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Science-Based Inquiry Learning with Islamic Values to Improve Critical Thinking : Pembelajaran Berbasis Penyelidikan Ilmiah dengan Nilai-Nilai Islam untuk Meningkatkan Pemikiran Kritis

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General background: Critical thinking is an essential competency in 21st-century education, requiring learning models that actively involve students. Specific background: Elementary science education often remains teacher-centered, limiting opportunities for students to develop reasoning skills. Knowledge gap: Few studies in Indonesia have investigated the integration of Islamic values within inquiry-based science learning, particularly in fostering students' critical thinking. Aims: This study aims to examine the role of science-based inquiry learning integrated with Islamic values in improving critical thinking among fourth-grade students. Results: Using a mixed-method design, findings indicate that the experimental class applying inquiry learning showed higher post-test scores and N-gain compared to the control class with conventional learning. Students actively engaged in investigations, discussions, and reflections while relating their learning to Qur'anic values. Novelty: The study uniquely integrates Islamic teachings with scientific inquiry to cultivate both cognitive and spiritual development. Implications: The findings suggest that inquiry-based learning contextualized with Islamic values can foster meaningful science learning while shaping students' character and critical thinking abilities.

Highlights :

1. Integration of Islamic values with inquiry learning supports critical thinking.
2. Students show higher achievement in inquiry-based classes.
3. Inquiry learning provides meaningful cognitive and spiritual development.

Keywords : Inquiry Learning, Science Education, Islamic Values, Critical Thinking, Mixed Methods

Pendahuluan

Education involves ongoing learning within social contexts aimed at acquiring knowledge, skills, attitudes, and critical thinking abilities. This process is undertaken by individuals to cultivate personal competencies that can contribute to community advancement. One form of thinking skill obtained through the educational process is critical thinking skills [1]. The goal of 21st-century education is to inspire everyone to be able to think critically when selecting accurate and relevant knowledge, discover imaginatively, work individually or in groups, and be able to overcome difficulties that arise in everyday life [2]. It is important to develop students' critical thinking skills because it impacts their ability to face challenges in everyday life [3]. Critical thinking skills are very important in the current digital era so that students are ready to face obstacles or changing situations in an ever-changing world [4]. The learning process must lead to critical thinking to produce result [5].

Studying science can help students strengthen critical thinking skills. Primary school science lessons must be integrated, with students receiving hands-on experience to expand their knowledge. In a constructivist learning setting, students are given chances to explore diverse information, analyze it from various angles, establish links between their learning and personal experiences, cater to different learning preferences, and engage in reflective practices [6]. In elementary science education, educators motivate students to take ownership of their learning through conducting experiments, gathering data, fostering curiosity through observation, and honing problem-solving abilities through clear explanations [7]. Critical thinking emerges as one of the advanced cognitive skills attainable through science education [8]. One teaching and learning approach that can be used to improve critical thinking skills is the inquiry learning model, where students are used as the topic of teaching and learning and each student is required to actively participate in teaching and learning activities [9]. Critical thinking skills are very relevant if trained using an inquiry-based learning model so the appropriate learning model is the inquiry learning model [10].

Based on the findings of observations that have been made, there are several problems with learning activities, including learning that is still teacher-centered, the teacher's teaching style is monotonous according to students because it does not use varied models in learning. Class IV students generally have advanced cognitive abilities to the concrete operational development stage. Students who are at the concrete operational stage can think rationally and methodically to solve problems, but they still need help from the teacher to complete the task. Children over the age of 10 usually try to complete tasks independently and face them freely [11]. The tendency of students to be required to hone their memory skills without being encouraged to think critically, and not training students to develop their reasoning power in applying the concepts they have learned [12]. Students' inadequate critical thinking skills stem from a learning process that fails to nurture their development in this area [13]. They lack training in posing and addressing questions and are not accustomed to articulating their thoughts or viewpoints. Passivity and mere receptivity to teacher-led explanations lead to reticence in expressing ideas or opinions among students, who tend to conform to instructions rather than engage actively. A key element in the success of the teaching and learning process is the development of student's critical thinking abilities.

Religion and science are interrelated and bind each other; they cannot be separated. The Koran also states that its contents include everything related to religion and science which is beyond doubt [14]. Incorporating Islamic principles into education holds significance, particularly for Muslim individuals. Furthermore, science education aims to enhance students' reverence and belief in the omnipotence of God [15]. Since both are identical in their scientific mission, religion, and science must coexist [16]. The dichotomy between religious knowledge and natural science can be combined appropriately so that they do not stand alone. The integration of religious knowledge and science is essential if science and religion are to enable readers to understand the greatness of God's understanding [17]. Thus, education serves as a platform for students to transform themselves and their thought processes positively. This study examines how incorporating Islamic values into the guided inquiry learning model affects students' critical thinking abilities.

Emphasizing the fusion of science education with Islamic values underscores an evaluation that extends beyond mere knowledge enhancement for students. It also encompasses skill development and the cultivation of the religious attitudes anticipated by students [18]. By integrating Islamic religious education with science and technology, it is hoped that the learning carried out will be more meaningful and easier to understand. Education endeavors to guide students towards comprehending, valuing, embracing, having faith in, and embodying the teachings of Islam, as derived from its primary sources, namely the sacred texts Al-Quran and Al-Hadith. This is accomplished through instructional guidance, practical training, and experiential activities [16]. By studying religion and science, scientists will bring themselves to change for the better and be able to interpret knowledge that should be addressed to all who will study it. Peace in life or region because many wise people have deep knowledge based on complete faith [19].

