

Analysis Of The Needs For A Qur'an-Based Science Exploration Module In Discovery-Inquiry Learning To Develop Scientific Attitudes In Early Childhood

Wardani, Wahyuni Panca^{1*}, Widjanarko, Moch¹, & Kusmanto, Agung Slamet¹

¹ Muria Kudus University, Indonesia

*Corresponding author: wahyunipanca.79@gmail.com

Received 12 March 2026, Revised 20 April 2026, Accepted 23 April 2026, Available online 28 April 2026

To link to this article: <https://doi.org/10.53797/ujssh.v5i2.10.2026>

Abstract: Early Childhood Education (ECE) plays a fundamental role in fostering children's cognitive, social, emotional, and scientific development during the critical period of early childhood. One of the essential competencies that should be developed at this stage is a scientific attitude, which includes curiosity, critical thinking, creativity, confidence, problem-solving skills, and environmental awareness. However, science learning in many early childhood education settings remains dominated by teacher-centered activities and worksheet-based instruction, limiting opportunities for children to explore and discover scientific concepts independently. Therefore, this study aimed to analyze the need for a Qur'an-based Science Exploration Module (SainsQu) integrated with the Discovery-Inquiry Learning model to support the development of scientific attitudes among early childhood learners. This study employed a qualitative descriptive approach using a literature review method. Data were collected from journal articles, books, government regulations, curriculum documents, and previous studies related to early childhood education, scientific literacy, scientific attitudes, Discovery-Inquiry Learning, and Qur'an-based science education. The data were analyzed using the interactive model of Miles, Huberman, and Saldaña, which includes data collection, data reduction, data display, and conclusion drawing. The findings indicate that Discovery-Inquiry Learning provides opportunities for children to actively investigate, observe, explore, and construct knowledge through direct experiences. Furthermore, integrating scientific concepts with Qur'anic values through the SainsQu module has the potential to strengthen children's scientific attitudes while simultaneously fostering spiritual and moral development. The study concludes that the development of a Qur'an-based Science Exploration Module is needed as an innovative learning resource to support meaningful science learning and the cultivation of scientific attitudes in early childhood education.

Keywords: Discovery-Inquiry Learning, Qur'an-Based Science Exploration Module, Scientific Attitude, Scientific Literacy, Early Childhood Education.

1. Introduction

Education is something effort coaching in increase quality source Power human resources (HR) in Indonesia. Efforts coaching This starting in education child age early Good That formally or informally. Children's education age early childhood education (PAUD) is something effort targeted coaching for child since born until with age six year carried out through giving stimulation education For help growth and development physically and spiritually so that children own readiness in enter education more carry on. According to Constitution Number 20 of 2003 concerning National Education System in Article 1 point 14, education child age early defined as something effort targeted coaching to child since born until with age six year carried out through giving stimulation education For help growth and development physically and spiritually so that children own readiness in enter education more carry on (Widhiyanti, 2022).

At the age of 0-6 years is called the golden age, namely the golden age, the time when development brain development is very rapid at this age and reached 80%, all the information we convey will easy absorbed and stored by

the child. By reason That child must Lots given stimulation For growth and development physical, social, intellectual and emotional development to grow and develop optimally (Untung, 2023; Widhiyanti, 2022).

Children aged early is unique personality Because own according to teachers interview, several characteristics possessed child age early: clean unique, spontaneous, careless, soulful adventurer, curiosity high tofu, active, energetic, selfish, short-tempered. Characteristics in development the environment family not yet Enough for a child For distribute his energy, expressing his emotions and develop his creativity. Seeing development brain children at the age of early very fast so besides family, PAUD institutions that contain educator need optimize potential child the with proper stimulation (Allen & Kelly, 2015; Hibana et al., 2024).

