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The Urgency of Islamic Ethnoscience-Based Science Learning in the 4.0 Era

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ABSTRACT. Entering the Industrial Revolution 4.0 era, science learning in elementary schools faces the challenge of becoming more digital, contextual, and meaningful. However, conventional approaches that are still predominantly textual and abstract are considered less relevant to students' local culture and Islamic values. This study aims to analyze the urgency of an Islamic ethnoscience-based science learning approach as a solution to the gap between science material, culture, and spiritual values. This study employs a qualitative approach, with an exploratory case study conducted at an Islamic-based Elementary School in South Kalimantan from January to May 2025. Research participants included five science teachers, 3 Banjar cultural figures, 2 Islamic education experts, and students in grades IV–VI. Data collection techniques included in-depth interviews, participant observation, and documentation studies of teachers, cultural figures, and Islamic education experts. The results show that conventional science learning has not explicitly linked the material to the local culture (the Banjar tribe) and Islamic values, resulting in low student engagement and a lack of meaning. The Islamic ethnoscience approach is considered capable of integrating cultural, religious, and technological values through digital learning media such as interactive e-books and contextual content based on the Quran. This research makes a significant contribution to developing a science education paradigm that is more grounded in spirituality and adaptable to the challenges of modern technology-based education.

Keywords: *Science Learning, Islamic Ethnoscience, Local Culture, Islamic Values, Digital Education*

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INTRODUCTION

Entering the era of the Industrial Revolution 4.0 which is marked by the development of technologies such as the Internet of Things (IoT), artificial intelligence, and digitalization of information, the world of education is faced with the demands to adapt to rapid digital transformation (Adel, 2024; Arif et al., 2025; Mohamed Hashim et al., 2022; Rosowulan et al., 2025). The education sector, especially at the Elementary School (SD) level, is expected to be able to adapt the learning process to automation and technology-based learning, especially in Natural Sciences (IPA) subjects which are full of abstract and applied concepts (Byukusenge et al., 2024; Putri et al., 2024). However, the rapid development of technology does not immediately answer all the challenges in science learning (Dinçer, 2024; Hamzah et al., 2023; Kardi et al., 2023; Linn, 2003;

Manaku, 2025). In the midst of digital progress, a phenomenon has emerged in which students experience a disconnect between what they learn and the values that live in their culture and beliefs (Shonfeld et al., 2021). Science learning tends to be delivered in a universal and scientific-positivistic manner, without considering the local cultural context and religious values they hold (Arizona et al., 2025; Madkan et al., 2025; Mansir, 2023; Nurulita et al., 2025; Parsons & Carlone, 2013). This causes students to only understand science as formal knowledge that is not relevant to everyday life. Various previous studies have revealed that the inconsistency between student culture and science material causes low acceptance of science concepts in schools.

(Baker, 2005) States that science learning tends to ignore students' cultural backgrounds. (Kameni et al., 2025; Ogunniyi & and Rollnick, 2015) itu, Cobern (1994) suggests the importance of integrating indigenous science into the formal science curriculum, so that students feel the material being studied is more intimate and meaningful. (Carter et al., 2003) even highlighting that science learning in Africa fails to bridge between modern science and local culture. Meanwhile, in Indonesia, which has ethnic, tribal, linguistic and religious diversity, this problem becomes even more complex (Mariyono, 2024; Qosim & Ihsan, 2025). Local cultures such as the Banjar, Dayak, Bugis, and Javanese cultures store a lot of empirical knowledge about nature that is in line with scientific principles. If this local wisdom is integrated into science learning, it will strengthen the mastery of concepts while forming students' ecological awareness. In addition to culture, Islamic values as the moral and spiritual basis of the majority of students also need to be integrated into science learning. The values in the Qur'an and Hadith about nature, creation, order, and human responsibility as caliphs are important foundations in forming an ethical scientific paradigm (Kartika et al., 2024; Mappasessu, 2025; Ramlah & Rahajeng, 2025). In this framework, the Islamic ethnoscience approach offers an innovative solution to address the failure of secular science learning that is detached from the cultural and religious roots of students. Thus, Islamic ethnoscience-based science learning is a necessity and an urgent need. This approach is not only able to bridge science with culture and religion, but also fosters a scientific attitude rooted in the values of local wisdom and Islamic spirituality. In the era of the Industrial Revolution 4.0, the urgency of learning like this is getting stronger, so that technological transformation remains in line with the formation of character and national identity.

