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SYSTEMATIC REVIEW

Concepts, Aspects, and Methods for Developing Ecoliteracy: A Systematic Literature Review

Conceptos, aspectos y métodos para el desarrollo de la ecoalfabetización: una revisión sistemática de la literatura

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ABSTRACT

Introduction: this research aimed to analyze research trends on concepts, aspects, and methods used for developing ecoliteracy in the scope of education for the last thirteen years (2010-2023).
Method: this research employed a systematic literature review method. Literature sources were obtained from reputable international journals with a research focus on concepts, aspects, and methods for developing ecoliteracy. Based on the reference sources, research results, and research focus, 16 articles were reviewed.
Result: research findings showed that ecoliteracy is an individual's awareness of understanding, appreciating, and interacting natural environment and surrounding ecosystem wisely. Ecoliteracy abilities are characterized by several aspects, such as cognitive skills regarding basic ecological knowledge (cognitive), the ability to adapt to the surroundings, environmental sustainability maintenance (spirit/connection), environmental emotions (heart/emotional), and responsible behavior and appreciation for natural wealth (hand/activities). Methods that can be used to develop ecoliteracy comprise carrying out practical activities (for example: 3R activities) in environmental conservation, conducting field trips to environment-related places, project-based learning, and technology-integrated learning.
Conclusions: this conclusion is that ecoliteration is an individual's awareness in interacting physically and non-physically with the natural environment wisely which is shown by cognitive abilities, enthusiasm/connection, emotions towards the environment, and environmental protection activities that can be carried out through practical activities of environmental conservation, field visits, project-based learning and technology. These findings can have theoretical implications regarding the definition of ecoliteracy, characteristics, indicators, and methods of ecoliteracy implementation. Future researchers can use theories from these findings to research a similar theme.

Keywords: Aspects; Ecoliteracy; Concepts; Methods.

RESUMEN

Introducción: esta investigación tuvo como objetivo analizar las tendencias de investigación sobre conceptos, aspectos y métodos utilizados para desarrollar la ecoalfabetización en el ámbito de la educación durante los últimos trece años (2010-2023).
Método: esta investigación empleó un método de revisión sistemática de la literatura. Las fuentes de literatura se obtuvieron de revistas internacionales de renombre con un enfoque de investigación sobre conceptos, aspectos y métodos para desarrollar la ecoalfabetización. Con base en las fuentes de referencia, los resultados de la investigación y el enfoque de la investigación, se revisaron 16 artículos.
Resultados: los hallazgos de la investigación mostraron que la ecoalfabetización es la conciencia de un individuo de comprender, apreciar e interactuar con el entorno natural y el ecosistema circundante de manera inteligente. Las habilidades de ecoalfabetización se caracterizan por varios aspectos, como las habilidades cognitivas con respecto al conocimiento ecológico básico (cognitivo), la capacidad de adaptarse al entorno, el mantenimiento de la sostenibilidad ambiental (espíritu/conexión), las emociones ambientales (corazón/emocional) y el comportamiento responsable y la apreciación de la riqueza natural (mano/actividades). Los métodos que se pueden utilizar para desarrollar la ecoalfabetización incluyen la realización de actividades prácticas (por ejemplo, actividades 3R) en conservación ambiental, la realización de visitas de campo a lugares relacionados con el medio ambiente, el aprendizaje basado en proyectos y el aprendizaje integrado con la tecnología.
Conclusiones: esta conclusión es que la ecoalfabetización es la conciencia de un individuo para interactuar física y no físicamente con el entorno natural de manera inteligente, lo que se muestra mediante habilidades cognitivas,

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entusiasmo / conexión, emociones hacia el medio ambiente y actividades de protección ambiental que se pueden llevar a cabo a través de actividades prácticas de conservación ambiental, visitas de campo, aprendizaje basado en proyectos y tecnología. Estos hallazgos pueden tener implicaciones teóricas con respecto a la definición de ecoalfabetización, las características, los indicadores y los métodos de implementación de la ecoalfabetización. Los futuros investigadores pueden utilizar las teorías de estos hallazgos para investigar un tema similar.

Palabras clave: Aspectos; Ecoalfabetización; Conceptos; Métodos.