The government has also prepare grand design to realize ideals rise generation gold in 2045. Among the proposed grand design is intensify Early Childhood Education (PAUD), increase quality of PAUD and education quality and equitable foundation. Educators is one of the supporting elements the success of Early Childhood Education, then in learning required Educators who provide stimulation that leads to HOTS (High Order Thinking Skills) not LOTS (Low Order Thinking Skills). But in the existing reality Educator in give learning Still Many are LOTS-based and rely on worksheets. HOTS-based learning will capable print child educate in accordance with demands Education revolution 4.0 in the 21st century competence participant students who have 4K competencies, namely Critical Thinking and Problem Solving, Creativity, Communication Skills and Collaboration (Agustini, 2024).

One of the learning models that can leading to the way HOTS thinking is with Discovery-Inquiry Learning model. With the Discovery-Inquiry Learning Model allows child For do test alone. One of the learning that can taken For Discovery-Inquiry Learning that is through activity science For child age early. With learning science so will can grow attitude scientific child age early (Agustini, 2024; Rusdiyani et al., 2025).

Attitude scientific which is also regulated in Minister of Education and Culture Regulation No. 146 of 2014 concerning Early Childhood Education Curriculum. Attitude scientific that will developed refers to development Basic Competencies, namely own behavior that reflects attitude want to know (KD 2.2), have behavior that reflects attitude creative (KD 2.3), has behavior that reflects attitude believe self (KD 2.5), has attitude cooperation (KD 2.10), knowing way and able finish problem everyday and thinking creative (KD 3.5/4.5) and have attitude care to environment with method know environment nature (KD 3.8/4.8) (Sugiyanti, 2018).

Based on observations made writer, writer, in fact the teacher has not have book guidelines or handle in give learning more science directed so that attitude scientific child age early not enough develop optimally. Then researcher interested For do study about use of Browse media SainsQu used by teachers. Researchers choose This Because researchers want to know whether module explore science based Al-Qur'an can grow attitude scientific child age early.

2. Methodology

This study employed a qualitative descriptive approach using a literature review method. The purpose of the study was to analyze the need for a Qur'an-based Science Exploration Module (SainsQu) integrated with the Discovery-Inquiry Learning model to develop scientific attitudes among early childhood learners. A qualitative descriptive approach was considered appropriate because it enables researchers to explore, interpret, and synthesize information from various sources related to the research topic without manipulating variables or testing hypotheses.

Data were collected through a comprehensive review of relevant literature, including journal articles, books, conference proceedings, government regulations, curriculum documents, and previous studies related to early childhood education, scientific attitudes, scientific literacy, Discovery-Inquiry Learning, and Qur'an-based science education. The selected literature was obtained from reputable academic databases and educational sources to ensure the credibility and relevance of the information.

The literature selection process involved three stages. First, relevant sources were identified using keywords such as *scientific attitudes*, *scientific literacy*, *Discovery Learning*, *Inquiry Learning*, *early childhood education*, *science learning*, and *Qur'an-based education*. Second, the identified sources were screened based on their relevance to the objectives of the study. Third, the selected sources were analyzed critically to identify themes, concepts, findings, and gaps related to the development of science learning materials for young children.

Data analysis followed the interactive model proposed by Miles, Huberman, and Saldaña (2014), which consists of data collection, data reduction, data display, and conclusion drawing. During the data reduction stage, information relevant to the study objectives was selected and categorized. The organized data were then presented systematically according to the major themes identified in the literature, including Discovery-Inquiry Learning, Qur'anic science, scientific literacy, and scientific attitudes. Finally, conclusions were drawn by synthesizing findings from the reviewed literature to determine the need for and potential contribution of a Qur'an-based Science Exploration Module in supporting the development of scientific attitudes among early childhood learners.

To ensure the trustworthiness of the findings, source triangulation was conducted by comparing information obtained from multiple scholarly references, educational policies, and previous research studies. This process helped enhance the validity and reliability of the conclusions generated from the literature review.