In general, inquiry-based learning is a teaching and learning method in which the instructor facilitates the learning process while students actively participate in it [20]. In the inquiry learning model, learning is centered on student activity, and the teacher's task is to provide instructions to students in the form of methodically structured questions that lead to the discovery of ideas [21]. Inquiry-based instruction entails creating scenarios where students are prompted to observe and interrogate phenomena, propose explanations for their observations, devise and conduct experiments to gather supporting evidence, and analyze data to draw conclusions [22]. Information grounded in facts and firsthand experience tends to be more readily embraced and retained in memory over time. Students excel in learning when presented with challenges. Through inquiry-based approaches, students engage in investigations to discover answers for themselves. Students help each other in their groups to solve problems so they can improve learning. Because of their involvement in the investigation, students who learn through the inquiry learning model have increased motivation and drive to apply their skills in solving problems [23][24][25]. Multiple preceding research endeavors

have explored inquiry-based learning models and their influence on science procedural abilities [26][27][28][29][30], critical thinking skills [31][10][32][33][34], creative thinking skills [35][36][37][38][39] and also problem-solving skills [40][41][42][43][44]. Nonetheless, there is a paucity of research conducted in Indonesia investigating the correlation between inquiry-based learning and critical thinking skills. Additionally, there remains an absence of integration of Islamic values into inquiry-based learning within science subjects.

Metode Penelitian

This research uses mixed research methods, namely research that integrates qualitative and quantitative data in one study [45]. This research was conducted in one of the grade IV elementary schools in Sidoarjo which was divided into 2 classes; control and experimental classes. The learning materials used are related to the topic of plant growth processes. The instrument used to collect data was a test sheet given to determine students' critical thinking skills through pretest and posttest. Qualitative methodologies involving observations, interviews, and supplementary documentation are employed to examine learning activities that integrate Islamic values and science through inquiry-based learning approaches. The quantitative method used was quasi-experimental with only a pretest-posttest control group design. The research design is in Table 1.

Table 1. Research Design

Group	Observations	Treatment	Observations
Experiment	X1	O1	Y1
Control	X2	O2	Y2

The pretest-posttest group design uses two groups, namely the experiment group using inquiry learning (O1) and the control group using conventional learning (O2) whose abilities are determined before and after studying the growth process (X) and (Y). The learning process in the experimental class uses science context-based inquiry learning which follows the stages of observation, investigation, explanation, conclusion, and communication (Table 2).

Table 2: Syntax and Student Activities in Inquiry Learning

No.	Syntax	Student Activities
1	Observation	Students recognize issues arising from observable phenomena.
2	Investigation	Students conduct group investigations based on the identified problems' outcomes
3	Explanation	Students interpret and elucidate the findings of the investigation through written explanations
4	Conclusion	Based on the investigation's findings, students draw conclusions regarding the material's content
5	Communication	Students traditionally present explanations of the investigation results

The five stages of inquiry support inquiry-based learning with a scientific approach, aiming to foster the advancement of critical thinking abilities. Table 3 illustrates the correlation between the stages of learning and critical thinking skills.

Table 3: The Relationship between Inquiry Learning and Critical Thinking Skills

No.	Syntax	Student Activities
1	Observation	Gather basic information
2	Investigation	Perform basic clarification of the problem
3	Explanation	Carry out strategies and tactics to make the best conclusions
4	Conclution	Make conclusions
5	Communicatio n	Provide further explanation

The data collection method employed in this study involves administering tests and observing both the learning process and student engagements. The instrument utilized is a critical thinking assessment comprising five indicators: analyzing arguments, drawing conclusions, observing and evaluating observational results, making decisions on courses of action, and formulating focused inquiries [6]. The test is administered both prior to and following the learning phase. Throughout the learning process, two observers oversee the inquiry-based learning process and group activities. The gathered data is subsequently subjected to both descriptive and inferential analyses. Qualitative data is initially supplemented by quantitative descriptive techniques, involving the calculation of percentages for each measured aspect.

Hasil dan Pembahasan

Inquiry-based learning within a scientific framework entails utilizing a scientific context as a platform to cultivate and enhance students' critical thinking skills. Guided by the teacher, students progress through inquiry stages, considering their elementary school level (fourth grade), involving observation, investigation, explanation, conclusion, and communication (Table 2). This inquiry learning stage provides students with the opportunity to carry out investigative activities under teacher supervision (Table 2). The inquiry learning stage is carried out by presenting phenomena, which are wrapped in the context of science in a personal, social, or global context. Moreover, students are encouraged to inquire and address problems by progressing through the following inquiry stages: identifying issues, conducting scientific experiments, gathering, processing, and analyzing data, presenting findings, and drawing conclusions while explaining the outcomes reached.

Implementation of science-based inquiry learning integrated with Islamic values

The application of inquiry learning begins with students identifying problems based on existing phenomena by playing videos about the plant growth process. The students were seen paying serious attention to the video shown by the teacher. After watching the video, the teacher distributes a piece of paper to all students and the students ask a question related to the video they have watched. They ask questions by writing them on the paper provided by the teacher. Fifteen questions from 15 students. There are eight different questions, including: (1) What are the parts of a plant? (2) What is the process of plant growth? (3) Why is sunlight important for plant growth? (4) What is the function of each part of the plant? (5) What happens if plants don't get sunlight? (6) What is meant by the process of photosynthesis (7) What is meant by growth? (8) What influences the plant growth process? Based on this question, it shows that class IV students have enough critical thinking when facing a certain phenomenon. Asking questions can initiate students' thinking skills process. The capacity of students to pose critical inquiries is also considered one of the skills they aspire to develop in the 21st century [46].

