



Strengthening the Character of Tawheed Student Through the Integration of Islam and Science in the Material of the Reproductive System at SMA Negeri 10 Kerinci

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ABSTRACT

This study aims to analyze the strengthening of the character of tauhid through the integration of Islam and science in the reproductive system curriculum at Kerinci State High School No. 10. The study employed a descriptive qualitative approach, with informants consisting of three biology teachers, 15 students, and one principal. Data were collected through interviews, observations, and documentation, then analyzed using the Miles, Huberman, and Saldaña model. The results revealed three main findings: the integration of biological concepts with Qur'anic verses regarding human creation; the use of dialogic and reflective strategies through discussions and probing questions; and diverse student responses in interpreting the relationship between biology and the value of tauhid. Some students demonstrated an understanding of the orderliness of creation and a sense of gratitude, while others remained focused on the biological aspects of the material. These findings indicate that the inclusion of Qur'anic verses in instruction does not, in and of itself, lead to the internalization of the value of tawhid among all students. The novelty of this study lies in its exploration of the learning process and the variations in students' interpretations when connecting biological knowledge with the value of tawhid in a high school context. Scientifically, this study underscores the importance of dialogic and reflective learning strategies, as well as the assessment of student understanding, in examining the strengthening of the character of Tawhid.

Keywords: *Tauhid character, Islam and science integration, reproductive system, biology learning, character education*

ABSTRAK

Penelitian ini bertujuan menganalisis penguatan karakter tauhid melalui integrasi Islam dan sains pada materi sistem reproduksi di SMA Negeri 10 Kerinci. Penelitian menggunakan pendekatan kualitatif deskriptif dengan informan yang terdiri atas tiga guru Biologi, 15 siswa, dan satu kepala sekolah. Data dikumpulkan melalui wawancara, observasi, dan dokumentasi, kemudian dianalisis menggunakan model Miles, Huberman, dan Saldaña. Hasil penelitian menunjukkan tiga temuan utama, yaitu integrasi konsep biologis dengan ayat Al-Qur'an tentang penciptaan manusia, penggunaan strategi dialogis dan reflektif melalui diskusi serta pertanyaan pemantik, dan beragam respons siswa dalam memaknai hubungan ilmu Biologi dengan nilai tauhid. Sebagian siswa menunjukkan pemahaman tentang keteraturan penciptaan dan rasa syukur, sedangkan sebagian lainnya masih berfokus pada aspek biologis materi. Temuan ini menunjukkan bahwa penyampaian ayat Al-Qur'an dalam pembelajaran belum dengan sendirinya menunjukkan internalisasi nilai tauhid pada seluruh siswa. Kebaruan penelitian terletak pada pengungkapan proses pembelajaran dan

variasi pemaknaan siswa dalam menghubungkan pengetahuan biologis dengan nilai tauhid pada konteks sekolah menengah. Secara ilmiah, penelitian ini menegaskan pentingnya strategi pembelajaran dialogis dan reflektif serta evaluasi pemahaman siswa untuk mengkaji penguatan karakter tauhid.

Kata Kunci: karakter tauhid, integrasi Islam dan sains, sistem reproduksi, pembelajaran biologi, pendidikan karakter

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A. INTRODUCTION

Education is no longer enough to be geared towards mastering academic knowledge and skills, but it is also necessary to form students who have strong character, moral responsibility, and spiritual foundations (Sukino & Failasufah, 2019). Technological developments that are not accompanied by the strengthening of values can present new challenges for students, especially through the rapid flow of information that is easily accessible without always being followed by the ability to assess the truth, moral suitability, and consequences of the information. In the context of Islamic education, this condition shows the importance of learning that does not separate scientific knowledge from religious values, so that the intellectual development of students is balanced with the formation of spiritual character (Mohamed, 2014).

This character is closely related to monotheism. Tawheed is not only understood as a belief in the oneness of Allah SWT, but also as a foundation in building students' perspectives on science, life, and behavior. Thus, strengthening the character of monotheism should not only be done through religious subjects, but can also be internalized through learning general science that is relevant to the lives of students (Yumila et al., 2026). This perspective emphasizes that the integration of Islam and science is not just an effort to add Qur'anic verses to science material, but an effort to build an understanding that science has ethical and spiritual dimensions.

