

DEVELOPING PROBLEM SOLVING SKILLS IN ELEMENTARY SCHOOL STUDENTS THROUGH INQUIRY- BASED LEARNING WITH ENVIRONMENTAL CONTEXT

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Abstract

Phenomenon/Issue: Traditional educational approaches often focus on memorization, limiting elementary students' ability to develop critical problem-solving skills that are essential for real-world challenges. Integrating inquiry-based learning (IBL) with environmental support addresses this gap by encouraging exploration and practical application. Purpose: This study aims to examine the effectiveness of IBL combined with environmental context in improving problem-solving skills among elementary students, with a particular focus on accommodating diverse learning styles. Novelty: Unlike previous studies that primarily evaluate IBL in isolated academic contexts, this study uniquely explores the benefits of embedding environmental issues within IBL activities, thereby increasing relevance and engagement. Additionally, this study emphasizes adapting IBL to meet individual learning preferences, thereby creating a more inclusive classroom environment. Research Methods: A qualitative literature review method was used, synthesizing current research on IBL, environmental education, and learning style adaptability in elementary education contexts. Results: Findings indicate that IBL with environmental context significantly improves students' critical thinking and problem-solving skills. Adapting IBL activities to students' learning styles further enhances engagement and understanding, creating a collaborative learning environment. Research Contribution: This study provides educators with insights into the application of IBL to environmental contexts, promotes an educational model that supports academic skills and fosters environmental awareness, and positions students to become proactive and informed problem solvers.

Keywords: Critical Thinking, Environmental Education, Inquiry-Based Learning, Learning Styles, Problem Solving

BACKGROUND

Inquiry-based learning has become known as one of the most modern and effective teaching methods that actively engage students in their learning process with regard to exploration, questioning, and problem solving. Based on constructivist theory, IBL enables students to build critical thinking and scientific reasoning skills, which are key competencies needed today due to the complexity of life and the abundance of information that surrounds everyone everywhere. While traditional notions of teaching emphasize memorization and sources of information is a teacher, IBL focuses on exploration by students where they are expected to formulate questions, conduct investigations, and draw conclusions from the results of their investigations. It can also be expected that inquiry-based learning in elementary education will help students build lifelong learning competencies, such as problem-solving skills, which are needed not only in school but also in real-life situations. As noted by Lieung et al., (2019),

over the past few years, the use of environmental contexts in inquiry-based learning has been shown to bring positive results regarding students' cognitive engagement and skill development. The environment as a teaching aid provides a more concrete context and is easier for students to understand. According to Jupriyanto et al., (2023) , environmental inquiry is beyond conventional teaching because of the connection between curriculum content and students' environment. Students can actually begin to connect abstract concepts to real life, enhancing their understanding and storing them in their memory. A study has shown that when students are exposed to the environment, they are in a better position to internalize various lessons which further enhances problem-solving skills. This approach, in addition to building curiosity, also helps them connect learning to real life. Problem-solving skills important for student with a number of reason namely : 1) Fundamentals for learning : problem-solving skills are an important foundation for many disciplines. Students who are skilled at solving problems will find it easier to grasp concepts in mathematics, science, and even language. This helps them build a strong foundation for continuing their learning at a higher level. 2) Developing think critical : problem-solving skills encourage students to think critically and analytically. They are trained to assess information, see different perspectives, and find the most appropriate solution. to breakdown problems . This ability will be very useful in various life situations. 3) Independence : Problem-solving skills encourage students to think critically and analytically, which in turn develops their independence. By learning to evaluate information, consider multiple perspectives, and identify effective solutions, students become more capable of solving challenges independently. These skills are not only useful in everyday life, but also shape individuals who are better prepared to face developments. knowledge knowledge and technology . 4) Improve social skills : in matter This student trained communicate and collaborate . 5) Relevance in life everyday : skills breakdown problem No only useful in context academic , but also very relevant in life everyday . 6) Encourage creativity : skills breakdown problem push student For can think creative and innovative . They Study For find concepts learned through the scientific process they do . It helps they build solid foundation For success both academically and personally. In the Indonesian school curriculum recognizes skills related to problem solving, and especially in the case of science education, problem solving is at the heart of scientific inquiry. However, several studies have identified deficiencies in the implementation of problem solving tasks among elementary school students . This is due to the learning approach conventionally traditional is still dominant in the classroom. Learning through conventional methods tend to focus more on delivery information from the teacher in direct so that the real student own potential that must be develop become passive . So that naturally there is a gap in achievement objectives . Therefore, embedding inquiry-based learning models in environmental contexts can prove to be an innovative solution to this problem.

