



IMPLEMENTATION OF INNOVATIVE ENVIRONMENTAL LITERACY-BASED LEARNING STRATEGIES TO INCREASE STUDENTS' ENVIRONMENTAL AWARENESS

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Abstract

Environmental damage in Indonesia often occurs very quickly. One way to prevent environmental pollution is to instill environmental awareness in students. This can be implemented by conducting environmental literacy-based learning. This study aims to investigate the implementation of environmental literacy-based learning strategies and their impact on students' environmental awareness. By using a qualitative approach through the literature study method, various data sources consisting of relevant previous studies and studies were collected and analyzed. The results showed that the implementation of environmental literacy-based learning strategies has the potential to increase students' environmental awareness through developing an understanding of environmental concepts, changing environmentally friendly behavior, and active participation in environmental protection activities. Challenges in implementing this strategy, such as limited resources, a dense curriculum, and student resistance, can be overcome by collaborative efforts between schools, teachers, parents, and the community. In conclusion, the implementation of environmental literacy-based learning strategies has the potential to form a generation that cares about and is responsible for the environment and plays an important role in holistic and sustainable environmental education.

Keywords: Learning Strategy, Environmental Literacy, Environmental Awareness.

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1. Introduction

The rate of damage and pollution that occurs in Indonesia is very fast. The main cause is because at the level of decision-making at the central and regional levels often ignores the interests of environmental preservation. For this reason, the consequences of natural disasters and damage to land, sea, and air. In Indonesia, the problem of pollution and the environment is very serious and must be resolved (Hao et al., 2022). In South Kalimantan, for example, where this province is a mining area, which of course will cause effects or damage to the environment, thus requiring strategic and conceptual policies in resolving the problem of damage caused by the mining sector. Examples of damage and pollution are also in the Montana oil case. According to the Government of the Republic of Indonesia, the Montara Oil Case that occurred in the Timor Sea also had an impact on Indonesian territorial waters, especially in the area of East Nusa Tenggara Province (Jafarpour & Khatami, 2021). However, PTTEP Australasia, stated that the impact of the Montara Oil Case did not harm Indonesian waters. And also based on the news released by the United Nations Environment Program (UNEP) in November 2012, it was stated that the volume of world waste reached 1.3 billion tonnes per year, with the amount of solid waste in big cities continuing to increase by 70% and this volume is expected to reach 2.2 Billion Tons in 2025 (Purnaweni et al., 2022). Furthermore, the increase in environmental damage is also caused by an increase in human exploitation of nature which triggers an increase in the risk of disaster. So that the level of environmental damage is one of the important factors that greatly influence the level of disaster risk in an area, especially in an archipelagic country like Indonesia. In addition to the problems of pollution and Montara oil, in Indonesia, there is also pollution and

damage to the sea (Yan et al., 2020). Based on the government regulation of the Republic of Indonesia Number 19 of 1999 concerning control of marine pollution and destruction that marine pollution is the entry of living things, substances, energy, or other components into the marine environment by human activities which cause the marine environment to be inconsistent with its quality and function. Besides marine pollution, Indonesia also experienced the eruption of Mount Merapi (Karjoko et al., 2022). Precisely in Umbulharjo Village and Kepuharjo Village. Umbulharjo Village and Kepuharjo Village are villages affected by the eruption of Mount Merapi which occurred in October 2010. One of the impacts felt was on the daily activities of the community, namely around 900 Micro, Small, and Medium Enterprises (MSMEs) out of 2,500 MSMEs in Sleman Regency stopped operating.

Another example of water pollution is in the case of the Kupang River. The Kupang River is one of the rivers that flow in Pekalongan City which receives waste, both from industry, agriculture, and domestic. Industrial and residential developments along the Kupang River have affected the quality of river water. The decline in water quality is marked by changes in water color and odor, even though some people living on the banks of the river still use the water from the Kupang River for their daily needs. And the damage to nature that we need to find a solution for is forest damage, where forest damage in the country is quite apprehensive (Chen et al., 2022). Based on the records of the Ministry of Forestry of the Republic of Indonesia, at least 1.1 million hectares, or 2% of Indonesia's forests are shrinking each year. Data from the Ministry of Forestry show that of the 130 million hectares of forest remaining in Indonesia, 42 million hectares have been cleared. Along with the progress of the times, an environment-

based curriculum is needed where recent events have been very troubling with global warming, uncertain climate change, forest fires, floods, landslides, environmental pollution, and species extinction. This makes us realize how important nature is to be maintained, cared for, and preserved (Biström & Lundström, 2021).