One of the fields that has a strong opportunity to develop this approach is biology learning. Biology studies various life phenomena that can be directly related to Islamic values. Learning about humans, for example, is not only related to the structure and function of the body, but can also be directed to awareness of the order of creation, the responsibility to take care of the body, and the appreciation of life as a mandate from Allah SWT. Therefore, the integration of Islam and science in biology learning has the potential to develop learning that does not stop at mastering concepts, but also directs students to reflect on the meaning and value of the knowledge they gain (Hidayatulloh, 2022).

The material on the human reproductive system is one of the strategic materials to be studied in this context. This material is directly related to the process of human creation, reproductive organs, fertilization, embryo development, reproductive health,

and adolescent behavior and association. On the one hand, the material requires proper scientific understanding, on the other hand, the material has a strong moral and religious dimension because it is related to self-respect, responsibility to the body, and behavioral boundaries from an Islamic perspective. The characteristics of this material make the reproductive system not just biological material, but a pedagogical space that allows teachers to connect scientific knowledge with the values of faith and moral responsibility of students.

A number of previous studies have shown the potential for the integration of Islam and science in learning. (Fauzan et al., 2022) examine the integration of Islam in the learning of science about human reproduction in the Islamic university environment, thus providing a foundation for the possibility of connecting reproductive knowledge with an Islamic perspective, but has not directly explained the dynamics of the application of such integration to Biology learning at the secondary school level. Furthermore, (Jamilatussholicha et al., 2024) discusses the internalization of the value of faith through the material of the human reproductive system, while (Eldalisna & Rosadi, 2025) focuses on the development of learning tools that integrate Qur'anic verses in the material. These two studies show the importance of integrating Islamic values, but based on the focus of the reported study, attention to the pedagogical interaction process, student learning experience, and differences in student responses in real learning have not been the same pressure point as this study. Therefore, previous research provides a conceptual and pedagogical foundation, while this research is directed to deepen understanding of how the integration of Islam and science is implemented, interpreted, and associated with strengthening students' monotheistic character in the context of Biology learning in secondary school.

The research still leaves several important issues to be studied further. Based on this comparison, the gap in this research does not lie in the lack of discussion of the integration of Islam and science in the material of the human reproductive system, but in the need for a more in-depth explanation of the pedagogical process that connects biological knowledge with the meaning of monotheism.

The integration of materials and the development of learning tools are important aspects, but the existence of Qur'anic verses in teaching materials does not in itself show how students understand, reflect, and interpret the relationship between biological phenomena and religious beliefs. In addition, students' responses to integrated learning need to be studied directly because scientific understanding and religious meaning do not always develop in the same way in every student. This gap is an important basis for this research to examine the practice of integration of Islam and science through the interaction of teachers and students, the learning strategies used, and the students' responses to the material of the human reproductive system. Thus, the focus of the research shifts from the question of the possibility of integration of Islam and science to the understanding of how the integration process takes place and how indications of strengthening the character of monotheism appear in students' learning experiences.

First, some research places more emphasis on the integration of materials or the development of learning tools, so attention to how the integration process actually contributes to the strengthening of students' character has not been the main focus. Second, research that discusses reproduction in an Islamic perspective tends to place the value of faith as part of the learning material or outcomes, but has not deeply described the process of strengthening the character of monotheism that takes place through the interaction of teachers, students, materials, and learning contexts. Third, research on the integration of Islam and science is still largely carried out in the general context or at certain levels of education, so that the context of high schools in regional areas, especially Kerinci Regency, has not received adequate attention. Thus, the problem is not only whether Islam and science can be integrated, but how the integration is implemented and interpreted in the learning process so as to result in the strengthening of the monotheistic character of students.