3. Results and Discussion

3.1 Discovery learning model

Bloom's Taxonomy was revised by Anderson and Krathwohl and consists of six cognitive levels: remembering, understanding, applying, analyzing, evaluating, and creating (Anderson & Krathwohl, 2001; Ramdhani et al., 2019). The first three levels are categorized as Lower Order Thinking Skills (LOTS), while the last three levels are classified as Higher Order Thinking Skills (HOTS). HOTS-oriented learning aims to develop students' critical, creative, and innovative thinking abilities, enabling them to solve problems effectively in various contexts (Heong et al., 2011; Saputri et al., 2019). Therefore, within the framework of the 2013 Curriculum (K13), students are expected to achieve the highest cognitive level, namely creating. This expectation requires teachers, as key agents of educational implementation, to develop learning strategies and instructional media that facilitate the development of higher-order thinking skills (Retnawati et al., 2018).

The implementation of the 2013 Curriculum, as stipulated in the Regulation of the Minister of Education and Culture No. 22 of 2016 concerning Process Standards, recommends three learning models that promote scientific attitudes, social competencies, and students' curiosity (Retnawati et al., 2018). These learning models are:

1. Discovery/Inquiry Learning;
2. Problem-Based Learning (PBL); and
3. Project-Based Learning (PjBL).

Discovery/Inquiry Learning is a student-centered learning model that enables learners to understand concepts, meanings, and relationships through a process of investigation and discovery. Learning occurs when students actively engage in cognitive processes to identify concepts and principles independently. These processes include observation, classification, measurement, prediction, determination, and inference. Through such activities, students construct their own understanding and develop meaningful learning experiences (Balim, 2009).

The Discovery Learning model consists of six main stages: stimulation, problem identification, data collection, data processing, verification, and generalization or conclusion drawing (Mubarok & Sulisty, 2014).

According to Syah (2014), discovery learning is a learning approach in which instructional materials are not presented in their final form. Instead, students are encouraged to explore, investigate, and discover knowledge independently. Similarly, Roestiyah (2012) explained that discovery learning involves students in various mental activities, such as discussions, exchanging ideas, reading, and conducting experiments, thereby enabling them to learn actively and independently. This perspective is supported by research indicating that discovery learning enhances students' inquiry skills, conceptual understanding, and active participation in the learning process (Balim, 2009).

Hamdani (2011) stated that the Discovery Learning model is systematically designed to help students acquire knowledge and concepts through their own discoveries, particularly through experimentation and investigation. In its implementation, students are presented with problems related to the learning material and are encouraged to discover concepts independently, while teachers function as facilitators and guides throughout the learning process (Mubarok & Sulisty, 2014).

The stages of Discovery Learning applied in this study follow the framework proposed by Syah (2014), namely stimulation, problem identification, data collection, data processing, verification, and conclusion drawing. The stages are described as follows.

1. Stimulation

At this stage, students are exposed to situations or phenomena that stimulate curiosity and encourage them to ask questions. Teachers intentionally avoid providing direct explanations or conclusions so that students are motivated to investigate and explore independently. Learning activities may begin with questions, reading assignments, observations, or other activities that lead students toward problem-solving (Mubarok & Sulisty, 2014).

2. Problem Identification

Following the stimulation stage, students are encouraged to identify various problems related to the learning material. From the identified problems, one is selected and formulated into a hypothesis that will guide the subsequent investigation process (Mubarok & Sulisty, 2014).

3. Data Collection

During this stage, students gather relevant information from various sources and activities, such as reading literature, observing objects or phenomena, interviewing resource persons, and conducting experiments. Through these activities, students connect newly acquired information with their prior knowledge and experiences (Balim, 2009).

4. Data Processing

The collected information is organized, classified, tabulated, analyzed, and interpreted. Through systematic analysis, students develop logical explanations and generate evidence that supports or refutes their hypotheses (Mubarok & Sulisty, 2014).

5. Verification

At the verification stage, students examine the validity of their hypotheses by comparing them with the findings obtained during data processing. This process allows students to determine whether the available evidence adequately supports the proposed explanations (Mubarok & Sulisty, 2014).

6. Drawing Conclusions or Generalization

In the final stage, students formulate conclusions based on the results of the verification process. These conclusions are then generalized into broader principles that can be applied to similar situations or problems. The generalizations developed are grounded in evidence obtained throughout the learning process and reflect students' understanding of the investigated concepts (Balim, 2009).