These environmental problems such as floods, landslides, droughts, land fires, and smoke pollution often become news in various mass media. Globally, the world has also experienced environmental changes, starting from the destruction of the ozone layer, global warming due to the greenhouse effect, ecological changes, and so on (Mukherjee et al., 2022). In Indonesia, people's behavior that is destructive to the environment, such as forests, causes forest areas to shrink. The increasing cases of environmental destruction and pollution are considered to be the main factors in the occurrence of disasters such as floods, landslides, forests, and land fires (Basuki et al., 2022). National waste production shows a tendency to increase from time to time. Plastic waste is disposed of in large quantities in landfill, and continuous compaction will prevent leachate from penetrating the bottom layer of the landfill due to the impermeable nature of plastic (Ferdous et al., 2021). Based on some of the problems above, we as humans need to find solutions so that pollution and environmental damage due to human actions does not happen again. This study then aims to look at the innovative implementation of environment-based learning strategies to increase students' environmental awareness.

Literature Review

Learning Strategy: The term strategy was originally used in the military world, this term is defined as a method of work, or steps taken by military forces to win wars. At this time, strategies are widely used in any activity or activity, and in any field that

aims to achieve the objectives of the activity (Bērziņš, 2020). That is, in general strategy is a method used to achieve the goals of what is being carried out, in any field. The term strategy itself comes from nouns and verbs in Greek. The noun of strategy in Greek is "strategos" which is a combination of the words "Stratos" which means military and ago which means to lead. The strategic verb in Greek is "stratego" which means to plan (Lees, 2020).

The learning according to experts is:

- a) Learning is a process by which a person's environment is deliberately managed to allow for changes in certain behaviors (Heslin et al., 2020).
- b) Learning is a process of interaction between students and educators and learning resources in a learning environment (Bdair, 2021).
- c) Learning is a process carried out by individuals to obtain a new behavior change as a whole, as a result of the individual's own experience in interaction with his environment (Solberg et al., 2020).
- d) Learning is a combination composed of human elements, materials, facilities, equipment, and procedures, which influence each other in achieving learning objectives (Castro & Tumibay, 2021).
- e) Learning is a series of events that affect learning so that the learning process can take place easily (Oliveira et al., 2021).

According to Abdul Majid, learning strategies are strategies that are applied in learning, while learning is an attempt by educators to help students in learning. This means learning strategies are strategies used by educators to help students learn (Loganathan et al., 2021). Another definition of learning strategy is a learning activity that must be carried out by teachers and students so that learning objectives can be achieved effectively and efficiently. In summary, learning strategies can be

interpreted as a plan or methods that will be selected and used by an educator to convey learning material, so that it will make it easier for students to achieve goals that will be mastered at the end of learning activities (Nieto-Escamez & Roldán-Tapia, 2021).

In general, learning strategies are the ways that are chosen and used by an educator to convey subject matter, so that it will make it easier to achieve learning goals that can be mastered at the end of learning activities. The subject matter chosen should be based on various considerations following the situation, conditions, and environment that will be faced (Halimah & Sukmayadi, 2019).

When viewed in terms of strategy in general, learning strategies have 4 problems:

- a) Identification and determination of specifications and qualifications for the results to be achieved and the targets of the business by taking into account the aspirations of the people in need. In other words, learning objectives (Di Vaio et al., 2020).
- b) Consideration and selection of the main effective approach to achieving the target. At this point, the teacher chooses the learning approach used to then be able to determine the strategy (Soviany et al., 2022).
- c) Consideration and determination of the steps taken from the beginning and the end. At this point, the new teacher establishes a learning strategy, which includes any number of learning methods (Gacs et al., 2020).
- d) Consideration and determination of benchmarks and standards that will be used to assess the success of the business being carried out (Barauskaite & Streimikiene, 2021).