This gap becomes increasingly important because the success of the integration of Islam and science is not only determined by the existence of Qur'anic verses in teaching materials. Symbolic integration risks making religious values only as a complement to science material without producing a process of internalizing values. On the other hand, integration carried out contextually allows students to relate scientific concepts with beliefs, attitudes, and behaviors in daily life. In the context of the material of the reproductive system, for example, the understanding of the process of human creation can be directed to awareness of the greatness of Allah SWT, while the discussion of health and reproductive behavior can be directed to the responsibility of maintaining self-honor and health. Thus, the strengthening of monotheistic character needs to be seen as an educational process that takes place through learning experiences, not just as a cognitive result after students receive the material.

This research was conducted at SMA Negeri 10 Kerinci, an educational context that has its own characteristics of a social and cultural environment. Previous research has not specifically provided an overview of how the integration of Islam and science is implemented in the learning of the reproductive system in the school. In fact, the local context is important because the implementation of value integration does not take place in a neutral space, but is influenced by the teacher's competence, student characteristics, school environment, learning resources, and religious culture that develops in the school. Previous research has also shown that teacher competence is an important factor in the success of associating scientific concepts with Islamic values (Khoiriah, 2023). Therefore, contextual studies at the school level are needed to understand not only the results of integration, but also the practices and conditions that allow the strengthening of the character of monotheism to take place.

Based on this study, the *research gap* of this research lies in the inadequate study that specifically describes the process of strengthening the character of monotheism through the integration of Islam and science in the material of the reproductive system at the high school level by considering direct learning experience. Previous research has provided the basis that the integration of Islam and science can

be applied to reproductive materials and has the potential to develop faith values, but there is still a need for studies that describe how these integrations are applied in learning practices, what monotheistic values emerge, and what factors support and hinder the process. This research takes a position to fill this gap through a qualitative approach by placing the learning process and experiences of teachers and students as the main source to understand the strengthening of monotheistic character.

The novelty of this research lies in an empirical study of the process of strengthening the character of monotheism through the integration of Islam and science in the material of the reproductive system in the context of biology learning at SMA Negeri 10 Kerinci. This study not only sees integration as a relationship between Qur'anic verses and biological concepts, but analyzes how the integration is translated into the learning process and is associated with the values of faith, gratitude, responsibility, maintaining self-respect, and religious awareness of students. Thus, this research contributes to the development of Islamic-based character education studies by showing that science learning can be a strategic space to strengthen the character of monotheism if it is designed and implemented contextually.

The novelty of this research lies in the empirical explanation of the mechanism of strengthening the character of monotheism through the integration of Islam and science in the learning of the human reproductive system at SMA Negeri 10 Kerinci. Different from studies that are oriented towards the development of learning tools or the discussion of integration in general, this study connects three main aspects, namely the pedagogical practice of teachers, the process of student meaning, and the variation of students' responses to the integration of the concept of Biology with Islamic values. Through interviews, observations, and documentation, this study seeks to identify how biological concepts are connected to the verses of the Qur'an, how dialogue and reflective questions are used to direct students' meaning, and how the understanding of the regularity of creation and gratitude appears in their responses.

The position of this research is also different from previous research which was more oriented towards the development of learning tools or proving the benefits of integrating Islam and science in general. This research uses a qualitative approach to gain a deeper understanding of the integration practice in the context of real learning. The research seeks to see the relationship between the material of the reproductive system, teachers' strategies in integrating Islamic values, students' responses, and the character values of monotheism that develop during the learning process. This approach allows the research to produce a more contextual picture of the mechanism of character strengthening, not just stating that the integration of Islam and science has a positive impact (Sutrisno, 2024).

This research contributes by broadening the understanding of the integration of Islam and science as a pedagogical process that involves mastering scientific concepts, association with Islamic values, reflective dialogue, and students' meaning. Practically, the research findings can be considered for Biology teachers in designing learning that does not stop at the presentation of scientific facts and the inclusion of

Qur'anic verses, but also provides a space for students to express understanding, ask questions, and reflect on the value of monotheism contextually. This contribution is still placed in accordance with the scope of qualitative research in one school and is not intended as evidence that the change in the character of monotheism has taken place permanently.