3.2 Qur'anic Science

3.2.1 Definition of Science

Science is generally understood as a systematic body of knowledge developed through observation, experimentation, and logical reasoning. However, the concept of science has been defined differently by various scholars and institutions. Several definitions of science are presented below.

1. Definition of Science According to Albert Einstein

Albert Einstein described science as an attempt to create a systematic understanding of sensory experiences through rational and logical thought. Science enables individuals to organize various observations and experiences into coherent patterns of understanding (Einstein, 1940).

2. Definition of Science According to Webster's New Collegiate Dictionary

According to Webster's New Collegiate Dictionary, science is knowledge acquired through study, practice, and observation, whose validity can be tested through scientific methods and empirical investigation.

3. Definition of Science According to Hardy and Fleer

Hardy and Fleer (1996) viewed science from a broader perspective and identified four major dimensions of science: science as a body of knowledge, science as a process, science as a set of values, and science as a way of understanding the world.

4. Definition of Science According to Wigner

Wigner defined science as a collection of knowledge concerning natural phenomena. This knowledge is obtained through interactions between human senses and the natural world and is organized systematically to explain observed events.

5. Definition of Science According to Sund

According to Sund, science consists of scientific products, scientific processes, and scientific attitudes. Therefore, science is not only concerned with knowledge but also with the methods used to obtain knowledge and the attitudes required during scientific inquiry (Sund & Trowbridge, 1973).

6. Definition of Science According to Romano Harré

Romano Harré defined science as a collection of theories that have been tested and verified to explain patterns, regularities, and irregularities observed in natural phenomena (Harré, 1985).

7. Definition of Science According to the Indonesian National Education System

According to the Indonesian National Education System Law, science is one of the essential subjects taught at various educational levels in Indonesia. Science education aims to help students understand natural phenomena through systematic inquiry and scientific reasoning (Republic of Indonesia, 2003).

3.3 Definition of Science According to the Indonesian Dictionary (KBBI)

According to the *Kamus Besar Bahasa Indonesia* (KBBI), science is systematic knowledge concerning nature and the physical world, including disciplines such as physics, chemistry, biology, geology, and astronomy. Science is acquired through observation, research, experimentation, and the formulation of principles that explain natural phenomena (Badan Pengembangan dan Pembinaan Bahasa, 2024).

Characteristics of Science

Science possesses several distinctive characteristics that differentiate it from other forms of knowledge. These characteristics include:

1. Science is logical, rational, and evidence-based.
2. Scientific claims are supported by empirical evidence.

3. Scientific hypotheses must be testable and falsifiable.
4. Scientific experiments should be replicable under similar conditions.
5. Science seeks to identify gaps in existing knowledge and develop explanations for unresolved phenomena.
6. Science requires objectivity through the control of variables and minimization of bias.
7. Science demands honesty and integrity in both research methods and reporting.
8. Science does not accept conclusions without sufficient evidence.
9. Science values parsimony, meaning that the simplest explanation consistent with the evidence is generally preferred (Popper, 2002; McComas, 2020).

3.4 Scientific Phenomena Explained in the Qur'an

As scientific knowledge continues to develop, many scholars have explored the relationship between scientific discoveries and verses in the Qur'an. The Qur'an contains numerous references to natural phenomena that encourage reflection on the universe and God's creation (Bucaille, 1976; Guessoum, 2011).

1. The Meeting of Two Seas

The Qur'an describes the meeting of two bodies of water that do not completely mix:

"He released the two seas, meeting side by side. Between them is a barrier that they do not transgress" (Qur'an 55:19–20).

This verse has often been associated with oceanographic phenomena involving water masses with different salinity, temperature, and density characteristics (Guessoum, 2011).

2. Fire Beneath the Sea

Modern geology has identified volcanic activity and hydrothermal vents on the ocean floor. These underwater geological processes involve extremely high temperatures and the release of magma and heated fluids from beneath the Earth's crust (National Geographic Society, 2023).

This phenomenon is often associated with the verse:

"And by the sea filled with fire" (Qur'an 52:6).