Environmental Literacy

The environment is a combination of the physical conditions of an ecosystem and the systems in it. The environment is all things

both animate and inanimate that together influence one another and live side by side. The environment can be in the form of a physical environment or a social environment, but in this study, more emphasis is placed on the understanding of the physical environment, namely a place for living things to live and continue their lives (Grotzer & Solis, 2023). Literacy is a student's ability to apply knowledge and skills in a major field of study and to analyze, reason, and communicate effectively as they pose, solve, and interpret problems in a variety of situations. While scientific literacy or what is often referred to as scientific literacy is a person's ability to be able to explain scientific phenomena, evaluate and design scientific investigations and be able to interpret scientific data and evidence. In scientific literacy, it is very multidimensional in terms of its measurement aspects, namely aspects that contain scientific literacy including knowledge, competence, context, and attitudes toward scientific literacy (Sharon & Baram- Tsabari, 2020). Roth describes environmental literacy as the ability to understand and interpret the health of environmental systems and then take action to repair, restore or maintain those systems. They believe environmental literacy is reflected in observable behavior and actions, not just the opinions of individuals (Gibson et al., 2022). Environmentally literate people know that, as consumers, they affect the environment. They recognize that their choices as consumers either help or harm the environment and that what they do as individuals or with their communities can hinder or assist the earth in sustaining biological life (Aprile & Punzo, 2022).

Roth's concept of environmental literacy, which first introduced EL (Environmental Literacy) to the world, presented three main levels of EL, namely: nominal EL, functional EL, and operational EL. Roth gave environmental literacy a purpose in

society. For the first time, EL was seen as a continuum based on knowledge, values, beliefs, and actions. perceived as environmentally literate citizens as competent and willing to take action on important issues (Klein et al., 2021). Roth also emphasizes the need for knowledgeable citizens, who take action, and work to solve human/environmental problems such as population growth, non-renewable resources, consumption, pollution, and social injustice (Fu et al., 2021). Roth stated that one must be an environmentally conscious citizen and have adequate knowledge of environmental issues. The concept of environmental literacy is emphasized in three aspects, namely nature, problems that occur in the environment, and sustainable solutions to overcome environmental problems (Örs, 2022). Dyanasari has a different opinion regarding the concept of environmental literacy, including the following: (1) "complete" knowledge of environmental issues; (2) empathy for the environment; (3) knowledge in action; (4) environmental responsibility towards beliefs, values, attitudes; (5) willing to get involved; (6) active in finding solutions to environmental problems (Wu et al., 2019). Measurement of environmental literacy understanding covers three aspects, namely: 1) standard education to test environmental abilities and knowledge; 2) each country/region has its measurements; and 3) Adiwiyata (Nurwidodo et al., 2020). According to Kusumaningrum, environmental literacy is a conscious attitude to pay attention to and maintain the environment so that it is always maintained and sustainable. Being aware means being sensitive to the environment and knowing the problems that occur. Someone who has knowledge about the environment is not only limited to theory but also responsive and agile in overcoming various problems that occur in the surrounding environment (González-Reverté et al., 2022).

2. Method

This research was carried out using a qualitative approach through the literature study method. A qualitative approach was chosen because the purpose of this study was to explore a deep understanding of the implementation of environmental literacy-based learning strategies and their impact on students' environmental awareness. Through the literature study method, researchers can analyze various results of previous studies and studies that are still relevant to the research discussion. The source of data used in this research comes from various research results and previous studies that have been done before. The data is in the form of scientific journal articles related to the implementation of environmental literacy-based learning strategies and their impact on students' environmental awareness. These data are accessed through digital libraries, academic databases, and other trusted sources. After the research data has been collected, the next step is to process the data. By conducting a careful and systematic analysis, it is hoped that the results of this research can provide a deeper understanding and make a significant contribution to the development of more effective and sustainable learning environment strategies (Sari et al., 2022).

