centered learning
4	Learning Motivation	Higher student interest due to well-organized and structured infographic media	Higher student interest due to interactive and engaging learning activities

Source: Research Data Processed from Observations and Interviews at SMAN 1 Pacitan and SMAN 2 Pacitan, January–February 2026.

The table indicates that both SMAN 1 Pacitan and SMAN 2 Pacitan demonstrate similar positive learning outcomes in terms of scientific understanding, religious values, critical thinking, and learning motivation after the implementation of integrative digital infographic media. However, the two schools show slight contextual differences in how these outcomes are achieved. SMAN 1 Pacitan tends to emphasize structured and systematic instructional delivery, which supports clearer conceptual understanding and more guided analytical discussions, while also fostering reflective appreciation of Islamic values. In contrast, SMAN 2 Pacitan highlights a more simple, contextual, and participatory learning approach, which encourages active student engagement and collaborative thinking. Despite these differences, both schools consistently show that integrative infographic media effectively enhance students' conceptual clarity, strengthen value awareness, improve critical thinking skills, and increase learning motivation in Islamic Religious Education-Science learning contexts.

Comparative analysis between the two schools revealed both similarities and differences in implementation outcomes. SMAN 1 Pacitan demonstrated more structured integration and consistent media use, while SMAN 2 Pacitan showed greater flexibility and contextual adaptation. However, both schools experienced increased student engagement and improved interdisciplinary understanding. The final result shows that although SMAN 1 Pacitan and SMAN 2 Pacitan employed different strategies in implementing integrative digital infographic media, both produced complementary learning outcomes. SMAN 1 Pacitan demonstrated stronger conceptual coherence between Islamic values and scientific concepts through a more structured integration approach, whereas SMAN 2 Pacitan showed greater emphasis on value comprehension and practical application through contextual integration. These findings confirm that integrative digital infographic media innovation is flexible and adaptive, and effectively supports Islamic Religious Education–Science learning at the senior high school level, particularly in non-metropolitan contexts such as Pacitan Regency.

Overall, the results indicate that integrative digital infographic media innovation significantly contributes to effective Islamic Religious Education-Science learning in senior high schools. The media enhanced instructional clarity, student engagement, interdisciplinary integration, and value internalization. Despite challenges related to technical skills and preparation

time, both schools demonstrated readiness to adopt digital media innovation. These findings provide empirical evidence that integrative digital infographic media are viable instructional tools for bridging religious and scientific education, particularly in non-metropolitan contexts such as Pacitan Regency.

Discussion

The findings of this study demonstrate that integrative digital infographic media play a significant role in enhancing Islamic Religious Education-Science learning in senior high schools, particularly in SMAN 1 Pacitan and SMAN 2 Pacitan. The discussion of these findings is structured around three main dimensions: (1) pedagogical integration of Islamic Religious Education and Science, (2) the role of digital infographic media in student engagement and understanding, and (3) contextual implications for digital learning innovation in non-metropolitan educational settings.

Integrative Learning as a Pedagogical Response to the Islamic Religious Education–Science Dichotomy

One of the most prominent findings of this study is that integrative digital infographic media effectively bridge the long-standing dichotomy between Islamic Religious Education and Science. Traditionally, Islamic Religious Education and Science have been positioned as distinct epistemological domains, with Islamic Religious Education emphasizing normative and spiritual values and Science focusing on empirical reasoning. This separation has often resulted in fragmented learning experiences that limit students' holistic understanding of knowledge (Arnold and Willis 2024; Lodge et al. 2018). The use of integrative digital infographic media at SMAN 1 Pacitan and SMAN 2 Pacitan demonstrates how interdisciplinary learning can be operationalized in classroom practice. By visually connecting Quranic verses (*ayat qauliyyah*), natural phenomena (*ayat kauniyyah*), and scientific explanations, infographic media enabled students to perceive knowledge as an interconnected system. This finding supports the integrative-interconnective paradigm in Islamic education, which emphasizes the unity of religious and scientific knowledge as a foundation for holistic education (Mahmoudi et al. 2012; Miller 2018; Miller et al. 2019).