3. The Orbit of the Solar System

The Qur'an states:

"And it is He who created the night and the day and the sun and the moon; all are swimming in an orbit" (Qur'an 21:33).

Modern astronomy confirms that celestial bodies move in specific orbital paths governed by gravitational forces (NASA, 2024).

4. The Big Bang Theory

The Big Bang Theory is the prevailing scientific explanation for the origin and evolution of the universe. Some Muslim scholars associate this theory with the following verse:

"Have those who disbelieved not considered that the heavens and the earth were a joined entity, and We separated them..." (Qur'an 21:30).

Although the verse is interpreted differently by various scholars, it is frequently discussed in relation to cosmological theories (Guessoum, 2011).

5. The Formation of Rain

The process of rain formation is described in the Qur'an:

"It is Allah who sends the winds, and they stir the clouds..." (Qur'an 30:48–49).

Modern meteorology explains that rainfall results from evaporation, condensation, cloud formation, and precipitation processes (Ahrens & Henson, 2019).

6. Water Bodies with Different Characteristics

The Qur'an also refers to two bodies of water with distinct properties:

"And it is He who has released the two seas, one fresh and sweet and one salty and bitter..." (Qur'an 25:53).

This verse has been linked to estuarine environments where freshwater and seawater interact while maintaining distinct physical properties.

7. Human Fingerprints

Modern forensic science recognizes fingerprints as unique identifiers for each individual. Even identical twins possess different fingerprint patterns. This uniqueness is often associated with the verse:

"Yes, We are able even to proportion his fingertips" (Qur'an 75:4).

The verse is frequently cited in discussions regarding human individuality and biological uniqueness.

Many additional natural phenomena described in the Qur'an continue to inspire scientific reflection and investigation. As scientific knowledge advances, new interpretations and insights into these verses continue to emerge.

3.5 Scientific Literacy

Scientifically literate individuals possess the ability to understand, evaluate, and apply scientific knowledge in everyday life. The term scientific literacy combines the concepts of literacy and science. According to the KBBI, literacy refers to an individual's ability to acquire, process, and utilize information, while science refers to systematic knowledge about the natural and physical world.

Therefore, scientific literacy can be defined as an individual's ability to understand scientific concepts, evaluate scientific information, and apply scientific knowledge to solve problems and make informed decisions in daily life (OECD, 2023; Bybee, 2013).

The importance of scientific literacy has increased significantly in the modern era, where individuals are constantly exposed to scientific information and technological developments. Scientific literacy enables individuals to critically evaluate information and participate effectively in society.

The objectives of scientific literacy include:

1. Understanding and connecting scientific concepts related to living and non-living things.
2. Explaining scientific concepts based on scientific evidence and reasoning.
3. Applying scientific knowledge in everyday life.
4. Developing procedural knowledge and understanding the processes involved in scientific inquiry and discovery (OECD, 2023; Bybee, 2013).

Conclusions

Based on the literature review, the Discovery-Inquiry Learning model is a promising approach for promoting scientific attitudes among early childhood learners because it encourages children to actively observe, investigate, explore, and construct knowledge through direct experiences. The findings also indicate that scientific attitudes, including curiosity, creativity, confidence, critical thinking, problem-solving ability, cooperation, and environmental awareness, can be fostered more effectively through meaningful and inquiry-based learning activities. Furthermore, the integration of scientific exploration with Qur'anic values through the SainsQu module provides opportunities to connect scientific understanding with spiritual and moral development in a manner that is relevant to early childhood education. Therefore, the development of a Qur'an-based Science Exploration Module is needed as an innovative learning resource that can support Discovery-Inquiry Learning, strengthen scientific literacy, and facilitate the holistic development of scientific attitudes among young children.

Acknowledgement

The Author would like to express his gratitude to Universitas Muria Kudus for support given.