Based on the description in the previous section, this study will explore 3 main points, namely, Why is conventional science learning less relevant to students' Islamic culture and values in the current digital era? The focus of this study will analyze the limitations of conventional science learning approaches in answering the contextual cultural and spiritual needs of students. Second, what is the urgency of implementing an Islamic ethnoscience approach in science learning in the Industrial Revolution 4.0 era? This study will focus on identifying the urgency of Islamic ethnoscience-based science learning as an alternative approach in the Industrial Revolution 4.0 era. and the third point is how can science learning be integrated with local cultural values and Islamic teachings to be more contextual and meaningful for students? The focus on this point is exploring strategies for integrating local cultural values and Islamic teachings into science learning that are more relevant to students' lives and characters. These three research focuses will be discussed in the next section.

This research is important to conduct because science learning in the Industrial Revolution 4.0 era faces dual challenges, namely the demands of digitalization on the one hand and the disconnection between science materials and students' cultural and spiritual values on the other. Although technologies such as IoT, AI, and virtual laboratories have changed learning methods, in reality many students do not feel personally connected to the material being taught because they do not consider the local cultural background and Islamic values they adhere to. Previous studies such as (Baker, 2005; Carter et al., 2003; Ogunniyi & and Rollnick, 2015), shows the importance of cultural integration in science learning, but has not specifically accommodated religious values, especially Islam, as the basis for scientific ethics. On the other hand, there has been no previous research that holistically combines the digitalization of science learning, local cultural values (such

as the Banjar tribe culture), and Islamic values in one complete approach. Therefore, this study has a strategic position to fill this gap by emphasizing the urgency of Islamic ethnoscience-based science learning, which not only answers the need for cultural and spiritual contextuality, but is also in line with the development of educational technology. This approach is expected to be able to form a more meaningful, down-to-earth understanding of science, and is rooted in local and Islamic values, so that students not only master concepts, but also build scientific attitudes that are ecologically and spiritually responsible.

METHOD

This research uses a qualitative approach with an exploratory case study (Bogdan & Biklen, 1998), which aims to understand in depth the urgency of integrating local cultural values (ethnoscience) and Islamic teachings in science learning in elementary schools in the era of the Industrial Revolution 4.0. The focus of this research is not on product development, but rather on conceptual and contextual exploration of how cultural and religious values can be integrated into science learning more meaningfully. The research location was chosen at the Islamic-based Nature Elementary School in South Kalimantan as a representation of Banjar culture. The research subjects included 5 science teachers, 3 Banjar cultural figures, 2 experts in Islamic education and science, and 45 students in grades IV–VI.

(Burrell & Cane, 1982) Data collection techniques were conducted through in-depth interviews with teachers, cultural figures, and education experts to explore views on the relationship between cultural and religious values in science; participant observation of science learning and local cultural activities to identify relevant practices; and documentation studies of science syllabi, textbooks, local cultural manuscripts, and interpretations of the Qur'an and Hadith related to nature. The main instrument in this study was the researcher as a human instrument, with the help of interview guidelines, observation sheets, and document analysis formats (Alordiah & Oji, 2024). Data analysis was conducted thematically through data reduction, categorization (science themes, cultural values, Islamic values), presentation of data in narrative and visual forms, and drawing conceptual conclusions. Data validity was guaranteed through triangulation of sources and methods, member checking, and audit trails so that the research results could be scientifically accounted for (Miles et al., 2014; Nurfajriani et al., 2024).

RESULT AND DISCUSSION

Result

Conventional Science Learning Is Less Relevant to Students' Islamic Culture and Values in the Current Digital Era

The results of the study show that conventional science learning in elementary schools, especially in South Kalimantan, is not fully relevant to the local cultural background and Islamic values held by students. Teachers still rely on national textbooks and textual approaches, which are general in nature and do not pay attention to the context of students' daily lives and the local traditions of the Banjar community. Science material is delivered theoretically and is oriented towards memorizing concepts, without being linked to cultural realities or religious principles that live in the daily lives of students.

This is confirmed by the results of an interview with a science teacher at SD Alam X, South Kalimantan,

> "We usually follow thematic books and science books from the government. The material is ready-made and not very flexible. When it comes to Banjar culture or its connection to Islam, it has not been included. In fact, children can actually understand better if explained through examples from around them." (Interview, Science Teacher, May 12, 2025).