Based on this description, this study aims to describe the strengthening of students' monotheistic character through the integration of Islam and science in the material of the reproductive system at SMA Negeri 10 Kerinci. The focus of the research is directed at the process of implementing the integration of Islam and science in learning, the form of monotheistic character that appears or is strengthened in students, as well as the supporting and inhibiting factors of its implementation. With this focus, this research is expected to provide an empirical overview of the practice of integrating Islam and science as one of the strategies to strengthen character education at the secondary school level.

B. METHOD

This study uses a qualitative approach with a descriptive design to gain a deep understanding of the process of integrating Islam and science in learning the human reproductive system and strengthening the monotheistic character of students at SMA Negeri 10 Kerinci. The research was carried out for approximately three months. The informants were selected using the purposive sampling technique based on their involvement and relevance to the focus of the research, consisting of 3 Biology teachers, 15 students who participated in learning material on the human reproductive system, and the principal as supporting informants. Teachers were chosen because they played a direct role in the planning and implementation of learning, while students were chosen because they experienced the learning process firsthand and could provide information about their understanding and experience. The principal was chosen to obtain information about the policies and context of character strengthening in the school environment.

Data collection was carried out through semi-structured interviews, non-participatory observations, and documentation. Interviews were conducted directly with teachers, students, and principals for approximately 30–45 minutes with a focus on the form of integration of Islam and science, learning strategies, student experiences, and efforts to strengthen monotheistic character. Observations were carried out three times using observation sheets that included teacher activities, the relationship of Biology material with Islamic values, student responses, learning interactions, and indicators of strengthening monotheistic character. Documentation was used to complete the data in the form of learning tools, materials, photos of activities, and other relevant documents.

Data validity is carried out through source triangulation and source triangulation techniques Source triangulation is carried out by comparing information from teachers, students, and principals, while technical triangulation is carried out by

comparing the results of interviews, observations, and documentation (Kelly, 2014) and (Chambers et al., 2019). Member checking is carried out by reconfirming the results of the interview and the initial interpretation to the informant to ensure the compatibility between the data obtained and their experience or views. The coding process, to the drawing of conclusions. Data analysis refers to the interactive model of Miles, Huberman, and Saldaña which includes data condensation, data presentation, and conclusion drawing and verification. At the condensation stage, the interview results are transcribed and read repeatedly, then coding statements relevant to the focus of the research. The initial codes, such as the integration of Qur'anic verses, the relationship between Islam and science, the greatness of Allah, the regularity of human creation, gratitude, and the awareness of monotheism, are then grouped into broader categories, such as forms of integration of Islam and science, teachers' strategies in strengthening the character of monotheism, and students' responses to learning. These categories are then compared between data sources to find patterns and developed into research themes.

C. RESULT AND DISCUSION

1. RESULTS

The results of the research on the integration of Islam and science in the learning of the human reproductive system at SMA Negeri 10 Kerinci showed three main findings, namely: (1) the integration of the concept of Biology with the values of the Qur'an in explaining the process of human creation; (2) the use of dialogical and reflective learning strategies to connect scientific knowledge with the value of monotheism; and (3) the emergence of student responses in the form of awareness of the regularity of creation, gratitude, and religious meaning to Biology material. The findings were obtained through interviews with three Biology teachers, 15 students, and school principals, learning observation three times, and documentation of learning activities.

Based on the results of the interview, the teacher not only explained the reproductive system from the aspects of biological structure, function, and process, but also related it to the process of human creation in the perspective of the Qur'an. Biology teacher 1 explained, *"When discussing human development, I invite students to see that the process described in biology also shows the regularity of God's creation. So students not only understand the process scientifically, but also understand its meaning."* (Biology Teacher Interview 1, 2026). This statement was strengthened by observations that showed that the teacher related the material about fertilization and embryo development with the concept of human creation, then asked reflective questions to students about the greatness of Allah. One of the students also said, *"Previously I saw this material only as a biological process, but after being explained together with the verses of the Qur'an I saw that the process of human creation is very orderly."* (Student Interview 5, 2026). Thus, the integration found is not only in the form of including Qur'anic verses in the material, but in the form of an effort to

connect biological facts with religious meanings.