3. Result and Discussion

Increasing Understanding of Environmental Concepts through Environmental Literacy:

In an environmental literacy-based learning strategy, it is important to present environmental concepts in a systematic and structured manner. Teachers can start with basic, easy-to-understand concepts, such as the food chain or plant life cycle, before progressing to more complex concepts such as the relationship between population and habitat. In addition, teachers need to integrate environmental concepts into the

context of students' daily lives. For example, in teaching about recycling, the teacher could discuss the importance of reducing the use of single-use plastics and invite students to design recycling projects at school or in their neighborhood. The role of students as active agents is emphasized in this environment-based learning. Students should be encouraged to ask questions, carry out independent research, and participate in group discussions to build shared understanding. This can improve students' critical thinking skills and help them develop a deeper understanding of environmental concepts. It is also important to consider the different learning styles of students. Some students may be more responsive to visual learning, while others prefer kinesthetic learning. In environmental literacy-based learning strategies, teachers must provide various types of teaching materials, such as text, images, videos, and practical activities, to meet the needs of various students (Paristiowati et al., 2022). In addition, it is important to create an inclusive and collaborative learning environment. Students should be allowed to work in pairs or small groups to explore environmental concepts. In this process, they can share knowledge and experiences, and enrich each other's understanding. Teachers can also utilize technology in environmental literacy-based learning strategies. For example, the use of mobile apps or interactive software can provide students with engaging and immersive learning experiences. Technology can also help students access more extensive information about the environment and explore concepts interactively. To increase understanding of environmental concepts, formative and summative evaluations have an important role. Teachers can use various forms of evaluation, such as written assignments, oral presentations, or creative projects, to measure student understanding. These evaluations can also provide useful feedback to improve future learning. In

addition to developing conceptual understanding, environmental literacy-based learning strategies can also develop students' literacy skills as a whole. Students will be skilled in reading, understanding, and analyzing texts about the environment. They will also be skilled in expressing their thoughts and ideas both in writing and orally. In environmental literacy-based learning, it is important to build relationships between environmental concepts and current global issues. For example, in studying the concept of renewable energy, students can explore the impact of climate change and the importance of switching to more sustainable energy sources. Finally, learning strategies based on environmental literacy must continue to be improved and adapted to the latest developments in the environmental field. Teachers and educators must keep abreast of the latest scientific and technological developments to present accurate and relevant information to students.

Development of Environmental Literacy Skills in Learning Contexts

In the context of learning, the development of environmental literacy skills is very important for students. Environmental literacy skills include the ability to read, write, speak, and listen with a focus on environmental topics. Reading is an important environmental literacy skill. Students need to be able to understand texts about the environment, such as scientific articles, research reports, or information about environmental issues. Reading with good comprehension will help students access information and broaden their knowledge about the environment. In addition to reading, writing skills also need to be developed in the context of the environment. Students must be able to express their thoughts, opinions, and ideas on environmental issues in written form. Through writing, students can explore their ideas in more depth and communicate

important messages related to the environment. Speaking is an environmental literacy skill that allows students to communicate orally about environmental issues. In group discussions or class presentations, students can share their knowledge, debate ideas, and come up with solutions to the environmental challenges they face (Hägström & Schmidt, 2020). In addition, listening skills are also important in the development of environmental literacy. Students must be able to listen carefully to information conveyed by teachers, resource persons, or classmates. Good listening skills will help students understand different points of view, obtain new information, and capture important messages related to the environment. There are various learning strategies and methods that can be used to develop environmental literacy skills. For example, group discussions are an effective method of engaging students in speaking and listening. Through discussion, students can gain a deeper understanding of environmental issues and develop critical thinking skills. Collaborative projects can also be used to develop environmental literacy skills. Through this project, students work in teams to complete tasks related to the environment, such as creating a campaign to reduce plastic waste in schools or designing sustainable community gardens. This kind of project allows students to develop writing, speaking, and listening skills in an integrated way. Field observation is a method that can develop environmental literacy skills through direct experience. Students can observe the ecosystem around them, conduct research on biodiversity, or study the recycling process in waste management sites. Through field observations, students can develop reading and writing skills based on their own experiences. Students can also develop environmental literacy skills through activities such as making research reports, and presentations or conducting interviews

with environmental experts. In making a research report, students must be able to combine information from various sources and arrange it into coherent and structured writing. Meanwhile, presentations and interviews will involve good speaking and listening skills. In developing environmental literacy skills, teachers need to provide constructive feedback to students. Teachers can provide written or oral feedback related to students' reading, writing, speaking, and listening abilities. This will help students refine and improve their environmental literacy skills gradually.