Conflict of Interest

The authors declare there is no conflict of interest

References

- Agustini, R. (2024). Enhancing critical thinking and curiosity in early childhood through inquiry-based science learning. *Aulad: Journal on Early Childhood*, 7(3), 734–742.
- Ahrens, C. D., & Henson, R. (2019). *Meteorology today: An introduction to weather, climate, and the environment* (12th ed.). Cengage Learning.
- Allen, L. R., & Kelly, B. B. (2015). *Child development and early learning*. National Academies Press.
- Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.
- Badan Pengembangan dan Pembinaan Bahasa. (2024). *Kamus Besar Bahasa Indonesia (KBBI)*.

- Balim, A. G. (2009). The effects of discovery learning on students' success and inquiry learning skills. *Eurasian Journal of Educational Research*, 35, 1–20.
- Bucaille, M. (1976). *The Bible, the Qur'an and science*. Seghers.
- Bybee, R. W. (2013). *The case for STEM education: Challenges and opportunities*. NSTA Press.
- Einstein, A. (1940). Science and religion. *Nature*, 146(3703), 605–607.
- Guessoum, N. (2011). *Islam's quantum question: Reconciling Muslim tradition and modern science*. I.B. Tauris.
- Hamdani. (2011). *Strategi belajar mengajar*. Pustaka Setia.
- Hardy, T., & Fleer, M. (1996). *Science for children: Developing a personal approach to teaching*. Prentice Hall.
- Harré, R. (1985). *The philosophies of science*. Oxford University Press.
- Heong, Y. M., Othman, W. B., Yunos, J. B. M., Kiong, T. T., Hassan, R. B., & Mohamad, M. M. B. (2011). The level of Marzano higher-order thinking skills among technical education students. *International Journal of Social Science and Humanity*, 1(2), 121–125.
- Hibana, H., Nayla, M. R., & Nurhayati, K. (2024). Exploring the role of game-based learning in early childhood cognitive development: Perspectives from teachers and parents. *Golden Age: Jurnal Ilmiah Tumbuh Kembang Anak Usia Dini*, 9(4), 733–745. <https://doi.org/10.14421/jga.2024.94-12>
- McComas, W. F. (2020). *Nature of science in science instruction*. Springer.
- Mubarok, C., & Sulistyono, E. (2014). Penerapan model pembelajaran discovery learning terhadap hasil belajar siswa. *Jurnal Pendidikan Teknik Elektro*, 3(1), 215–221.
- OECD. (2023). *PISA 2025 science framework*.
- Popper, K. (2002). *The logic of scientific discovery*. Routledge.
- Ramdhani, A., Usodo, B., & Subanti, S. (2019). Higher order thinking skills based on revised Bloom taxonomy in mathematics learning. *Journal of Physics: Conference Series*, 1188(1), Artikel 012089.
- Republic of Indonesia. (2003). *Law Number 20 of 2003 concerning the National Education System*.
- Retnawati, H., Djidu, H., Kartianom, Apino, E., & Anazifa, R. D. (2018). Teachers' knowledge about higher-order thinking skills and its learning strategy. *Problems of Education in the 21st Century*, 76(2), 215–230.
- Roestiyah. (2012). *Strategi belajar mengajar*. Rineka Cipta.
- Rusdiyani, I., Ruhiat, Y., Kusuma, J. W., & Bangsawan, T. A. (2025). Models and techniques of science learning in cultivating cognitive and socio-emotional learning attitudes in early childhood in Banten Province, Indonesia. *European Journal of Educational Research and Practice*, 19, Artikel e2025551.
- Saputri, A. C., Sajidan, & Rinanto, Y. (2019). Critical thinking skills profile of senior high school students in biology learning. *Journal of Physics: Conference Series*, 1241(1), Artikel 012041.
- Sund, R. B., & Trowbridge, L. W. (1973). *Teaching science by inquiry in the secondary school*. Merrill.
- Syah, M. (2014). *Psikologi pendidikan dengan pendekatan baru*. Remaja Rosdakarya.
- Untung, S. H. (2023). The gold age of childhood: Maximizing education efforts during early childhood. *Atlantis Press Proceedings*.
- Widhiyanti, S. (2022). Brain based learning approach in early childhood learning. *EAI Proceedings*. <https://doi.org/10.4108/eai.26-11-2022.2339366>