While inquiry-based learning approaches are indeed an effective way to enhance higher-order thinking skills, effectively meeting the challenge of going beyond uniformity in learning styles is a step in the right direction. Learning style theory states that each student has an individual preferred way of processing information, and these preferences can influence their learning activities and performance. This view is supported by the work of (Divrik et al., 2020) , Inquiry-based learning is learning that involves student in a way active carry out scientific processes with notice style learning that is owned students . For example, visual learners will learn about environmental themes best through some graphical representation of information, while kinesthetic learners may prefer activity-based learning related to the environment. Adapting inquiry activities to these different learning needs facilitates better learning because students feel more comfortable and confident in their ability to solve different problems.

The literature on the potential benefits of inquiry-based learning in developing problem-solving skills lacks research on how this approach interacts with environmental learning and caters to diverse learning styles. Efstathiou et al., (2018); Twigg, (2010) found that inquiry-based activities with explicit real-world or authentic contexts can ultimately facilitate students in enhancing their creative problem-solving skills, which are integral to overall cognitive development among students. However, most IBL studies have been conducted in controlled or isolated classroom settings without real-world environmental elements. Therefore, there is a need to ascertain the specific impact of environment-based inquiry learning on problem-solving skills, particularly for the elementary school context.

Qualitative research methods thus have the potential to support exploration of how nuances in interactions with inquiry-based learning models dominate students' experiences. Indeed, qualitative approaches conduct in-depth investigations into students' experiences, perspectives, and challenges faced in engaging in environmental inquiry activities. This approach will allow researchers to investigate the cognitive and emotional processes that students experience during inquiry-based learning through interviews, focus groups, and observations. Qualitative data will also show how different learning styles influence how students engage with the material and their overall problem-solving abilities in the approach, according to Chen & Chen 2012. Understanding these dynamics is important to help educators design appropriate inquiry-based curricula that are responsive to diverse learning needs.

This study addresses the broader educational challenge of preparing students to become critical thinkers and problem solvers in a rapidly changing world. Environmental literacy has received much emphasis in education systems around the world due to the increasing pressure of various environmental issues. In addition, the integration of environmental content into inquiry-based learning develops students' problem-solving skills and a sense of responsibility towards the environment in a resilient way. Through real-world environmental problems that students engage in, they learn to think more critically about their impact on the planet and, as a result, begin to develop early perceptions of sustainability and stewardship. Regarding the significance of the study conducted by Ekantini & Damayanti, (2022) , it is explained as follows: "The contribution of this study lies in its purpose: this study aims to address the gap in the educational literature on the relationship between the learning process of environmental inquiry-based learning, problem solving, and learning styles in elementary school students." Given the importance of problem solving in education and especially at the science level, this study is expected to generate some important insights into how teachers can create more effective and engaging learning experiences for diverse students . The results of this study can help policy makers, educators, and curriculum developers identify best practices for integrating environmental inquiry into elementary education in an effort to provide society with a generation of students who are both good problem solvers and responsible stewards of the environment.