INTRODUCTION

Indonesia has focused education towards Sustainable Development (ESD). This direction is one form of comprehensive and transfiguration education with the context of the learning process, pedagogy, and learning resources.[1] ESD has combined various contents of climate change, poverty, to sustainable curriculum meals. In addition, ESD also focuses on environmental conservation. The existence of ESD intends to optimize the empowerment of each individual's potential through reflection and real actions taken by individuals. These actions pay attention to the consequences of their current and future social, cultural, economic, and environmental existence from a local and global perspective.[2] The existence of ESD is highly desired to provide insight into the environment, society and economy.[3] To address the issue, environmental education needs to be implemented to preserve the natural environment.[4]

In preserving the environment, abilities that lead to environmental education are needed. These abilities must be able to support the prevention of environmental damage. Ecoliteracy is a competency that is related to the environment and is part of comprehensive ecological intelligence.[5] This intelligence is characterized by the possession of cognitive, affective, and psychomotor elements within the individual. According to Capra[6] and the Center for Ecoliteracy[7], ecoliteracy is characterized by the possession of cognitive intelligence (head), emotional (heart), spirit (connection), and activity (hand) in an individual. Each of these characteristics has its uniqueness based on information about the environment. Therefore, environmental awareness is part of the affective element. Meanwhile, the act of preserving the environment is part of the psychomotor element.[8]

Ecoliteracy can be developed using various methods. The method encompasses the involvement of a person's emotional state, such as environmental affection. As stated by Capra[6], emotions towards the environment are shown by a sense of care, empathy, respect for living creatures, respect, and commitment to protecting the environment. In addition to emotional methods, the development of ecoliteracy can also be maximized cognitively. Students can be provided with insight into the environment during or after their learning hours. This understanding certainly entails teachers' and parents' involvement in supervising their children in mastering environmental issues. Cognitive methods can be implemented by providing insight into basic ecological principles, assessing the impact of environmental damage, and imagining the long-term consequences of decisions to protect or damage the environment.[7]

Another method that can be implemented is the spirit method which is important to strengthen students' ecoliteracy and maintain their cognitive stability regarding the environment. The spirit is students' introduction to activities supporting environmental sustainability. One way to implement the spirit method is with storytelling. Literature review shows that stories are a strategy for introducing ecoliteracy through storylines, moral messages, and emotions to children. This is because the understanding of ecoliteracy is not only related to cognition, but also to emotion, action, and spirit that can be provided through storytelling.[9] Furthermore, a method involving student behavior or actions can significantly influence students' knowledge about the impact of their actions on the environment because real actions done by students are practical. Previous research states that environmental conservation actions for students can be developed by providing 3R (Reduce, Reuse, and Recycle) activities, doing field-trip activities in learning, using goods made from environmentally friendly materials, as well as environmental project-based activities.[10,11,12,13]

Those efforts are important for students at both primary and tertiary education levels to introduce global issues and challenges to students regarding the benefits of the environment. Therefore, the efforts must involve the use of all resources through ecoliteracy activities, both in the learning process and daily life. It is also important to provide an understanding of ecoliteracy to deepen students' environmental issues and promote environmental sustainability in the future. Ecoliteracy is an initiative to provide an understanding of the relationship between ecology and human lifestyle. Knowledge and understanding of ecological literacy is a foundation for individuals and is very important for the sustainability of life.[14]

Considering the importance of ecoliteracy education, a literature review related to ecoliteracy is needed because it provides direction to the thinking and action patterns of academics and practitioners. Currently, few publications discuss concepts, aspects, and methods for developing ecoliteracy in educational settings. Several previous studies have presented several conceptual frameworks such as environmental marketing research conceptual framework, social media conceptual framework, ecopedagogy conceptual framework, and social sciences conceptual framework.[15,16,17,18] Therefore, this research intends to analyze developments and research trends on the topic of concepts, aspects, and methods for developing ecoliteracy for the last thirteen years, from 2010 to 2023, through a systematic review. This systematic review is useful for synthesizing the results comprehensively and impartially. Specifically, this study explores the following research questions:

RQ1: what is the concept of ecoliteracy in general?

RQ2: what are the aspects of ecoliteracy?

RQ3: what methods can be used to develop ecoliteracy?

METHOD

This research utilizes the Systematic Literature Review (SLR) method. SLR is defined as a systematic research approach by identifying previous research findings (in the form of research articles) and concluding the research results as answers to research questions.[19] The SLR design was chosen to carry out a complete review procedure from marking, monitoring, to interpreting existing research results according to relevant topics.[20] The SLR design presents a summary of findings from previous researchers to be followed up in the form of a final decision. This final decision-making takes quite a long time through the collection of primary sources. These sources are also monitored and checked in detail so that the data obtained can be represented in a wider area. In essence, the findings truly represent information from the formulation of the problem and the research objectives needed.[21] Therefore, this systematic literature review article intends to analyze the concept of ecoliteracy, aspects of ecoliteracy, and methods of ecoliteracy development.