The second finding is related to the teacher's strategy in developing an understanding of monotheism through the learning process. The results of the observation show that the teacher uses conceptual explanations, questions and answers, discussions, the use of images or illustrations of embryonic development, as well as reflective questions. The strategy provides space for students to connect scientific knowledge with religious values. The Biology teacher 2 stated, *"I do not immediately conclude that this is proof of the greatness of Allah, but usually I ask students how they see the regularity of the process. From their answers, I then direct the value of monotheism."* (Biology Teacher Interview 2, 2026).

Observational data showed that when the teacher asked a question about the regularity of the human creation process, some students gave responses that linked biological phenomena to the power of Allah. One of the students said, *"I think that the process is very orderly, from conception to fetal development. From there, I feel that human beings are not created just like that."* (Student Interview 9, 2026). The learning documentation also shows that there are discussion and question and answer activities between teachers and students when the material of the reproductive system is associated with Islamic values. These findings show that the strengthening of the character of monotheism takes place through a learning process that combines understanding concepts, dialogue, and reflection, not solely through verbal delivery of religious materials.

The third finding shows that there are indications of strengthening the awareness of monotheism in the way some students interpret the material of the reproductive system. Based on the interviews, some students stated that learning made them view biological processes as part of the order of God's creation. Student 12 said, *"After studying the process of reproduction and human development, I became more grateful because it turned out that the process of human formation was very complex and orderly."* (Student Interview 12, 2026). This statement is in accordance with the results of observations that show a change in students' responses from simply answering factual questions to reflective responses when the teacher relates the material to the value of monotheism. However, the data also shows that the students' responses are not completely the same. Some students still give answers that focus on the biological aspect and have not been able to explain the relationship between the concept of science and the value of monotheism in depth. Therefore, the findings of the study cannot be interpreted as evidence that all students have experienced permanent changes in the character of monotheism.

The findings are more accurately interpreted as indications of strengthening understanding, awareness, and reflection of monotheism that arise during the learning process. Based on the overall data, the integration of Islam and science in the learning of the reproductive system takes place through three main processes, namely connecting scientific concepts with the values of the Qur'an, providing space for dialogue and reflection, and encouraging students to interpret the order of

biological processes as part of the greatness of Allah.

Table 1. Field Findings Matrix

Focus of Findings	Interview Data	Date Notice	Documentation	Interpretasi
Integration of Islam and science	The teacher relates the process of reproduction and human development to the verses/values of the Qur'an	Teacher connects the concept of Biology with human creation	Learning materials/images and classroom activities	Integration takes place through the relationship between scientific concepts and religious meanings
Strategies to strengthen tauhid	Teachers use questions and answers and reflective questions	Students are given the opportunity to give opinions and relate the material to the greatness of Allah	Documentation of discussions and learning processes	The strengthening of monotheism is done through a dialogical and reflective process
Student response	Students expressed an understanding of the order of creation and gratitude	Some students gave a religious response when discussing the process of creation	Documentation of student activities and interactions	There are indications of strengthening the awareness and meaning of tauhid
Differences in student responses	Some students still give answers based on biological aspects	Not all students actively provide religious reflection	Learning activity notes	Integration has not resulted in a uniform response across students
Mechanism of strengthening tauhid	Teachers connect science → the Qur'an → reflection	Dialogue and reflective questions occur	Learning materials and activities support the process	The strengthening of tauhid occurs through the process of interpretation, not just the insertion of verses

2. DISCUSSION

The findings of the study show that the integration of Islam and science in the material of the human reproductive system does not occur only through the insertion of verses from the Qur'an, but through the process of connecting biological concepts with religious meanings. The teacher explains the process of fertilization and human development based on the concept of Biology, then directs students to reflect on the regularity of the process in the perspective of Allah's creation. This mechanism shows that the strengthening of monotheistic character takes place through the stages of understanding the concept, association with Islamic values, dialogue, and reflection of students. This finding has a very strong compatibility with (Saleh, 2023), which specifically developed integrated learning of Islamic values on the material of the reproductive system and found that such integration can strengthen students' religious character as well as critical thinking skills. However, research (Khasanah et al., 2025) focusing on the development and testing of learning materials, while this study provides a qualitative explanation of the pedagogical process that occurs when teachers associate the concept of the reproductive system with the value of monotheism (Asmanto, 2015). Thus, the contribution of this research lies in the explanation of how the integration is interpreted by teachers and students in real learning situations.