Application of Environmental Literacy-Based Learning Strategies in the Curriculum:

The integration of environmental literacy-based learning strategies into the education curriculum is an important step to ensure students acquire a deep understanding of environmental issues and strong literacy skills. By integrating environmental literacy into existing subjects, students will be able to develop a cross-disciplinary understanding and relate environmental concepts to real contexts. The role of the teacher in implementing environmental literacy-based learning strategies is very important. Teachers have the responsibility to select material that is relevant to environmental issues and integrate it into the existing curriculum. This involves selecting texts, teaching materials, or resources that are appropriate to the objectives of the learning environment (Garner et al., 2020). In addition, teachers are also responsible for developing activities that encourage students to read, write, speak, and listen in the context of the environment. Teachers can design reflective writing assignments, group discussions, or collaborative projects that engage students in understanding and exploring environmental issues. Evaluation of learning outcomes is also an important part of implementing environmental

literacy-based learning strategies. Teachers need to develop appropriate evaluation instruments to measure students' understanding of environmental concepts and their literacy skills. This evaluation can involve assessing a student's completed writing, presentation, or environmental project.

In mathematics, teachers can integrate learning strategies based on environmental literacy by giving assignments involving environmental data analysis, mathematical modeling related to environmental issues, or measurements and calculations related to environmental topics. In the field of natural sciences, teachers can invite students to read and analyze texts about the environment, make field observations, or conduct experiments related to environmental topics such as climate change, biodiversity, or renewable energy sources. In the Indonesian language course, teachers can choose texts that focus on environmental issues, such as news articles, essays, or short stories. Students can read the text, analyze the message contained, and write an essay or report that describes their understanding of environmental issues. In the field of history, teachers can teach about environmental policy changes in the past and their relationship to social and political contexts. Students can read historical texts, analyze historical data, and participate in discussions about the importance of learning from past experiences for a more sustainable future. It is important to note that the integration of environmental literacy-based learning strategies is not only limited to specific subjects. Teachers in various disciplines, such as art, music, or physical education, can also create opportunities to integrate environmental concepts into their learning. For example, students can create works of art inspired by the environment or do outdoor activities related to environmental sustainability. By integrating learning strategies based on environmental literacy

in the education curriculum, students will have a more holistic learning experience and be connected to the realities of their lives. They will gain an in-depth understanding of environmental issues as well as strong literacy skills to communicate, think critically, and act to protect and preserve the environment.

The Impact of Implementation of Environmental Literacy-Based Learning Strategies on Students' Environmental Awareness:

Implementation of environmental literacy-based learning strategies has a significant positive impact on students' environmental awareness. Through this strategy, students become more aware and have a deep understanding of environmental issues that are relevant to their lives. One of the main positive impacts is a change in student behavior in dealing with environmental issues. Students who are involved in environmental literacy-based learning tend to adopt behaviors that are more environmentally friendly, such as reducing the use of single-use plastics, recycling, saving energy, or using more sustainable transportation. The implementation also increases student participation in environmental protection activities. Students become more active in taking part in activities such as tree planting, environmental cleanup, or environmental campaigns in their school or community. In addition, students' environmental awareness is also reflected in their attitude toward the environment. Students who are involved in environmental literacy-based learning tend to have a more positive attitude and care about environmental preservation. They value biodiversity, the importance of protecting ecosystems, and the positive impact of individual actions in maintaining environmental balance.

Environmental literacy-based learning strategies also influence students' knowledge and understanding of

environmental issues more deeply. Students become more informed about various environmental issues, such as climate change, pollution, habitat loss, and others. This provides a solid basis for developing more environmentally responsible attitudes and actions. The positive impact of implementing this learning strategy is also reflected in the increased ability of students to think critically and analyze environmental issues. Students learn to look at environmental issues from multiple perspectives, evaluate evidence, and develop arguments based on the knowledge and understanding they have acquired. Student participation in practical and real activities, such as reducing the use of single-use plastics or saving energy, is concrete evidence of the impact of implementing environmental literacy-based learning strategies. Students apply the knowledge and understanding they acquire in their daily lives, intending to make a positive contribution to the environment. Another concrete example is students who are involved in environmental literacy-based learning and are active in campaigning for behavior change among their peers. They share information and understanding about environmental issues, invite their friends to participate in environmental protection actions and form environmental groups or clubs at school. Implementation of environmental literacy-based learning strategies also encourages students to become agents of change in society. Students engaged in this learning tend to be more proactive in participating in environmental activities outside of school, such as joining environmental organizations or attending conferences and workshops on environmental issues (Zimmer & Matthews, 2022). Overall, the implementation of environmental literacy-based learning strategies has a significant impact on students' environmental awareness. By increasing students' knowledge, attitudes, behavior, and participation in environmental issues, this