Research data were taken based on articles published in reputable international journals from 2010-2023. In selecting the title, the researcher chose articles with keywords that were appropriate to the research focus, such as 'ecoliteracy', 'aspects of ecoliteracy, and 'methods for developing ecoliteracy'. Of the many relevant articles related to ecoliteracy, sixteen articles from international journals were reviewed in this research. These basic data were used as the main reference and considered a credible scientific source. In summary, there were special criteria for selecting relevant articles.

Table 1. Selection criteria for relevant articles

No	Specific criteria
1	Research articles focus on the concept of ecoliteracy
2	Research articles are published between 2010 and 2023
3	Research articles are written in English
4	Research articles utilize an appropriate research structure

The SLR research process is divided into 3 major parts, namely planning, implementation, and reporting.[22] The initial stage is called planning. This process is carried out by recording the necessary reviews by considering the research questions. In this stage, a complete review of the research framework is also carried out. The next stage is called implementation. In this process, researchers consider the suitability of relevant literature, method selection, data extraction process, in-depth data review, and synthesis process to obtain an adequate review article. The last stage is called reporting. This process is reported in a structured writing in the form of a scientific article.

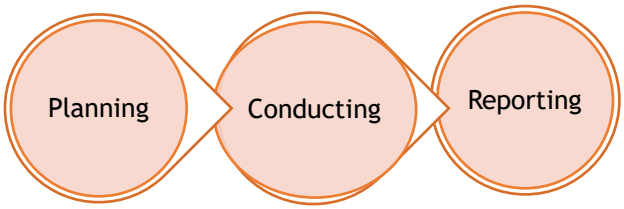


Figure 1. The procedure of systematic review

RESULTS

In this research, 16 articles obtained from searching for the keyword ecoliteracy were from international journals. The articles had been reviewed based on the reference source, type of journal, research results, and research focus. In this research, several journals were used as research references. The journal distribution document is depicted in table 2 below.

Table 2. Journal distribution of the reviewed articles

Journal names	Total
Rusian Law Journal	1
International Journal of Environmental and Ecological Engineering	1
Journal of Social Studies Education Research	1
European Journal of Educational Research	1
Journal of Sustainability Education	2
Ecosphere Journal	1
The Journal of Environmental Education	1
Journal of Management & Entrepreneurship	1
The International Journal of Early Childhood Environmental Education	1
Journal of Architectural and Planning Research	1
Cleaner and Responsible Consumption	1

Table 2. Journal distribution of the reviewed articles

Journal names	Total
Rusian Law Journal	1
International Journal of Environmental and Ecological Engineering	1
Journal of Social Studies Education Research	1
European Journal of Educational Research	1
Journal of Sustainability Education	2
Word and Image	1
Journal of Scientometric Research	1

Table 2 shows that reference journals were taken evenly or not only from one/two/three journals. There were thirteen journals obtained from this research search. Then, in terms of regions of the journals, the reviewed articles were spread from various regions in the world. The results of the journal distribution are as portrayed in table 3 below.

Table 3. Reviewed articles distribution by country/region

Country/region names	Total
Malaysia	2
Indonesia	4
The United States of America	8
India	1
New Zealand	1

Table 3 shows that The United States of America (USA) is at the top with a total of eight publications, followed by Indonesia, Malaysia, India, and New Zealand. The data indicated that Asian and American countries have quite a large number of publications related to ecoliteracy.

In this research, the fields of scientific study in the reviewed articles were also diverse. Regarding the subject, some research focused on elementary school, junior high school, university level, and even on teachers. Apart from that, in terms of methods, the research was from several methods, such as literature review, qualitative, mixed methods, quantitative, and bibliometrics. The method distribution of the reviewed articles is depicted in table 4 below.

Table 4. Distribution of the reviewed articles based on the method

Methods	Total
Quantitative	4
Qualitative	9
Mixed Method	1
Bibliometric	1
Literature Review	1

Table 4 shows that the reviewed articles were dominated by qualitative research, followed by quantitative research. There has not been any development research with a focus on increasing student ecoliteracy, so future researchers need to address the issue. Next, the results of the review were described in terms of the objectives of this research (concepts, aspects, and methods for developing ecoliteracy).