The findings on student dialogue and reflection also show that the integration of Islamic values becomes more meaningful when students are given the opportunity to connect scientific knowledge with their own religious understanding. This is in line with (Asshagab et al., 2025), which found that the integration of Islamic values in science learning is carried out through reflection on the verses *kauniyah*, responsible scientific activity, and reflective evaluation so that learning produces a scientific-religious character (Hanafi et al., 2022). The research supports the findings of this study that the value of monotheism is not enough to be conveyed verbally, but needs to be presented in the student's thinking and reflection process. However, there are differences in context, examining material and energy learning in science education students, while this study takes place in high school students in the material of the human reproductive system. These differences show that the reflection mechanism can be applied to different scientific contexts, but the form of stimulus needs to be adjusted to the characteristics of the material and the level of development of the students.

The research data also showed that students' responses to the integration of Islam and science were not entirely uniform. Some students were able to relate the regularity of the reproductive process to the greatness of Allah and express gratitude, while others still gave a biologically-oriented response. These findings are important because they show that the integration of Islam and science does not automatically result in the same character changes in all students. The findings are in line with (Prayogo et al., 2026), which found that the integration of Islamic values

in science learning can support the development of religious character, discipline, responsibility, social awareness, and scientific attitudes, but that its implementation takes place through school policies, lesson planning, and teachers' pedagogical practices in a systematic manner (Kurniawan et al., 2025). Thus, the data of this study strengthens the argument that character changes are not solely caused by the existence of Islamic values in the material, but are influenced by the way teachers integrate these values into students' learning experiences. The difference in student responses in this study is also an important finding that prevents overinterpretation that the integration of learning directly forms the character of monotheism permanently.

When compared to the wider study, (Kurniawan et al., 2025) identify several patterns of Islamic and STEM integration in science learning, including integration through Qur'anic verses, ethical-based projects, and the history of Islamic science. The study shows the potential for improving religious character and science literacy through a systematically designed integration model. Meanwhile, (Mubarok et al., 2026) emphasizing that the effectiveness of integrating Islamic values in science learning is influenced by teacher competence, institutional support, curriculum flexibility, and epistemological coherence between Islamic values and science concepts. The two studies help explain the findings of this study that teacher quality is an important factor in the integration process. This means that Qur'anic verses do not automatically produce monotheistic awareness, teachers need to have the ability to choose relevant concepts, ask reflective questions, create dialogues, and help students build relationships between scientific facts and Islamic values (Muh Habibulloh et al., 2024). Thus, the mechanism of character strengthening found in this study can be formulated as an understanding of biological concepts → an association with Islamic values → a reflective dialogue → a meaning of the regularity of creation → the emergence of monotheistic awareness and gratitude. This pattern is the main contribution of the research because it explains the process, not just stating that the integration of Islam and science is important for character formation.

D. CONCLUSION

This research shows that the integration of Islam and science in learning biology on the material of the human reproductive system can be a pedagogical approach in strengthening the character of students' monotheism. The process of strengthening is not only carried out by including verses of the Qur'an, but through associating biological concepts with Islamic values, discussions, questions and answers, and reflections. This process helps students understand biological phenomena as well as interpret the greatness of Allah SWT. through the creation of humans.

Theoretically, this study emphasizes that the integration of Islam and science is a process of building a meaningful relationship between scientific knowledge and spiritual awareness, not just combining two learning materials. Practically, this

research contributes to teachers to design contextual, systematic, and reflective biology learning by connecting the concepts of science and Islamic values. This finding can also be a consideration for schools in developing teaching materials and learning strategies that support the strengthening of students' monotheistic character.

This research has limitations because it was conducted in one school, with a limited number of informants and research time, so it cannot describe the development of monotheistic character in the long term. Further research is recommended to involve more schools with different characteristics and use a mixed methods or longitudinal approach to obtain broader and measurable data. Further research can also develop and test biology learning modules or models based on the integration of Islam and science in other materials.

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