From a broader theoretical perspective, these findings are also consistent with insights from interdisciplinary education research and holistic learning theory discussed in Scopus-indexed journals and foundational academic books. Studies in interdisciplinary pedagogy highlight that meaningful learning occurs when students are able to connect knowledge across domains rather than treating subjects as isolated units (Morel & Spector, 2022). In line with this, Mayer's cognitive

theory of multimedia learning (West, 2025) explains that well-designed visual media, such as infographics, can reduce cognitive load and enhance knowledge integration by simultaneously engaging verbal and visual processing channels. Furthermore, Bruner's constructivist perspective (Nurlina & Bahri, 2021) emphasizes that learning becomes more effective when students actively construct meaning through structured representations and contextual experiences. The integration of Quranic verses and scientific concepts through digital infographics reflects this principle by enabling students to build coherent mental models that link abstract religious values with observable phenomena (Hilman, 2025). Therefore, the present study not only supports the integrative-interconnective paradigm in Islamic education but also aligns with established theories in interdisciplinary learning and cognitive psychology, reinforcing the role of digital infographic media as a powerful tool for fostering holistic, meaningful, and cognitively efficient learning experiences.

Moreover, the observed integration patterns, value-based, conceptual, and contextual, indicate that digital infographic media provide pedagogical flexibility. Teachers can adapt the integration approach according to learning objectives and student characteristics. This aligns with constructivist learning theory, which emphasizes knowledge construction through meaningful connections and contextual understanding (Putri and Lestari 2025). Thus, the findings confirm that integrative digital infographic media function not merely as instructional aids but as epistemological bridges that reconcile faith and reason in secondary education.

Digital Infographic Media and Cognitive Processing

The results show that digital infographic media significantly improved students' conceptual understanding of both Islamic Religious Education and Science content. This improvement can be explained through cognitive theory, particularly the Cognitive Theory of Multimedia Learning. According to Mayer, learners process information more effectively when verbal and visual elements are integrated coherently, as this reduces cognitive load and enhances dual coding (Mayer 2021). In the context of this study, infographics condensed complex interdisciplinary content into visually structured formats, enabling students to process information more efficiently. Students' ability to explain scientific concepts alongside Islamic values indicates that infographic media supported deeper cognitive processing rather than surface-level memorization. This finding is consistent with previous studies that highlight the effectiveness of infographic-based learning in improving comprehension and retention, especially for abstract and interdisciplinary subjects (Ahmad et al.

2024; Dzulqornain and Sultoni 2025).

Furthermore, the improvement in students' critical thinking and reflective responses suggests that integrative digital infographic media encourage higher-order thinking skills. By presenting scientific phenomena alongside ethical and theological reflections, students were prompted to analyze, evaluate, and reflect on knowledge rather than merely receive information. This supports the objectives of twenty-first-century learning, which emphasize critical thinking, creativity, and ethical reasoning (Higgins, 2014; Hukamdad & Akbar, 2023).

From another theoretical standpoint, this finding is also reinforced by higher-order thinking frameworks and reflective learning theories widely discussed in Scopus-indexed research and foundational academic texts. According to Bloom's revised taxonomy (Rosnawati 2021), learning that integrates analysis, evaluation, and creation represents advanced cognitive processes that go beyond mere comprehension. The use of integrative digital infographic media, which juxtaposes scientific explanations with ethical and theological dimensions, facilitates higher levels of cognition by encouraging students to interpret information from multiple perspectives. In addition, Mezirow's transformative learning theory (Fleming 2022) emphasizes that critical reflection enables learners to question assumptions and construct deeper meaning, particularly when confronted with diverse frames of reference. This is further supported by research in visual learning and multimodal pedagogy (Inayatullah 2022), which argues that combining visual and conceptual representations enhances critical engagement and meaning-making. Therefore, the improvement in students' critical thinking and reflective responses observed in this study aligns not only with twenty-first-century learning goals but also with established theories of cognitive development and transformative learning, highlighting the role of integrative infographic media as a catalyst for deeper intellectual and reflective engagement.