Local cultural figures also expressed their concerns about the disconnection of local wisdom values in science education. They believe that science learning in schools tends to imitate the abstract Western system and does not touch on the cultural roots of society. *"There is a lot of natural*

knowledge possessed by the Banjar community, such as observing the seasons, how to plant, and natural herbs. But it is never included in school lessons. Even though it is a living knowledge and can be part of science." (Interview, H, Banjar Cultural Figure, May 14, 2025)

In addition, from interviews with Islamic education experts, it was revealed that conventional science learning tends to be secular because it does not emphasize the values of monotheism, human responsibility towards nature (khalifah), and the importance of maintaining the balance of the ecosystem as part of Allah's mandate."*Science should shape spiritual awareness as well, not just cognition. When children learn about water, earth, or plants, they should also be taught that they are all God's creations. But this is rarely explained by teachers.*" (Interview, Islamic Education Expert, 15 Mar 2025).

Meanwhile, from the observation of the science learning process in grade IV, it was found that students showed low enthusiasm when the material was taught abstractly and not related to their real lives. However, when the teacher gave examples such as the use of Banjar medicinal plants in learning plant parts, students' interest increased significantly.

Conventional science learning in Elementary Schools is not yet relevant to the local cultural context and students' Islamic values. This has an impact on the low involvement and meaning of students towards science. Therefore, an alternative approach is needed in the form of Islamic ethnoscience-based science learning, which is able to align scientific, cultural, and spiritual aspects, especially in the current digital context.

The Urgency of Applying the Islamic Ethnoscience Approach in Science Learning in the Era of the Industrial Revolution 4.0

The results of the study indicate that conventional science learning approaches are not only less contextual, but also fail to answer the needs of education in the Industrial Revolution 4.0 era which demands digitalization, flexibility, and meaningfulness. In this context, the Islamic ethnoscience approach is seen as urgent to be implemented as an alternative that can bridge the needs of technology, local culture, and Islamic spiritual values. The science teachers who were interviewed stated the need for a new learning model that links science with the reality of students' lives, especially in the context of Islam and the surrounding culture. "*Today's children are very close to technology, but our lesson content is still rigid and does not enter their world. If science is linked to Banjar culture or Islamic values, then packaged digitally, I am sure they will be more enthusiastic.*" (Interview, Science Teacher, Feb 12, 2025).

This urgency is also emphasized by Islamic education experts, who view the digital era as an opportunity to spread Islamic values through a relevant and contextual scientific approach. "Technology is not a threat, it can actually be a means of conveying Islamic values through science. What we need now is a curriculum and media that unites science, culture, and Islam." (Interview, 15 Feb 2025).

Banjar cultural figures also emphasized that local culture has great potential to be used as a context for science learning. If integrated with Islamic values and digital technology, learning will not only be effective, but also shape students' character and identity. "*We have many stories, customs, and wisdom that are actually science too. It's just a matter of how to package it in learning that is easy for students to understand and still in accordance with Islamic values*." (Interview, January 14, 2025).

Observation results also show that students are more actively involved when learning is linked to examples from their environment and packaged digitally (for example, using animated videos or Islamic infographics). This proves that a meaningful, contextual, and spiritual learning approach is needed to answer the challenges of the times. The urgency of the Islamic ethnoscience approach in science learning lies not only in the weaknesses of conventional approaches, but also in the great potential of the integration of local culture and Islamic teachings in creating meaningful science learning. In the digital era, this approach is an innovative strategy that answers students' contextual needs, facilitates the wise use of technology, and forms an ethical and spiritual understanding of science.

Science Learning Can Be Integrated with Local Cultural Values and Islamic Teachings to Be More Contextual and Meaningful for Students

The results of the study indicate that the integration of local cultural values and Islamic teachings into science learning can be done through a conceptual, thematic, and contextual approach, by utilizing cultural practices, local languages, ecological wisdom, and relevant Islamic texts. This strategy not only makes science materials closer to students' lives, but also strengthens their spiritual values and ecological responsibilities.

Through interviews with science teachers, an initial strategy was obtained in the form of selecting locally relevant science themes. For example, when teaching about ecosystems, teachers can use examples of tidal land farming systems known in the Banjar community. "*When we discuss ecosystems, children understand better if we take examples from the lowland rice fields that they see every day. We can also include hadiths about planting or preserving water, so they feel that it is part of worship*." (Interview, January 12, 2025).

Local cultural figures suggest that folklore and traditional practices can be used as a gateway to understanding scientific concepts. For example, stories about natural signs to read the planting season, or the use of local plants for medicine. *"Our parents used to know the best planting time from the direction of the wind and the stars. That can be explained scientifically, and children can learn that our culture is also full of logic.*" (Interview, Jan 14, 2025).