Based on the inquiries raised by students, they are then tasked with investigating the process of plant growth. Working in groups, students devise procedures, enthusiastically conduct experiments, and actively participate. They record their observations, organize them into a table, and subsequently draw conclusions. Subsequently, they share their experiment results with another group, where two students provide explanations, and two others ask questions. Through this approach, plant lessons are structured across three distinct sessions covering discussions on plant anatomy and functions, the process of photosynthesis, and its significance to living organisms, and the phenomenon of plant growth.

Learning activity I, discussion of plant body parts and their functions. Students are grouped to actively participate, explore, elucidate, elaborate, and assess their learning experiences. In study groups, students observe the parts of the plants that have been provided. After that, students write down the results of their investigations and observations in their groups. Students learn that each part of the body has its function which aims to fulfill the plant's needs for survival. Students are motivated

to seek and gather diverse supporting information from the internet or alternative sources. They validate their findings through practical experimentation. Through various procedures undertaken, students are able to communicate their learning outcomes to both teachers and peers. Additionally, students delve into scientific narratives rooted in the teachings of the Qur'an, which elucidates the magnificence of Allah's creations as expounded in verse 58 of Surah Al-A'raf.

يَشْكُرُونَ لِقَوْمٍ آيَاتِۡ ال نُصَرِّفُ كَذٰلِكَ ۚ نَكِدًا إِلَّا يَخْرُجُ لَا خَبُثَ لَّذِي وَا ۖ رَبِّهِ بِإِذْنِ نَبَاتُهُ يَخْرُجُ الطَّيِّبُ وَالْبَلَدُ

“And good land, the plants grow abundantly with Allah's permission, and the soil is not fertile, the plants only grow miserable. Thus We repeat the signs of (Our) greatness for those who are grateful.”

Learning activity II, the process of photosynthesis, and relating the importance of this process to living things. Humans and animals will look for food if they feel hungry. Animals will move looking for prey. People will cook or go to buy what they need. Then, what about plants? These living creatures do not move from place to place like us. Neither has a mouth. However, just like all other living creatures, plants also need food. This is done through the process of photosynthesis. Students are organized into groups to actively participate, investigate, elucidate, elaborate, and assess their learning process. In study groups, students observe the process of plant photosynthesis. Following this, students document the outcomes of their inquiries and observations within their respective groups. They are prompted to seek and gather diverse supporting information from the internet or alternative sources. Through the various procedures undertaken, students are able to convey examination results to both teachers and classmates.

Students learn scientific stories based on Al-Qur'an values from the teacher's presentation regarding Al-Qur'an verses about plant growth. Allah is the one who sends down rain from the sky, which causes the growth of various types of plants consisting of various shapes, kinds, and flavors. In Surah Al-An'am verse 99, the Quran elaborates on the magnificence of Allah's creation.

وَجَنّٰتٍ دَانِيَةٌ قِنْوَانٌ طَلْعِهَا مِنْ النَّخْلِ وَمِنَ مُّتَرَاكِبًاۚ حَبًّا مِنْهُ نُخْرِجُ خَضِرًا مِنْهُ فَاَخْرَجْنَا شَيْءٍ كُلِّ نَبَاتَ بِهٖ فَاَخْرَجْنَا مَاۤءً السَّمَاۤءِ مِنَ اَنْزَلَ الَّذِيْ وَهُوَ يُؤْمِنُوْنَ لِّقَوْمٍ لَاٰيٰتٍ ذٰلِكُمْ فِيْ اِنَّۗ وَيَنْعِهٖ اَثْمَرَ اِذَآ ثَمَرِهٖٓ اِلٰى اُنْظُرُوْٓا مُتَشَابِهٍۗ وَّغَيْرَ مُشْتَبِهًا وَالرُّمَّانَ وَالزَّيْتُوْنَ اَعْنَابٍ مِّنْ

"And He is the One who sends down rain from the sky, then We make all kinds of plants grow with that water. So We bring out from it plants in layers. And from a date palm tree that has thick bunches, it grows from its base, bunches that bend down because of its weight, and vineyards, and olives, and pomegranates, all like and not like. Look at the fruit when it bears fruit, and look when it is ripe. Verily in that are signs (of the greatness of Allah) for the people who believe."

Learning activity III, plant growth. Students are asked to investigate the process of plant growth. Students are grouped to actively participate, explore, elucidate, elaborate, and assess their learning process. Students prepare tools and materials, the teacher prepares student activity sheets. Students investigated the growth process of green bean plants planted in two places with different treatments. The first green bean seeds were treated with murottal verses from the Koran and the second green bean seeds were not treated with murottal verses from the Koran. Students observe the growth process of the green bean seeds and water them every day. Students are motivated to seek and gather diverse supporting information from the internet or alternative sources. They acquire scientific narratives rooted in the values of the Qur'an through the teacher's presentations on verses related to plant growth. Additionally, the Qur'an elucidates on the magnificence of Allah's creation in Surah Yasin verse 33.

يَأْكُلُوْنَ فَمِنْهُ حَبًّا مِنْهَا نَاۡ وَاَخْرَجَ اَحْيَيْنٰهَا الْمَيْتَةُۖ الْاَرْضُ لَّهُمُ وَاٰيَةٌ

“And a sign (of Allah's great power) for them is the dead earth. We revived the earth and brought out grain from it, so they ate from it."