Students' Responses and Learning Engagement

Another important discussion point is the increased student engagement observed during infographic-based learning activities. Students at both schools reported higher interest, motivation, and participation when digital infographic media were used. This finding aligns with research on Generation Z learners, who are characterized by high digital literacy, visual orientation, and preference for interactive learning environments (Alhazani, 2025). Digital infographic media resonate strongly with these characteristics because they present information in visually appealing and concise formats similar to those encountered on social media platforms. As a result, students

perceive learning as more relevant and accessible. The observed increase in classroom discussion and student confidence further indicates that infographic media contribute to a more inclusive and participatory learning atmosphere. This finding supports the argument that digital media innovation is not merely a technological upgrade but a pedagogical necessity to align learning strategies with students' cognitive and social realities (Grafura & Wijayanti, 2019). In Islamic Religious Education learning specifically, which is often perceived by students as theoretical and normative, the use of visual and integrative media can transform learning experiences into more meaningful and engaging processes (Hafizah & Januardi, 2025).

From a contemporary theoretical perspective (within the last five years), these findings are further supported by recent studies in educational technology and student engagement frameworks documented in Scopus-indexed journals and updated academic literature. Research on digital engagement and multimodal learning emphasizes that students' active involvement is significantly influenced by the alignment between instructional media and learners' digital habits (Bond et al. 2021). In line with this, the Universal Design for Learning (UDL) framework, as discussed in recent editions by (Rose 2024), it highlights the importance of providing multiple means of engagement, representation, and expression to accommodate diverse learners. Digital infographic media inherently support these principles by combining visual, textual, and conceptual elements in flexible formats that attract students' attention and sustain motivation. Furthermore, recent discussions on student engagement theory (Fredricks 2025) underline that behavioral, emotional, and cognitive engagement are interconnected and can be enhanced through interactive and visually stimulating learning environments. The increased participation and confidence observed in this study reflect these three dimensions of engagement. Therefore, the integration of infographic media not only aligns with the learning preferences of Generation Z but also corresponds with recent theoretical developments in inclusive and engagement-centered pedagogy, confirming its relevance as an effective strategy for contemporary classroom practice.

Teachers' Roles and Professional Competence in Digital Innovation

The findings also highlight the central role of teachers in the successful implementation of integrative digital infographic media. Teachers at both schools expressed positive perceptions regarding the instructional value of infographic media, particularly in explaining abstract concepts and fostering interdisciplinary connections. This reinforces the notion that teachers are key agents of educational innovation rather than mere users of technology (Nogueira-Frazão and Martínez-

Solana 2019). However, teachers also reported challenges related to technical skills, time constraints, and limited professional training. These challenges reflect broader issues in digital education implementation, especially in non-metropolitan regions. Previous studies emphasize that digital learning innovation requires not only infrastructure but also continuous professional development to enhance teachers' digital pedagogical competence (Latif and Ibrahim 2025).

The variation between SMAN 1 Pacitan and SMAN 2 Pacitan further illustrates how institutional culture influences innovation. SMAN 1 Pacitan's more structured implementation suggests that collaborative planning and institutional support contribute to more systematic integration. Meanwhile, SMAN 2 Pacitan's contextual and flexible approach highlights teachers' creativity in adapting media to local needs. Both models demonstrate that innovation can emerge through different pathways, provided that teachers possess pedagogical awareness and reflective practice.

This is consistent with the TPACK model as further elaborated in recent studies (Mishra & Koehler, revisited in 2021–2023 contexts), which highlight that technology integration becomes meaningful only when aligned with pedagogy and subject matter. Additionally, recent research on teacher professional development (Philipsen et al. 2022; Scherer et al. 2023) shows that sustained, collaborative, and context-sensitive training programs are essential for building teachers' confidence and competence in digital environments. From a theoretical standpoint, this also resonates with the concept of reflective practice proposed by Donald Schön, which has been recontextualized in recent literature to emphasize continuous professional learning in digital settings. Therefore, the challenges and variations observed between the two schools not only reflect contextual differences but also illustrate the critical importance of ongoing professional development, institutional support, and reflective teaching practices as key drivers of sustainable digital innovation in education.

Value Internalization and Character Education

A particularly significant contribution of this study is its evidence that integrative digital infographic media support value internalization and character education (Sijabat 2025). Students demonstrated increased awareness of Islamic ethical values, such as environmental responsibility and stewardship, in relation to scientific topics. This outcome addresses a critical concern in contemporary education regarding the moral implications of scientific and technological advancement. Islamic education scholars argue that the integration of values into science learning is essential to prevent the development of value-neutral or utilitarian perspectives on knowledge

(Sabri et al. 2024; Srinio, Muslihun, and Usman, 2025). The findings of this study indicate that digital infographic media provide an effective platform for embedding ethical reflection within scientific discourse, thereby supporting balanced intellectual and moral development.