Ecoliteracy concepts

The first finding was related to the concept of ecoliteracy. Research findings about the concept summarized five articles that were relevant to the research focus. These articles were published in international journals. The summary results are shown in table 5 below.

Table 5. Journal review about the concept of ecoliteracy

Article title/Journal names	Results
Digital literacy, technological literacy, and ecological literacy as predictors of attitudes towards ICT G-readiness [as a recommendation to the drafting of the personal data protection law (PDP)]/ Rusian Law Journa [23]	Eco-literacy describes the ability of humans who have reached a high level of awareness of the importance of the environment.
Ecoliteracy and Pedagogical Praxis in the Multidisciplinary University Greenhouse toward the Food Security Strengthening/ International Journal of Environmental and Ecological Engineering [24]	The concept of Ecoliteracy is humans interconnection with the environment and creating daily interaction in which humans develop survival activities.

Table 5. Journal review about the concept of ecoliteracy

Article title/Journal names	Results
Examining the Effects of Ecoliteracy on Knowledge, Attitudes, and Behavior through Adiwiyata Environmental Education for Indonesian Students / Journal of Social Studies Education Research[25]	Ecoliteracy can be defined as a person's understanding and knowledge of ecological values that are useful for overcoming environmental problems
The Role of Eco-School Program (Adiwiyata) towards Environmental Literacy of High School Students/ European Journal of Educational Research[26]	Ecoliteracy can be defined as the ability to handle, reduce, and resolve environmental problems.
Environmental education and eco-literacy as tools of education for sustainable development/ Journal of Sustainability Education[27]	Ecoliteracy is the ability to identify, classify, and understand environmental problems, as well as take action and participate in the decision-making process regarding environmental problems.

Table 5 shows the results of a review of the concept of ecoliteracy. The first reference argued that ecoliteracy is the achievement of someone aware of the importance of the environment, as well as the importance of protecting and caring for the earth, ecosystem, and nature as a place to live and to grow. On the other hand, reference two has a different opinion stating that ecoliteracy is defined as the interconnection of humans with the environment and the construction of day-to-day realities in which humans develop survival activities. The third and fourth reference sources provide the same opinion, declaring that ecoliteracy is an understanding of the value of ecology in overcoming environmental problems. The fifth reference adds that ecoliteracy is the ability to identify, classify, and understand environmental problems, as well as take action and participate in the decision-making process regarding environmental problems. From those references related to ecoliteracy, it can be concluded that ecoliteracy is an individual's awareness of understanding, appreciating, and interacting with the natural environment and the surrounding ecosystem wisely.

Ecoliteracy aspects

The research results on aspects of ecoliteracy were obtained from five published articles. In summary, the research findings are shown in table 6.

Table 6. Review of journals regarding aspects of ecoliteracy

Article titles/journal names	Results
Environmental literacy, ecological literacy, ecoliteracy: What do we mean and how did we get here?/ Ecosphere Journal[28]	Ecoliteracy aspects include: (1) affect, ecological knowledge, (2) socio-political knowledge, (3) knowledge of environmental issues, (4) cognitive skills, Environmentally Responsible Behaviors (ERB), and (5) additional determinants of ERB.
The National Environmental Literacy Project: A Baseline Study of Middle-Grade Students in the United States/ The Journal of Environmental Education[16]	Four aspects of ecoliteracy include (1) foundational ecological knowledge; (2) environmental affect-verbal commitment, environmental sensitivity, and environmental feeling; (3) cognitive skills-issue identification, issue analysis, action planning; and (4) behavior-actual commitment, i.e., pro-environmental behavior.
Multiple literacies in environmental education: An epistemology for sustainable development/ Journal Of Management & Entrepreneurship[29]	Ecoliteracy competency is divided into several components, namely ecological self, sense of place and active citizenship, systems of thinking and relationships, the ecological paradigm, pedagogy of education for sustainability, and reading the world of nature and culture.
Using Picture Books to Enhance Ecoliteracy of First-Grade Students/ The International Journal of Early Childhood Environmental Education[30]	Ecoliteracy competencies are divided into four domains, namely head/cognitive, heart/emotional, hands/action, and spirit/connection.
Essential Ecoliteracy, or "earth smarts ": Defining and validating a pragmatic educational construct based on quality of life/ Journal of Sustainability Education[31]	Ecoliteracy competency has several domains, including self-regulation/adaptability, scientific reasoning, practical ethics, and sociopolitical skills.