Table 4. Observation Results of the Application of Inquiry Learning

Activity Stages	Activity Description	Average Learning Process Assessment		
		First	Second	Third
Introduction	The teacher greets conducts apperception, and conveys the learning objectives	90	100	100
Main activities	Observation	90	90	100
	Investigation	100	100	100
	Representative	100	100	100
	Conclusion	100	100	100
	Communication	100	100	100
Closing	Conclusion and reflection	90	100	100
Average		97.1	98.6	100

The investigation, representation, conclusion, and communication stages were overall carried out well. From the initial lesson onward, the teacher has been guiding students to conduct investigations for problem-solving, present findings appropriately, draw conclusions based on investigation results, and communicate these findings to other groups. The inquiry process progressed smoothly due to active participation from both the teacher and students, who demonstrated keen observation, effective communication, and cooperation. The observation and communication phases within the learning process can enhance critical thinking among students, facilitating knowledge acquisition [46] and encourage students' critical thinking disposition [47]. Engaging in collaborative group work offers students the chance to collaborate in planning, executing, negotiating, and assessing tasks or challenges. This investigative practice fosters independence among students, encouraging them to take responsibility for their learning, enhance learning efficacy, and develop critical thinking skills [48] [49] [50]. In this case, students become individuals who feel grateful to God for the blessings and gifts that God gives in everyday life.

In conclusion learning activities, students appear active and responsible in presenting step-by-step the results of their discussions with the group. In this stage of learning activities, students will become responsible individuals and dare to express the results of their discussions with their group. A dynamic learning environment for students to cultivate their religious and spiritual capacities, self-discipline, personality, intellect, virtuous ethics, and critical thinking abilities. Students delve into scientific narratives grounded in the teachings of the Quran and Hadith. Through diverse procedures, students are able to share examination outcomes with both teachers and peers [18]. Additionally, when conveying their learning outcomes, students exhibit joy and eagerness during each phase of learning, exploration, and group tasks, demonstrating bravery and courtesy in voicing their perspectives. This corresponds with Ramos' assertion that students' active engagement in learning can stimulate their critical thinking [51]. Towards the conclusion of the lesson, both the teacher and students wrap up the session and offer reinforcement.

Students' Critical Thinking Skills Through science-based inquiry learning

In addition to enhancing scientific literacy achievement, the adoption of science-centered inquiry learning methods can enhance students' critical thinking skills, as indicated in Table 5.

Table 5. Descriptive Data on Students' Critical Thinking Skills

Group	Inquiry		Conventional	
	Pre-Test	Post-Test	Pre-Test	Post-Test
Mean	53.8	77.6	56.0	65.0
Standard of Deviation	12.6	9.4	11.9	8.3
Variance	159.9	89.2	143.7	69.4
Maximum	73.0	92.0	72.0	82.0
Minimum	33.0	58.0	33.0	50.0
Range	40.0	34.0	39.0	32.0
Mean of N-gain	51.9 (medium)		18.04 (low)	

Prior to engaging in inquiry-based learning, students exhibit a higher average level of critical thinking ability compared to conventional learning methods. Table 4 illustrates the average enhancement in students' critical thinking skills through both inquiry-based and conventional learning, with an average N-gain of 51.9 and 18.04, respectively. To ascertain the significance of the improvement in critical thinking skills, a statistical examination is conducted on the two average enhancements achieved through inquiry-based and conventional learning. Before conducting inferential testing, prerequisite tests such as normality and homogeneity testing are carried out, followed by the t-test.

Table 6. Results of Normality, Homogeneity, and Critical Thinking Skills t-test

Group	Normality Test	Homogeneity Test	T-Test
Inquiry	P = 0.38	P = 0.44	P = 0.0
Conventional	P = 0.83		

The test outcomes are displayed in Table 6. Findings from the normality and homogeneity tests reveal that $p > 0.05$, indicating that both datasets are normally distributed and homogenous. The t-test results indicate that the t value exceeds the critical t value, and $p < 0.05$. This signifies a notable difference between the average enhancement in students' critical thinking skills observed through inquiry-based and conventional learning. This improvement is attributed to students' evident engagement in the learning process, where they attentively observe phenomena with scientific

contexts while documenting questions they intend to pose. Furthermore, students demonstrate enthusiasm and collaboration throughout the investigation.
They exhibit confidence in both asking and explaining concepts to their peers. The activities and discussions conducted by students hone their critical thinking abilities, ultimately contributing to their overall improvement. Engaging in question-answer interactions positively influences the advancement of critical thinking levels. Moreover, discussions serve to elevate students' critical thinking aptitude and enhance their capacity to correlate claims with evidence [52]. The observations indicate that nearly all students actively engage in resolving contextual challenges through investigative tasks. They scrutinize the issues they encounter, devise strategies, and execute problem-solving methodologies. This aligns with the findings of Rusilowati and Khanafiyah's study, suggesting that open inquiry methods can enhance students' critical thinking skills [53].

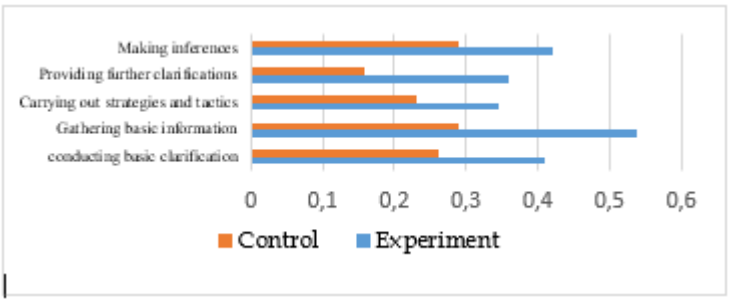

Figure 1. Improving Students' Critical Thinking Skills in Every Aspect

The critical thinking skills assessed in this study encompass fundamental problem clarification, information gathering, drawing conclusions, elaborating further, and employing strategies and tactics to derive optimal conclusions. Student proficiency in each facet of critical thinking skills is illustrated in Figure 1.