Therefore, this current study re-explores how environmentally supported inquiry-based learning influences problem-solving skills among fifth-grade students, taking learning styles into account. This study, with a qualitative research design, will investigate precisely how students engage, understand, and utilize environmental inquiry activities in an ecologically valid environment. The findings are expected to add to the literature on inquiry learning by offering practical insights into how environmentally relevant education can be effectively integrated into the elementary school curriculum in a way that fosters problem-solving skills

and diverse learning styles. It is from this premise that this study focuses on how concrete recommendations can be made for the construction of inclusive, engaging, and effective learning environments at the elementary level.

1. Inquiry Based Learning Model

Description: Inquiry-based learning (IBL) is a model in which students are actively involved in the learning process, exploring topics independently, and solving problems on their own. This model encourages students to develop critical thinking and problem-solving skills by engaging in hands-on investigations and inquiry.

Arifandi & Kristin, (2020) found that IBL significantly improved critical thinking skills among fifth grade students, as those involved in IBL demonstrated greater critical thinking skills compared to those in traditional learning environments (Arifandi & Kristin, 2020) . Chen & Chen, (2012) also found that IBL not only improved students' understanding of scientific concepts but also strengthened their critical thinking and analytical skills, especially in science subjects (Chen & Chen, 2012) .

2. Environmental Approach in Learning

Description: The use of an environmental approach in education connects academic content with the real world, especially the students' natural or local environment, so that the learning experience becomes more meaningful. By integrating the environmental context, students gain a deeper understanding of concepts and are able to apply them in real-life situations. Jupriyanto et al., (2023) found that the application of an environmental approach in science education significantly improved the critical thinking skills of fifth-grade students, because it allowed them to connect scientific concepts with real-world environmental issues (Jupriyanto et al., 2023) . Ekantini & Damayanti, (2022) showed that an environmental literacy approach integrated with inquiry-based learning can improve students' environmental awareness and character, helping them develop a responsible attitude towards the surrounding ecosystem (Ekantini & Damayanti, 2022) .

3. Problem Solving Skills

Description: Problem-solving skills refer to the ability to identify, analyze, and find solutions to complex problems. These skills are important in education because they enable students to think critically and creatively. Lieung et al., (2019) found that integrating a scientific approach in an environmental context had a positive impact on elementary school students' problem-solving skills, especially when dealing with ecological problems. This approach teaches students to think systematically and scientifically, which is essential for effective problem solving (Lieung et al., 2019) . Divrik et al., (2020) observed that metacognitive strategies supported by IBL significantly improved students' problem-solving skills, as they encouraged students to think more deeply and creatively when facing problems (Divrik et al., 2020) .

4. Learning Styles

Description: Learning styles refer to individual preferences in which students process and understand information. Each student has a unique learning style, which can be visual, auditory, kinesthetic, or a combination of several styles. Divrik et al., (2020) found that an inquiry-based learning model tailored to accommodate a variety of learning styles increased

student engagement, comprehension, and academic performance. By aligning teaching methods with students' preferred learning styles, students can more effectively develop critical thinking and problem-solving skills (Divrik et al., 2020).

METHODOLOGY

This study used a qualitative approach with a literature review method to examine the effectiveness of environmentally-assisted inquiry-based learning (IBL) in developing problem-solving skills in elementary school students. This study focused on the synthesis and analysis of existing academic literature, including peer-reviewed journal articles, conference proceedings, and relevant educational reports published in the last ten years. Data collection was conducted through a systematic search in several academic databases, such as Google Scholar, ERIC, and JSTOR, using specific keywords such as "inquiry-based learning," "problem-solving skills," "environmental education," and "elementary school students." Inclusion criteria focused on studies related to IBL in elementary education, with a special emphasis on studies that discussed problem solving, environmental context, and learning styles. The collected data were analyzed using thematic analysis to identify recurring themes, trends, and gaps in the literature. Key themes included the benefits of IBL on cognitive development, the role of environmental context in making learning more relevant, and the impact of learning styles on student engagement and skill development. The results of this study aim to provide insights and recommendations for implementing IBL strategies in elementary education to improve problem-solving skills effectively. This literature review methodology allows for a comprehensive understanding of current knowledge, highlighting effective practices and areas that require further exploration in elementary education.