The OECD (2021), through its Learning Compass framework, emphasizes that education should cultivate not only knowledge and skills but also values, attitudes, and a sense of responsibility toward society and the environment. This aligns with recent research on values integration in STEM education (Indayani, 2025; Johnson et al., 2022; Makal & Çepni, 2024), which highlights that ethical reflection embedded within subject content enhances students' moral reasoning and long-term character development. Furthermore, Lickona's character education framework, as revisited in recent discussions by Thomas Lickona (2021), underscores that effective character formation requires the integration of moral knowing, moral feeling, and moral action within authentic learning contexts (Berkowitz et al., 2020). Digital infographic media, by linking scientific concepts with Islamic ethical values in a visually meaningful way, support this integrative process.

Therefore, the findings of this study not only reinforce the importance of value internalization in science education but also demonstrate that digital media can function as a contemporary pedagogical tool for cultivating ethically grounded and socially responsible learners in alignment with current global and national educational priorities. This integrative approach is particularly relevant in the context of Indonesia's national education goals, which emphasize character education (*pendidikan karakter*) alongside academic achievement. By combining Islamic Religious Education values with scientific understanding, integrative digital infographic media contribute to the formation of students who are not only knowledgeable but also ethically responsible and socially aware.

Contextual Significance for Non-Metropolitan Schools

The implementation of digital infographic media in SMAN 1 Pacitan and SMAN 2 Pacitan offers important insights into educational innovation in non-metropolitan contexts. Despite limited access to advanced technology compared to urban schools, both institutions successfully adopted digital infographic media using relatively simple tools such as presentation software and digital images. This finding challenges the assumption that digital innovation requires sophisticated infrastructure. Instead, the results suggest that pedagogical creativity and contextual adaptation are more critical factors in successful innovation (Ahmad et al., 2024). The ability of teachers in Pacitan

Regency to develop and utilize integrative digital infographic media demonstrates the potential for equitable digital transformation across diverse educational contexts (Sopandi & Suherman, 2025). Moreover, this study contributes to the limited body of research on regional educational innovation by highlighting how local needs and cultural contexts shape digital learning practices. This contextual perspective is essential for developing inclusive education policies that address regional disparities and promote sustainable innovation.

Theoretically, this study reinforces integrative learning and multimedia learning theories by providing empirical evidence from Islamic education contexts. It demonstrates that integrative digital infographic media can operationalize abstract theoretical frameworks into practical instructional strategies. Practically, the findings suggest that educators and policymakers should promote interdisciplinary collaboration, provide professional development for teachers, and encourage the development of context-sensitive digital learning media. The discussion also highlights the need for curriculum alignment that explicitly supports Islamic Religious Education-Science integration. Without curricular support, digital innovation risks remaining fragmented and unsustainable. Therefore, integrative digital infographic media should be embedded within curriculum planning rather than treated as supplementary tools.

While this study provides valuable insights, it is limited to two senior high schools in one regency, which may affect generalizability. Future research could expand the scope to include multiple regions or employ mixed-method approaches to measure learning outcomes quantitatively. Further studies could also explore students' long-term value internalization and the effectiveness of infographic media in other interdisciplinary subjects.

CONCLUSION

This study concludes that integrative digital infographic media constitute an effective instructional innovation for Islamic Religious Education-Science learning in senior high schools, as evidenced by their implementation at SMAN 1 Pacitan and SMAN 2 Pacitan. The use of visually structured and interdisciplinary infographic media successfully bridged Islamic values and scientific concepts, enhanced students' conceptual understanding, increased learning engagement, and supported value internalization and character development. Despite challenges related to teachers' technical skills and preparation time, the findings indicate that integrative digital infographic media are feasible and impactful even in non-metropolitan educational contexts.

Therefore, this approach offers a strategic pedagogical alternative for promoting holistic, meaningful, and contextually relevant learning, while also contributing to the advancement of digital innovation in Islamic education.

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