Figure 1 illustrates that students in the experimental group exhibit higher levels of critical thinking skill attainment in each aspect compared to those in the control group. The most significant difference in improving critical thinking skills is in gathering basic information and providing further clarification. This happens because inquiry learning provides students with the opportunity to make further plans. Before the experiment, such as determining the purpose of the experiment, preparing tools and materials, searching the literature, determining stages, and collecting and analyzing data. This task necessitates the utilization of effective problem-solving strategies and techniques. Open-ended laboratory exercises aid in fostering a more genuine learning atmosphere by encouraging exploration into the reasons and methodologies behind investigating natural phenomena [54]. On the other hand, in the control class, students did not carry out experiments like those in the experimental class. Thus, when learning in the control class, the teacher actively explains and explores, and the students seem to behave passively in class.

According to the findings, the adoption of inquiry-based methods can enhance critical thinking abilities, as indicated in Tables 5 and 6. Critical thinking plays a pivotal role in science education, as it endeavors to equip students with the capacity to think critically and responsibly as citizens. Consequently, science education should be structured to effectively cultivate students' critical thinking skills [55].

Integration of Science and Islamic Values

The Quran implies the significance of incorporating Islamic values into science education. Numerous Quranic verses emphasize the importance of contemplating natural phenomena to strengthen one's religious faith. Science equips individuals with the knowledge to interact with nature, carry out various processes, and fulfill life's necessities. Conversely, religion imparts teachings on devotion to the Creator and the value of compassion towards others. Integrating Islamic values into education entails guiding students through exemplary educational models focused on instilling life values encompassing religious, cultural, ethical, and aesthetic aspects. This aims to foster the development of students who possess religious spiritual intelligence, self-discipline, integrity, noble character, as well as the requisite skills for personal, societal, and national advancement. [56].

The subsequent document depicts a flowchart merging Islamic principles with scientific methodologies. The fusion of Islamic and scientific values can be systematically executed through engagement, exploration, explanation, depiction, and evaluation. These discoveries stem from scientific investigations and are subsequently harmonized with Islamic principles delineated in the Quran, utilizing online educational materials. This approach offers students extensive room for exploration, with no constraints on the diversity of learning outcomes, fostering not only knowledge acquisition but also the development of integrated skills and competencies.

Figure 2.Integration of Islam and Science with Inquiry Learning

The learning activities in Figure 2 involve students in observing, investigating, representing, concluding, and communicating in the learning process so that students can learn, think, act, and care about their environment. [57]. Throughout the educational journey, instructional materials are aligned with Islamic principles derived from the Quran and substantiated by research findings. This integration aims to cultivate critical thinking skills among students within the school setting, fostering their ability to critically assess both scientific knowledge and behaviors. This is due to the characteristics of Generation Z, namely being more critical in responding to new information. By comparing the information they know, they will be more critical [58].

Instilling Islamic values in students is a teacher of value and moral education not only when teaching them, but whenever and wherever Islamic values must become an integral part of life. The process of plant growth exemplifies the magnificence of God's creation. However, students have yet to contemplate their knowledge by incorporating Islamic values from the Quran and Hadith. Through daily activities and discussions, students can grasp and interpret the significance of this verse, enhancing their understanding. Integration of Islamic values in learning helps students to realize and experience values and place them integrally in their entire lives.

Simpulan

Science-based inquiry learning contextualizes science within everyday situations. The structure of science-based inquiry learning comprises observation, investigation, representation, conclusion, and communication. This structure actively engages students in learning, facilitating the development of their knowledge and enhancement of critical thinking skills, which are crucial for their future endeavors. Fostering students' inclination towards knowledge acquisition and critical thinking should be consistently nurtured across various educational levels. Critical thinking abilities empower students to tackle challenges effectively. Science context-based inquiry learning has been demonstrated to be effective in enhancing critical thinking skills, guiding students in basic problem clarification and information gathering. Furthermore, students can draw conclusions at the culmination of learning activities, providing additional clarification and employing strategies and tactics to derive optimal conclusions.

The merging of science education and Islamic principles seeks to facilitate and enhance students' learning process within an active learning environment, fostering the development of religious spirituality, self-discipline, character, intelligence, noble ethics, and critical thinking skills. Through various stages, students engage in comparisons and discussions related to events depicted in the Quran. The integration of Islamic teachings and scientific knowledge provides students with factual, cultural, and educational experiences that resonate with the marvels of the Quran. The outcomes of this study aim to cultivate devout Muslims within educational institutions and strengthen their faith and dedication to their acquired knowledge. Consequently, implementing inquiry-based learning grounded in scientific contexts intertwined with Islamic values not only enriches students' knowledge but also enhances their critical thinking abilities and nurtures their religious beliefs.

References

[1] U. Rosidin, N. Kadaritna, and N. Hasnunidah, "Can Argument-Driven Inquiry Models Have Impact on Critical Thinking Skills for Students With Different Personality Types?," Cakrawala Pendidikan, vol. 38, no. 3, pp. 511–526, 2019, doi: 10.21831/cp.v38i3.24725.

[2] A. Ramadhanti and R. Agustini, "Analisis Keterampilan Berpikir Kritis Peserta Didik Melalui Model Inkuiri Terbimbing Pada Materi Laju Reaksi," Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran, dan Pembelajaran, vol. 7, no. 2, p. 385, 2021, doi: 10.33394/jk.v7i2.3458.

[3] P. Tapanuli, S. Hal, S. Wahyuni, R. Nasution, and M. Pd, "Penerapan Model Inkuiri Terbimbing (Guided Inquiry) Dalam Meningkatkan Kemampuan Berpikir Kritis Pada Pembelajaran Fisika," Jurnal Education and Development Institut, vol. 3, no. 1, pp. 1–5, 2018.

[4] N. Karisma Putri, Yuberti, and U. Hasanah, "Physics and Science Education Journal (PSEJ)," Physics and Science Education Journal, vol. 1, pp. 1–12, 2021.