RESULTS

This qualitative literature review explores how inquiry-based learning (IBL), when integrated with environmental context, influences problem-solving skills among elementary school students. The review also considers the role of learning styles, examining how different instructional adaptations within IBL can meet different student needs. The results are organized into three main themes: (1) the effectiveness of IBL on cognitive and problem-solving skills, (2) the role of environmental context in enhancing relevance and engagement, and (3) the importance of learning styles in maximizing IBL outcomes.

1. Effectiveness of Inquiry-Based Learning on Problem Solving Skills

The literature consistently supports the conclusion that IBL is a highly effective approach to improving problem-solving skills among elementary school students. Research shows that IBL's emphasis on active exploration, hypothesis testing, and independent inquiry encourages cognitive engagement, allowing students to develop critical thinking and problem-solving skills that go beyond rote memorization. A study by Arifandi & Kristin, (2020) showed that IBL significantly improved students' critical thinking, with students demonstrating stronger analytical skills and greater ability to synthesize information when taught through IBL, compared to traditional teaching methods (Arifandi & Kristin, 2020).

In addition, IBL has been shown to increase curiosity and motivation among young learners, which increases their persistence in solving complex problems. (Guyen & Cansu, 2022) found that IBL activities structured around real-world tasks improved academic achievement and creative problem-solving skills in fifth-grade students. Their study

highlighted that when students were presented with open-ended questions and encouraged to explore multiple solutions, they tended to develop more robust problem-solving approaches (Guvén & Cansu, 2022) .

2. The Role of Environmental Context in Enhancing Engagement and Relevance

A key finding in the literature is that integrating environmental contexts into IBL makes learning more meaningful and relevant, especially for elementary school students. The environmental approach grounds abstract concepts in real-world experiences, allowing students to directly relate their learning to real-world applications. For example, Jupriyanto et al., (2023) observed that incorporating environmental issues into the curriculum increased students' engagement and critical thinking skills by encouraging them to think deeply about local ecological challenges (Jupriyanto et al., 2023)

Environmental contexts not only make learning more engaging but also encourage students to develop problem-solving skills that can be applied outside the classroom. By discussing relevant issues such as pollution, recycling, and conservation, students learn to view themselves as active participants in their communities and environment. Ekantini & Damayanti, (2022) showed that inquiry-based environmental literacy positively impacts students' attitudes toward environmental care and responsibility, fostering a sense of responsibility as they face environmental challenges. This finding is supported by Pinyo et al. (2023), who found that students showed increased motivation and competence in solving science-related problems when learning was contextualized with the environment (Pinyo (Ekantini & Damayanti, 2022; Monsang et al., 2021; Pinyo et al., 2023; Treepob et al., 2023) et al., 2023).

3. The Importance of Learning Styles in Maximizing IBL Results

The literature suggests that learning styles—a student's preferred mode of processing information—play a critical role in optimizing the effectiveness of IBL. Adapting IBL activities to accommodate different learning styles can significantly improve student engagement and comprehension. For example, visual learners may benefit from diagrams and graphic organizers that help them map concepts, while kinesthetic learners often thrive in hands-on activities that involve physically manipulating materials. Divrik et al. (2021) highlighted that when IBL was adapted to include metacognitive strategies that aligned with students' learning styles, problem-solving and critical thinking outcomes improved significantly. They found that students with matched learning preferences demonstrated greater persistence and deeper engagement in inquiry tasks (Divrik et al., 2020) .

Furthermore, by considering different learning styles in IBL, teachers can create a more inclusive classroom environment where each student's strengths are recognized and utilized. This inclusive approach has been shown to be particularly effective for students with diverse academic backgrounds, helping them bridge gaps in understanding by allowing them to process information in a way that suits their natural tendencies (Guvén & Cansu, 2022) . The diversity of learning styles in the classroom can be an asset, as students collaborate and learn from each other's approaches to solving problems. For example, while one student may approach a problem analytically, another student may bring a creative solution, fostering a collaborative learning environment.