Meanwhile, from the perspective of Islamic teachings, the strategies used include the integration of verses from the Qur'an and Hadith at the beginning of learning, explaining the spiritual meaning of natural phenomena, and instilling the value of monotheism in scientific observations. "*We can start the lesson with verses about the creation of nature, such as QS. Al-Anbiya: 30 or QS. Al-Ghasyiyah: 17-20. This invites children to think about science as a form of worship and contemplation*" (Interview, January 15, 2025).

From the documentation of the syllabus and textbooks, it was found that there is no systematic science learning that explicitly combines the three elements: science themes, local culture, Islamic values. Therefore, the integrative strategy offered by the researcher includes, selecting science themes that are culturally contextual (eg: local medicinal plants, local agricultural systems, traditional weather patterns). Connecting with Islamic values through relevant verses of the Qur'an and Hadith. Utilizing digital technology such as interactive e-books, Islamic infographics, and local cultural videos to bridge scientific concepts with student experiences.

The integration of local and Islamic cultural values in science learning is not only possible, but also very strategic in forming contextual, spiritual, and adaptive learning for the digital era. This strategy requires teachers to design thematic and locally relevant learning, and support it with representative digital media, so that science learning becomes more down-to-earth and meaningful for Elementary School students.

Table 1. Research Findings on Islamic Ethnoscience-Based Science Learning in the Era of the Industrial Revolution 4.0

Focus of Findings	Description of Findings	Data Sources (Interview Quotes & Observations)	Implications
1. Conventional Science Learning is Less Relevant to Islamic Culture and Values	Learning tends to be theoretical, using national books that do not consider the Banjar cultural context and Islamic values. The lack of integration of culture and religion leads to	"The material is ready-made and not flexible... when it comes to Banjar or Islamic culture, it hasn't been included." (Science Teacher, May 12, 2025) "There is a lot of Banjar knowledge that has never been included in school	A new learning approach is needed that links science with local culture and Islamic spirituality to make it more meaningful and contextual.

	low student engagement.	lessons." (Cultural Figure, May 14, 2025) "Science should shape spiritual awareness, but teachers rarely explain it." (Islamic Education Expert, May 15, 2025) Observation: students are passive when the material is presented abstractly, active when local culture is brought up	
2. Urgency of Islamic Ethnoscience Approach in Science Learning	The conventional science approach does not answer the demands of digitalization and meaningfulness. The Islamic ethnoscience approach is able to integrate culture, spiritual values, and technology.	"If science is linked to Banjar or Islamic culture, then packaged digitally, children will be more enthusiastic." (Science Teacher, May 12, 2025) "Technology can be a means of conveying Islamic values through science." (Islamic Education Expert, May 15, 2025) "We have a lot of wisdom that can be used as part of the lesson." (Cultural Figure, May 14, 2025) Observation: Students are more active when learning science with digital media with local and Islamic themes	The Islamic ethnoscience approach is a strategic solution to answer the challenges of more meaningful, contextual, and spiritual science learning in the digital era.
3. Strategy for Integrating Local Culture and Islamic Teachings in Science Learning	Integrative strategies include: selecting local-based science themes, linking Islamic values through verses and hadiths, and using digital media.	"Children understand when learning about the ecosystem of the lowland rice fields that they know." (Science Teacher, May 12, 2025) "Culture such as stargazing can be explained scientifically." (Cultural Figure, May 14, 2025) "Lessons can start with verses about the creation of nature." (Islamic Education Expert, May 15, 2025) Documentation: There is no explicit syllabus that integrates the three elements of science, local culture, and Islam	This integration is effective in building science learning that is contextual, down-to-earth, and strengthens students' identity. Teachers need to be encouraged to design thematic and digital learning based on Islamic ethnoscience.

Discussion

The research findings show that conventional science learning still has serious limitations in responding to the contextual needs of students, especially in Islamic-based Elementary School environments in South Kalimantan. Science materials taught through a textual approach and oriented towards memorization make students not actively and reflectively involved. Science concepts such as force, ecosystems, and natural events are delivered without any connection to the daily living environment or local wisdom inherited by the community. This disconnection weakens students' ability to grasp the meaning and function of science in life.