[5] A. M. Kanzul and W. Subchan, "Jurnal Pendidikan MIPA," Jurnal Pendidikan MIPA, vol. 12, no. 2, pp. 682–689, 2022.

[6] I. D. Pursitasari, E. Suhardi, A. P. Putra, and I. Rachman, "Enhancement of Student's Critical Thinking Skill Through Science Context-Based Inquiry Learning," Jurnal Pendidikan IPA Indonesia, vol. 9, no. 1, pp. 97–105, 2020, doi: 10.15294/jpii.v9i1.21884.

[7] J. Brier and L. D. Jayanti, "Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Kemampuan Berpikir Kritis IPA SD," Jurnal Kajian Pendidikan Matematika, vol. 21, no. 1, pp. 1–9, 2020.

[8] R. Jundu, P. H. Tuwa, and R. Seliman, "Hasil Belajar IPA Siswa SD di Daerah Tertinggal Dengan Penerapan Model Pembelajaran Inkuiri Terbimbing," Jurnal Pendidikan dan Kebudayaan, vol. 10, no. 2, pp. 103–111, 2020.

[9] Y. D. A. Kurniawan, H. Utomo, and N. Insani, "Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Kemampuan Berpikir Kritis Pada Mata Pelajaran Geografi," Jurnal Integrasi dan Harmonisasi Inovasi Ilmu-Ilmu Sosial, vol. 2, no. 1, pp. 81–88, 2022, doi: 10.17977/um063v2i12022p81-88.

[10] M. M. Sari and M. Muchlis, "Improving Critical Thinking Skills of High School Students Through Guided Inquiry Implementation for Learning Reaction Rate Concept in Chemistry," Jurnal Pijar MIPA, vol. 17, no. 2, pp. 169–174, 2022, doi: 10.29303/jpm.v17i2.3278.

[11] M. L. Ilhamdi, D. Novita, and A. N. K. Rosyidah, "Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Kemampuan Berpikir Kritis IPA SD," Jurnal Ilmiah Kontekstual, vol. 1, no. 2, pp. 49–57, 2020, doi: 10.46772/kontekstual.v1i02.162.

[12] F. Wulandari, S. Sukardi, and M. Masyhuri, "Pengaruh Model Pembelajaran Inkuiri Terbimbing Berbantuan Media PowerPoint Terhadap Kemampuan Berpikir Kritis Siswa," Jurnal Ilmiah Profesi Pendidikan, vol. 7, no. 3, pp. 1327–1333, 2022, doi: 10.29303/jipp.v7i3.752.

[13] A. F. Siagian, "Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Keterampilan Berpikir Kritis Siswa SMA," INPAFI (Inovasi Pembelajaran Fisika), vol. 3, no. 3, pp. 299–306, 2015, doi: 10.24114/inpafi.v3i3.5289.

[14] M. Sulaiman, "Integrasi Agama Islam dan Ilmu Sains dalam Pembelajaran," Jurnal Pendidikan Islam, vol. 15, no. 1, pp. 96–110, 2020.

[15] E. Ragab and F. Elhoshi, "The Role of Teachers in Infusing Islamic Values and Ethics,"

International Journal of Academic Research in Business and Social Sciences, vol. 7, no. 5, pp. 426–436, 2017, doi: 10.6007/IJARBSS/v7-i5/2980.

[16] C. Chanifudin and T. Nuriyati, "Integrasi Sains dan Islam dalam Pembelajaran," Asatiza, vol. 1, no. 2, pp. 212–229, 2020, doi: 10.46963/asatiza.v1i2.77.

[17] A. Marvavilha and S. Suparlan, "Model Integrasi Nilai Islam Dalam Pembelajaran Sains," Humanika: Kajian Ilmiah Mata Kuliah Umum, vol. 18, no. 1, pp. 59–80, 2018.

[18] E. F. Fahyuni, Wasis, A. Bandono, and M. B. U. B. Arifin, "Integrating Islamic Values and Science for Millennial Students' Learning Using Seamless Mobile Media," Jurnal Pendidikan IPA Indonesia, vol. 9, no. 2, pp. 231–240, 2020, doi: 10.15294/jpii.v9i2.23209.

[19] A. I. Ramadhani, R. Vebrianto, and A. Anwar, "Upaya Integrasi Nilai-Nilai Islam Dalam Pembelajaran IPA di Madrasah Ibtidaiyah," Instructional Development Journal, vol. 3, no. 3, pp. 188–202, 2020.

[20] C. Nzomo, P. Rugano, J. N. Mungai, and C. G. Muriithi, "Inquiry-Based Learning and Students' Self-Efficacy in Chemistry Among Secondary Schools in Kenya," Heliyon, vol. 9, no. 1, p. e12672, 2023, doi: 10.1016/j.heliyon.2022.e12672.

[21] A. Musliman and U. Kasman, "Efektivitas Model Inkuiri Terbimbing untuk Melatih," Jurnal Jendela Pendidikan, vol. 2, no. 1, pp. 48–53, 2022.

[22] D. Cairns and S. Areepattamannil, "Exploring the Relations of Inquiry-Based Teaching to Science Achievement and Dispositions in 54 Countries," Research in Science Education, vol. 49, no. 1, pp. 1–23, 2019, doi: 10.1007/s11165-017-9639-x.

[23] P. Õ and F. Kabap, "The Effects of Inquiry-Based Learning on Elementary Students' Conceptual Understanding of Matter, Scientific Process Skills and Science Attitudes," Procedia - Social and Behavioral Sciences, vol. 2, pp. 1190–1194, 2010, doi: 10.1016/j.sbspro.2010.03.170.