The findings from this literature review highlight that inquiry-based learning, particularly when combined with environmental support, provides substantial benefits for developing problem-solving skills in elementary school students. This approach not only enhances cognitive skills, such as critical thinking and analysis, but also fosters engagement by connecting learning to real-world contexts. Furthermore, adapting IBL to accommodate different learning styles ensures that every student has an equal opportunity to participate in and benefit from inquiry-based activities. This study highlights that students engaged in environmental IBL are more motivated, more responsible in their approach to learning, and better able to apply the skills learned to real-life situations. This approach ultimately fosters a generation of scientifically literate and environmentally conscious problem solvers.

The studies reviewed collectively support the conclusion that IBL, particularly with an environmental context, is an effective pedagogical model for elementary education, as it not only strengthens problem-solving skills but also prepares students to address real-world challenges with a thoughtful and informed perspective. This review suggests that future research could focus on the long-term impact of IBL on students' problem-solving skills and environmental awareness, as well as on the potential for further refinement of the IBL model to support diverse learning styles in a broader educational context.

DISCUSSION

The results of this literature review indicate that inquiry-based learning (IBL), especially when integrated with environmental contexts, significantly improves problem-solving skills in elementary school students. By encouraging students to explore, investigate, and develop solutions independently, IBL provides a foundation for critical thinking and creativity. This paper will discuss the main findings, their implications for educational practice, the role of learning styles, and suggestions for future research directions.

IBL and Problem Solving Skills Development

One of the most compelling findings from the literature is the effectiveness of IBL in developing problem-solving skills among young learners. Studies by Arifandi & Kristin, (2020) and GÜVEN & Cansu, (2022) show that students engaged in IBL not only develop stronger critical thinking skills but also demonstrate greater resilience and creativity in problem-solving contexts. Unlike traditional instructional models that focus on memorization, the open-ended, question-based format of IBL allows students to engage with the content more deeply, understanding not only facts but also processes. This encourages students to flexibly apply learned concepts to solve new problems, a skill that is essential for lifelong learning and adaptability.

The importance of these findings cannot be overstated, as problem solving is a core competency in education and is essential for navigating complex issues in real-life contexts. By nurturing problem-solving skills from an early age, IBL helps build students' confidence and prepares them to address academic and personal challenges with a solution-oriented mindset. The review suggests that IBL approaches align with the goals of 21st-century education, which prioritize not only the acquisition of knowledge but also the development of skills. These findings suggest that schools should prioritize IBL approaches, particularly in primary education, to develop students' problem-solving and critical thinking skills from a young age.

The Role of Environmental Context in Enhancing Engagement

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Another important finding from this study is the role of environmental context in enhancing the effectiveness of IBL. Studies such as those conducted by Jupriyanto et al., (2023) and Ekantini & Damayanti, (2022) show that connecting classroom learning to real-world environmental issues, such as pollution and conservation, makes learning more meaningful and increases student engagement. Environmental investigations allow students to see the relevance of their learning in the wider world, which fosters a sense of responsibility and stewardship. For young learners, this grounding in real-world contexts provides a stronger foundation for understanding abstract concepts, as they can directly observe and relate them to environmental issues.

The inclusion of environmental context in IBL is critical given the growing global environmental concerns. Educators are increasingly recognizing the need to prepare students for a world where environmental awareness and sustainability are critical. Pinyo et al. (2023) found that students not only became more motivated in science learning but also more environmentally conscious when their learning was rooted in environmental issues, further enhancing the effectiveness of IBL in building real-world skills (Pinyo et al., 2023) . By integrating environmental education into IBL, educators can instill both cognitive and affective skills, thereby cultivating a generation of students who are prepared to face environmental challenges with practical knowledge and responsible attitudes.