strategy helps create a generation that is more concerned and responsible for environmental preservation.

Challenges and Efforts in the Implementation of Environmental Literacy-Based Learning Strategies:

Implementation of environmental literacy-based learning strategies can be faced with several challenges. One of them is limited resources, such as textbooks or learning materials that are relevant to environmental issues. In addition, limited time in a dense curriculum can also be a challenge in integrating this strategy into existing learning. Student resistance can also be a challenge in implementing environmental literacy-based learning strategies. Some students may not have high environmental awareness or are less interested in environmental issues. This can affect their motivation and participation in learning activities related to the environment (Nurwidodo et al., 2020). To overcome these challenges, the school can make various efforts. First, schools can collaborate with environmental organizations or research institutions to obtain resources and teaching materials that are relevant to environmental issues. This cooperation can also involve activities outside of school, such as field trips or workshops. In addition, schools can expand collaboration with local communities to enrich students' experiences in environmental learning. For example, students can get involved in environmental projects in the community or join an existing environmental cleaning program.

The school can also conduct training for teachers to improve their competency in implementing environmental literacy-based learning strategies. This training may include developing environmental literacy skills, utilizing technology, and integrating curricula relevant to environmental issues. Teachers can also play an active role in overcoming challenges in implementing

this learning strategy. They can seek out and develop creative learning resources, such as videos, simulations, or interactive games related to the environment. In addition, teachers can encourage students to carry out independent research and bring up-to-date information on environmental issues to the classroom. The role of parents is also important in overcoming challenges in implementing environmental literacy-based learning strategies. Parents can be encouraged to support environmental learning at home, such as by inviting their children to read books or watch films related to the environment. They can also get involved in environmental activities in the community or school. The community also has a role in supporting the implementation of environmental literacy-based learning strategies. Environmental organizations or institutions concerned with the environment can collaborate with schools in providing relevant learning resources and activities. The community can also provide moral support and recognition of the school's efforts to increase students' environmental awareness. In overcoming challenges in implementing this learning strategy, it is important to continue to increase awareness and understanding of the importance of environmental literacy at the policy level. Support from the government and higher education institutions can strengthen the implementation of this strategy through the provision of broader guidelines and resources. Overall, although the implementation of environmental literacy-based learning strategies can be faced with challenges, collaborative efforts from the school, teachers, parents, and the community can overcome these obstacles. Through good cooperation and strong initiatives, challenges in implementing this strategy can be overcome, thereby having a positive impact on students' environmental awareness and encouraging them to act actively in protecting and preserving the environment.

4. Conclusion

Implementation of environmental literacy-based learning strategies has a significant impact on students' environmental awareness. Through this strategy, students develop a deep understanding of environmental issues, adopt more environmentally friendly behaviors, and actively participate in environmental protection activities. In this context, it is important to overcome challenges that may be faced, such as limited resources, a dense curriculum, and student resistance. To overcome these challenges, it is necessary to make collaborative efforts from various parties. Schools can collaborate with environmental organizations, conduct training for teachers, and expand cooperation with local communities. Teachers can develop creative learning resources and engage students in independent research. Parents and the community also have an important role to play in supporting the implementation of this strategy. Overall, the implementation of environmental literacy-based learning strategies has had a broad positive impact on students' environmental awareness. By increasing students' knowledge, attitudes, behavior, and participation in environmental issues, this strategy encourages the formation of a generation that is more concerned, responsible, and ready to face environmental challenges in the future. With continuous cooperation and efforts, learning strategies based on environmental literacy can become one of the main pillars of holistic and sustainable environmental education.

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