[24] R. S. Smith and R. Walker, "Can Inquiry-Based Learning Strengthen the Links Between Teaching and Disciplinary Research?," Studies in Higher Education, pp. 37–41, 2010, doi: 10.1080/03075070903315502.

[25] A. Veloo, S. Perumal, and R. Vikneswary, "Inquiry-Based Instruction, Students' Attitudes and Teachers' Support Towards Science Achievement in Rural Primary Schools," Procedia - Social and Behavioral Sciences, vol. 93, pp. 65–69, 2013, doi: 10.1016/j.sbspro.2013.09.153.

[26] H. Taib, A. Haerullah, and C. Roini, "Pengaruh Pembelajaran Inkuiri Terbimbing Terhadap Keterampilan Proses Sains Siswa SMP," Edukasi, vol. 18, no. 2, pp. 342–353, 2020, doi: 10.33387/edu.

[27] I. P. Artayasa, M. Muhlis, G. Hadiprayitno, and I. W. Merta, "Efek Metode Peta Konsep Dalam Pembelajaran Inkuiri Terbimbing Terhadap Keterampilan Proses Sains Siswa," Bioscientist: Jurnal Ilmiah Biologi, vol. 9, no. 1, pp. 96–103, 2021, doi: 10.33394/bjib.v9i1.3711.

[28] F. S. Parawansa et al., "Pengaruh Model Pembelajaran Inkuiri Terbimbing Dalam Mengembangkan Keterampilan Proses Sains: Literature Review," Alveoli, vol. 3, no. 1, pp. 1–10, 2022, doi: 10.35719/alveoli.v3i1.83.

[29] Gunawan, A. Harjono, Hermansyah, and L. Herayanti, "Guided Inquiry Model Through Virtual Laboratory to Enhance Students' Science Process Skills on Heat Concept," Cakrawala Pendidikan, vol. 38, no. 2, pp. 259–268, 2019, doi: 10.21831/cp.v38i2.23345.

[30] S. Sulistiyono, "Efektivitas Model Pembelajaran Inkuiri Terbimbing Terhadap Keterampilan Proses Sains dan Pemahaman Konsep Fisika," Jurnal Pendidikan Fisika Undiksha, vol. 10, no. 2, pp. 61–70, 2020, doi: 10.23887/jjpf.v10i2.27826.

[31] M. Solikah and D. Novita, "The Effectiveness of the Guided Inquiry Learning Model on the Critical Thinking Ability of Students," Jurnal Pijar MIPA, vol. 17, no. 2, pp. 184–191, 2022, doi: 10.29303/jpm.v17i2.3276.

[32] L. Hayati, I. N. Loka, and Y. A. S. Anwar, "Pengaruh Model Pembelajaran Inkuiri Terbimbing Dengan Metode Pembelajaran Terpadu Terhadap Kemampuan Berpikir Kritis," Chemistry Education Practice, vol. 2, no. 2, pp. 29–38, 2019, doi: 10.29303/cep.v2i2.1364.

[33] G. A. P. U. Parwati, N. K. Rapi, and D. O. Rachmawati, "Penerapan Model Pembelajaran Inkuiri Terbimbing Untuk Meningkatkan Kemampuan Berpikir Kritis dan Sikap Ilmiah," Jurnal Pendidikan Fisika Undiksha, vol. 10, no. 1, pp. 49–58, 2020, doi: 10.23887/jjpf.v10i1.26724.

[34] Yuliana, H. Hikmawati, and W. Wahyudi, "Pengaruh Model Pembelajaran Inkuiri Terbimbing Berbantuan Peta Konsep Terhadap Kemampuan Berpikir Kritis Peserta Didik," Kappa Journal, vol. 4, no. 1, pp. 85–92, 2020.

[35] R. Ruqoyyah, M. A. Fatkhurrohman, and Y. Arfiani, "Implementasi Model Inkuiri Terbimbing Berbantuan Pop-Up Book untuk Meningkatkan Kemampuan Berpikir Kreatif," Jurnal Edukasi Matematika dan Sains, vol. 8, no. 1, pp. 42–50, 2020, doi: 10.25273/jems.v8i1.6166.

[36] R. A. Rahmawati, "Penerapan Metode Inkuiri Untuk Meningkatkan Kemampuan Berpikir Kreatif Siswa Dalam Pembelajaran IPS," Repository UPI, vol. 4, no. 1, pp. 1–5, 2022.

[37] T. A. Djola, T. Abdjul, and N. E. Ntobuo, "Pengaruh Model Pembelajaran Inkuiri Terbimbing Berbantuan PhET Simulations Pada Materi Pemantulan dan Pembiasan Cahaya," Jurnal Pendidikan Fisika Tadulako Online, vol. 9, pp. 1–6, 2021.

[38] N. Ulandari, R. Putri, F. Ningsih, and A. Putra, "Efektivitas Model Pembelajaran Inquiry Terhadap Kemampuan Berpikir Kreatif Siswa pada Materi Teorema Pythagoras," Jurnal Cendekia: Jurnal Pendidikan Matematika, vol. 3, no. 2, pp. 227–237, 2019, doi: 10.31004/cendekia.v3i2.99.

[39] R. Putri, "Efektivitas Pembelajaran Berbasis Inquiry Untuk Meningkatkan Penguasaan Konsep dan Kemampuan Berpikir Kreatif Mahasiswa Farmasi," Jurnal Biolokus, vol. 3, no. 2, pp. 298–305, 2020, doi: 10.30821/biolokus.v3i2.754.