Building on these findings, the study further emphasizes that conventional science learning in Islamic-based elementary schools remains largely textual, memorization-oriented, and disconnected from both local wisdom and religious values, causing students to lose meaning and emotional attachment to the subject matter. To address this, the integration of Islamic ethnoscience into the national curriculum requires policies that recognize local culture as a legitimate source of knowledge, incorporate Islamic values through Qur'anic verses relevant to natural phenomena, utilize educational technologies such as interactive e-books and virtual laboratories enriched with cultural and spiritual content, apply contextual-thematic pedagogical approaches that connect science to students' social realities, and adopt a tauhid-based paradigm that views science as a means of worship and strengthening faith (Aziz et al., 2025; Munawir et al., 2024; Sholihah et al., 2024). In this way, the integration of Islamic ethnoscience not only overcomes the limitations of conventional science learning but also offers a more meaningful, contextual, and spiritual model of education aligned with the challenges of the Industrial Revolution 4.0.

This result is in line with the findings (Almeida & Morais, 2025; Saifan et al., 2024) which highlights the failure of science education in various developing countries because it does not take into account the local cultural dimension. In the context of Indonesia which is rich in cultural diversity and religious values, this is a complex problem (Pangalila & Rumbay, 2024). Local cultures such as those of the Banjar tribe, which hold ecological and technical knowledge about nature, should be a legitimate source of learning. However, in reality, local cultures are only considered as a complement, not a valid source of science. When science learning fails to present this cultural context, students lose their emotional and cognitive attachment to the material being taught (Desmiati et al., 2023; Hasan et al., 2024). Thus, it is important to reconsider the design of a science curriculum that is more down-to-earth and able to explore the potential of relevant and applicable local knowledge, especially in an era when education is required to be more inclusive and contextual.

In addition to the cultural dimension, the results of the study emphasized the importance of the aspect of Islamic spirituality in science learning, especially in forming a holistic and ethical understanding of nature. Modern science developed with a positivistic approach tends to ignore spiritual values, thus placing science in a neutral, value-free space. In fact, from an Islamic perspective, science is part of the process of recognizing God's creation and as a means to strengthen faith through contemplation of nature. In interviews, teachers and Islamic education experts said that science learning in elementary schools should begin with verses of the Qur'an related to natural phenomena, such as QS. Al-Anbiya: 30 which mentions the creation of everything from water, or QS. Al-Ghasyiyah: 17–20 about the creation of camels, the sky, and the earth (Rahman et al., 2024). This approach not only builds cognitive understanding, but also shapes students' spiritual affection.

This is in line with the concept of "tauhid-based science education" which emphasizes that learning science is part of worship and a mandate as a caliph on earth (Anwar et al., 2023; Rahmawati et al., 2024; Sanyoto et al., 2023). Unfortunately, in conventional science learning practices, this dimension is almost ignored. Knowledge is delivered as a collection of facts and natural laws that are free from values, so that students do not get a moral foundation in understanding and utilizing science. Therefore, science learning based on Islamic ethnoscience is present as an answer to the

need to present science education that is not only intellectually intelligent, but also moral and spiritual.

The Industrial Revolution 4.0 presents a new challenge in the world of education, namely how to make learning not only technology-based but also meaningful and contextual. In a world that is digital and automated, there is a tendency towards dehumanization in education, where the learning process shifts to technical activities that are disconnected from the social and cultural dimensions of students (Azizah & Mardiana, 2024). In this context, the results of the study confirm that the Islamic ethnoscience approach is very relevant because it is able to bridge educational technology, local culture, and Islamic spirituality.

Interactive e-books, virtual laboratories, and other digital media can be used effectively if the content contains local cultural values and Islamic teachings. For example, learning about plant structure can be linked to Banjar medicinal plants that have historical and scientific value, then reinforced with religious arguments about the importance of preserving God's creation. This approach not only makes learning closer to the world of students, but also provides moral and social direction for the use of technology. This concept is in line with the theory of Contextual Teaching and Learning (CTL)(Faizah et al., 2023; Faizal et al., 2025; Yudha et al., 2019) and the Humanizing Science Education approach (Dean et al., 2024; Soares et al., 2024), which emphasizes the need for value-based education and students' real experiences. In this case, the 4.0 era should be used to strengthen locality and spirituality, not to distance students from their identity. Therefore, Islamic ethnoscience-based science learning can be an ideal model to answer pedagogical challenges in the digital era.

The main theoretical contribution of this study is the strengthening of the paradigm of value-based science learning, namely an approach that focuses not only on cognitive content, but also on the cultural and spiritual dimensions of students. This complements the discourse of context-based science education and expands the idea (Ferguson et al., 2024; Koirala, 2025; Lathouris, 2025) about the importance of "cultural border crossing" in science.