Learning Styles and Adaptability in IBL

An important consideration in the successful implementation of IBL is the adaptation of instruction to accommodate diverse learning styles. Research by Divrik et al., (2020) et al. highlighted that when IBL activities are tailored to students' individual learning preferences, such as visual, auditory, or kinesthetic, engagement and comprehension are significantly enhanced (Divrik et al., 2020) . For example, visual learners benefit from diagrams and concept mapping, while kinesthetic learners excel when they can manipulate materials or engage in hands-on activities (Brock et al., 2020; Daniel, 2023) . This adaptability is essential in creating an inclusive learning environment that recognizes the unique ways in which students absorb and process information.

By accommodating different learning styles in IBL, educators can maximize the potential of each student. In addition, this approach encourages collaborative learning, as students have different strengths in problem-solving activities. A diverse learning environment where students can learn from each other fosters a more comprehensive understanding of concepts and approaches (Ammar et al., 2024; Fan & Cai, 2022) . For example, visual learners can develop analytical perspectives by working with kinesthetic learners, while auditory learners can gain spatial reasoning skills by observing visual learners. These findings suggest that teachers should consider integrating strategies for different learning styles in IBL to increase inclusivity and ensure that all students can benefit from the model.

Implications and Future Directions

The implications of these findings extend beyond elementary education to the broader educational landscape. Given the benefits of IBL in building essential life skills such as critical thinking and environmental awareness, educators and policymakers should consider incorporating IBL approaches across the curriculum and grade levels. Schools can introduce training programs for teachers to facilitate IBL methods effectively, ensuring that teachers are

equipped to handle diverse classroom dynamics and adapt lessons to different learning styles. Additionally, resources such as field trips, environmental projects, and multimedia materials can support IBL and provide students with practical exposure to environmental issues (Dubie, 2024; Uzzi, 2024) .

Future research should investigate the long-term impact of IBL on students' academic performance, problem-solving skills, and environmental responsibility. Research could explore how these skills develop as students transition to higher levels of education and whether early exposure to environmentally-assisted IBL correlates with better academic and professional outcomes. Additionally, research on the effectiveness of specific adaptations for different learning styles in IBL could further refine this model, allowing for more targeted teaching strategies (Bahtiar et al., 2024; Brumann et al., 2022) .

This literature review highlights that inquiry-based learning, particularly with an environmental context, is an effective method for enhancing problem-solving skills in elementary school students. IBL not only builds cognitive skills but also fosters an appreciation of environmental issues, preparing students to engage meaningfully with real-world problems. The importance of accommodating different learning styles in IBL is also evident, as it promotes inclusivity and helps each student maximize their potential. By adopting IBL with the help of an environment, educators can create more dynamic and relevant educational experiences, preparing young learners with the critical thinking and problem-solving skills needed in an increasingly complex world.

CONCLUSION

This literature review concludes that inquiry-based learning (IBL), especially when integrated with an environmental context, is highly effective in enhancing problem-solving skills in elementary school students. IBL fosters critical thinking, creativity, and resilience, which are essential for addressing complex, real-world problems. By grounding learning in real-world environmental issues, such as pollution and conservation, students not only gain a deeper understanding of scientific concepts but also develop environmental awareness and a sense of responsibility. Studies consistently show that this approach increases engagement and motivation, making learning more meaningful and relevant to young learners. Additionally, the findings highlight the importance of accommodating diverse learning styles in IBL. By adapting instructional strategies to align with students' preferences—visual, auditory, or kinesthetic—educators can create a more inclusive environment that maximizes each student's potential. This adaptability ensures that all students can engage effectively in IBL, fostering collaborative and supportive classroom dynamics. Overall, environmentally-assisted IBL offers a comprehensive educational model that equips students with the skills necessary for academic success and responsible citizenship, making it a valuable approach for 21st-century education.

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