[40] I. Nidda, M. Taufik, W. Wahyudi, and A. Doyan, "Pengembangan Perangkat Pembelajaran Model Inkuiri Terbimbing untuk Meningkatkan Penguasaan Konsep dan Kemampuan Pemecahan Masalah," Jurnal Ilmiah Profesi Pendidikan, vol. 7, no. 4, pp. 2355–2359, 2022, doi: 10.29303/jipp.v7i4.1037.

[41] A. Rizqa, A. Harjono, and W. Wahyudi, "Kemampuan Pemecahan Masalah Fisika Peserta Didik Melalui Model Pembelajaran Inkuiri Terbimbing Berbantuan Post Organizer," ORBITA: Jurnal Kajian, Inovasi dan Aplikasi Pendidikan Fisika, vol. 6, no. 2, pp. 243–247, 2020, doi: 10.31764/orbita.v6i2.3133.

[42] D. S. Putri and S. Riwayati, "Pengembangan LKS Kemampuan Pemecahan Masalah Matematis Siswa Kelas VIII Berbasis Inkuiri Terbimbing Berbantu Media Grafis," Jurnal Inovasi Pendidikan Matematika, vol. 3, no. 2, pp. 138–146, 2021, doi: 10.31851/indiktika.v3i2.5446.

[43] K. Kuswanto, A. Sutono, and J. Siswanto, "Pengembangan Perangkat Pembelajaran Model Inkuiri Terbimbing Berbasis Kearifan Lokal Untuk Meningkatkan Kemampuan Pemecahan Masalah," Jurnal Ilmiah Pendidikan Dasar, vol. 7, no. 2, pp. 620–632, 2022, doi: 10.23969/jp.v7i2.6578.

[44] S. Suratna, "Penerapan Metode Inkuiri Terbimbing Berbantuan Aplikasi PhET Untuk Meningkatkan Ketrampilan Memecahkan Masalah Fisika," Jurnal Sains dan Teknologi, vol. 5, no. 2, pp. 404–412, 2022, doi: 10.31764/justek.v5i2.11904.

[45] E. J. Halcomb and L. Hickman, "Mixed Methods Research," Nurse Researcher, vol. 22, no. 5, pp. 16–21, 2015.

[46] S. A. DeWaelsche, "Critical Thinking, Questioning and Student Engagement in Korean University English Courses," Linguistics and Education, vol. 32, pp. 131–147, 2015, doi: 10.1016/j.linged.2015.10.003.

[47] S. Weinstein and D. Preiss, "Scaffolding to Promote Critical Thinking and Learner Autonomy Among Pre-Service Education Students," Journal of Education and Training, vol. 4, no. 1, pp. 69–85, 2017, doi: 10.5296/jet.v4i1.9871.

[48] M. Smallhorn, J. Young, N. Hunter, and K. B. da Silva, "Inquiry-Based Learning to Improve Student Engagement in a Large First Year Topic," Student Success, vol. 6, no. 2, pp. 65–71, 2015, doi: 10.5204/ssj.v6i2.292.

[49] U. Kopzhassarova, G. Akbayeva, Z. Eskazinova, G. Belgibayeva, and A. Tazhikeyeva, "Enhancement of Students' Independent Learning Through Their Critical Thinking Skills Development," International Journal of Environmental and Science Education, vol. 11, no. 18, pp. 11585–11592, 2016.

[50] S. Geng, K. M. Y. Law, and B. Niu, "Investigating Self-Directed Learning and Technology Readiness in Blended Learning Environment," International Journal of Educational Technology in Higher Education, vol. 16, no. 1, pp. 1–22, 2019, doi: 10.1186/s41239-019-0147-0.

[51] I. D. D. Ramos, "The English Majors' Expectations, Experiences, and Potentials: Inputs Toward Korea's Globalization," International Journal of English Language Education, vol. 2, no. 1, pp. 157–170, 2014, doi: 10.5296/ijele.v2i1.4963.

[52] M. Duran and I. Dökme, "The Effect of the Inquiry-Based Learning Approach on Student's Critical-Thinking Skills," Eurasia Journal of Mathematics, Science and Technology Education, vol. 12, no. 12, pp. 2887–2908, 2016, doi: 10.12973/eurasia.2016.02311a.

[53] A. Rusilowati, S. Sarwi, and S. Khanafiyah, "Implementasi Model Eksperimen Gelombang Open-Inquiry Untuk Mengembangkan Keterampilan," Jurnal Pendidikan Fisika Indonesia, vol. 8, no. 1, pp. 41–50, 2012.

[54] B. R. Wilcox and H. J. Lewandowski, "Open-Ended Versus Guided Laboratory Activities: Impact on Students' Beliefs About Experimental Physics," Physical Review Physics Education Research, vol. 12, no. 2, pp. 1–8, 2016, doi: 10.1103/PhysRevPhysEducRes.12.020132.

[55] R. M. Vieira and C. Tenreiro-Vieira, "Fostering Scientific Literacy and Critical Thinking in Elementary Science Education," International Journal of Science and Mathematics Education, vol. 14, no. 4, pp. 659–680, 2016, doi: 10.1007/s10763-014-9605-2.

[56] S. W. Abas, "Integrasi Pendidikan Al-Qur'an Dalam Pembelajaran IPA," OSF Preprints, pp. 1–12, 2020.

[57] N. A. R. Ghamrawi, N. Ghamrawi, and T. Shal, "Perception of Character Education: The Case of Lebanese School Leaders," Open Journal of Leadership, vol. 4, no. 4, pp. 129–142, 2015, doi: 10.4236/ojl.2015.44012.

[58] A. Mansur and R. Ridwan, "Karakteristik Siswa Generasi Z dan Kebutuhan Akan Pengembangan Bidang Bimbingan dan Konseling," Educatio, vol. 17, no. 1, pp. 120–130, 2022, doi: 10.29408/edc.v17i1.5922.