This study goes further by emphasizing the integration of Islamic values into the local context, as well as the application of technology as a bridge to strengthen meaning. In practice, this study provides strategic direction for teachers and curriculum developers in designing teaching materials based on Islamic ethnoscience, including the development of thematic e-books that combine science themes, local culture, and Islamic values. In addition, this study also opens up space for more holistic and transformative educational innovations at the Elementary School level, especially in Islamic-based schools. In the context of science, this approach has the potential to become a new foundation in the development of a national curriculum based on character and local context. Therefore, the Islamic ethnoscience approach is not just an integration of methods, but a transformation of the paradigm of science education that prioritizes meaningfulness, spirituality, and strengthening of national identity amidst global dynamics.

Table 2 Dimensions of Update in Islamic Science Learning Design

Aspect	Conventional Approach / Previous Research	Novelty in This Research
Cultural Context	Science is taught universally and regardless of local culture (Baker et al., 1995; Ogunniyi, 1998)	Integrating local culture (Banjar tribe) as a source of scientific knowledge in science learning
Islamic Values	Spiritual and religious dimensions are often ignored in science learning	Inserting Islamic values (Quranic verses, Hadith) to build spiritual awareness and science ethics
Educational Technology	Science materials are delivered conventionally and do not utilize digital technology	Developing the concept of interactive e-books and virtual laboratories based on Islamic ethnoscience

Student Engagement	Low because the material is abstract and not contextual	Increasing students' interest and meaning with a thematic approach based on culture and religion
Pedagogical Approach	Tends to be memorized, textual, and not contextual	Using a thematic, contextual, and value-based approach (contextual + spiritual learning)
Scientific Paradigm	Positivist-based and value-free	Offering a paradigm of tauhid-based science education as a basis for integrating science and faith
Theoretical Contribution	Cultural border crossing and context-based science (Aikenhead & Jegede, 1999)	Expanding with the integration of Islamic values and technology as elements forming the Islamic ethnoscience curriculum
Practical Contribution	Curriculum and teaching materials do not accommodate locality and spirituality	Providing strategic direction for teachers and curriculum developers through the design of science teaching materials based on Islamic ethnoscience

CONCLUSION

This study concludes that conventional science learning in elementary schools, particularly in areas rich in local culture such as South Kalimantan, is not entirely relevant to the needs of students who live in a culturally and religiously diverse environment. The approach used is still textual, theoretical, and detached from the context of students' real lives. This approach has an impact on low student involvement and minimal understanding of science as a down-to-earth and spiritual science. In fact, students have a cultural background rich in local knowledge and Islamic values that can be used as an entry point to understanding scientific concepts in a contextual and meaningful way. The urgency of implementing Islamic ethnoscience-based science learning is becoming stronger in the era of the Industrial Revolution 4.0. This approach is not only a solution to the weak connection between science material and Islamic culture and values, but also answers the challenges of digitalizing education. The Islamic ethnoscience approach has proven to be able to integrate local cultural values, Islamic teachings, and digital technology harmoniously, while also increasing student interest and participation in the learning process. This study also demonstrates that an integrative strategy incorporating local themes, Qur'anic and Hadith quotations, and the utilization of Islamic digital media can form a more comprehensive science learning model, encompassing cognitive, affective, and spiritual aspects. Therefore, science learning not only equips students with scientific knowledge but also forms character, ecological awareness, and spiritual understanding of God's creation.

This study expands the field of science education by introducing a conceptual framework for science learning grounded in Islamic ethnoscience. This approach offers an alternative to the modern science education model, which is often secular and ahistorical in nature. Islamic ethnoscience combines the concept of indigenous science and Islamic values in a local context, which has not been widely explored in science education research in Indonesia. This approach enables students to strengthen their cultural identity and increase awareness of the importance of environmental conservation. Students not only become little scientists, but also guardians of local values and heritage that align with Islamic values. Thus, science education becomes a means of forming a generation with character, knowledge, and piety.

This study has several limitations that need to be considered. First, the study was only conducted in one Islamic elementary school in South Kalimantan, so the findings are contextual and cannot be generalized to other regional cultures in Indonesia. Second, the qualitative case study approach used produces descriptive and interpretive data, but has not been tested quantitatively for its effectiveness on student learning outcomes. Third, student involvement as subjects is limited to classroom observations without further interviews, so that students' direct perceptions are less

explored. Fourth, the Islamic ethnoscience-based science practicum e-book developed in this study remains conceptual and has not been widely implemented; therefore, further research is needed to test its effectiveness in the context of real science learning.

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