Table 6 shows the results of a review of ecoliteracy aspects obtained from four research article references. The results of the review from the first reference concluded that aspects of ecoliteracy include: (1) affect, ecological knowledge, (2) socio-political knowledge, (3) knowledge of environmental issues, (4) cognitive skills, Environmentally Responsible Behaviors (ERB), and (5) additional determinants of ERB. Similarly, research from the second reference source stated that there are four aspects of ecoliteracy. These aspects include (1) foundational ecological knowledge; (2) environmental affect-verbal commitment, environmental sensitivity, and environmental feeling; (3) cognitive skills-issue identification, issue analysis, action planning; and (4) behavior-actual commitment, i.e., pro-environmental behavior. The first and second reference sources have similarities in the form of aspects of pro-environmental behavior and understanding of ecology. The third reference source conveyed that ecoliteracy indicators are based on ecological self, sense of place and active citizenship, systems thinking and relationships, the ecological paradigm, pedagogy of education for sustainability, and reading the world of nature and culture. On the other hand, research from the fourth reference stated that aspects of ecoliteracy competence are characterized by head/cognitive, heart/emotional, hands/action, and

spirit/connection. The fifth reference stated that ecoliteracy has several domains, including self-regulation/adaptability, scientific reasoning, practical ethics, and sociopolitical skills.

Ecoliteracy methods for developing ecoliteracy

The third finding relates to methods for developing ecoliteracy. The research results are briefly presented in table 7 below.

Table 7 portrats the results of a review of methods for developing ecoliteracy. Findings regarding this matter were obtained from six journal reference sources, namely two international journals and four national journals. Several reference sources mentioned several ways. The results of the review of the first reference concluded that Ecoliteracy can be developed through a process of developing affection, building knowledge, maintaining concern for the environment, and organizing services. Furthermore, the second reference explained that ecoliteracy can be done with 3R, namely recycle, reuse, and reduce. Students' ecoliteracy is also developed through direct activities such as sorting waste and recycling waste. Apart from that, there is literature stating that ecoliteracy can be integrated with technology/digital-based learning, such as the use of social media.

Table 7. Journal review of methods for developing ecoliteracy

Article titles/journal names	Results
A greener future: the active role of place in enhancing ecoliteracy in children/ Journal of Architectural and Planning Research[32]	The way to develop students' ecoliteracy is through the process of developing affection, building knowledge, maintaining concern for the environment, and managing services.
Can environmental literacy and integrated behavioral factors encourage green practices at home? Evidence from Malaysia/Cleaner and Responsible Consumption[33]	Students' ecoliteracy can be improved through activities at school such as 3R activities, namely recycle, reuse, and reduce.
Broadcast networks and the Early Modern emblem/ Word and Image[34]	The ecoliteracy process can be implemented with project activities such as sorting waste, recycling unused paper (books, magazines, etc.), and limiting paper consumption.
Eco-literacy and Social Media: A Bibliometric Review/ Journal of Scientometric Research[35]	Student ecoliteracy can be improved by implementing an environmental approach that is integrated with digital communication technology, such as social media.
The effect of digital eco-learning on student Worksheets Flipbook to environmental project literacy and Pedagogic Competency/ Journal of Technology and Science Education [36]	The use of digital eco-learning has been proven to help students understand the environment quickly without having to reduce their pedagogical and environmental literacy skills.
Multiliteracy: Alternative learning models to improve Ecological literacy of Primary School students/ Palarch's Journal of Archaeology of Egypt/Egyptology[37]	The use of electronic media and learning with a multiliteracy model helps students become more aware of the importance of protecting nature/the environment.

DISCUSSION

Ecoliteracy comes from two terms: ecological and literacy. Ecology means things related to the environment, while literacy means things related to literacy or having an understanding of something. Thus, ecoliteracy can be defined as a situation of literacy, understanding, and knowledge of the working principles of ecology in life. Ecoliteracy describes humans who have achieved a high level of awareness concerning the importance of the environment. This definition is in line with the opinion of Rahma et al.[38] stating that ecoliteracy is an abbreviation of ecological literacy, also known as ecological literacy, environmental literacy, ecological literacy, and environmental literacy. In line with this opinion, Lira et al.[24] revealed that the concept of ecoliteracy is the interconnection of humans with the environment and building daily realities in which humans develop survival activities.

Apart from that, the concept of ecoliteracy is also interpreted as a person's understanding and knowledge of ecological values which are useful for overcoming environmental problems. Ecoliteracy is one way to increase understanding of sustainable development. Ecoliteracy abilities are demonstrated by identifying, classifying, and understanding environmental problems, as well as taking action and participating in the decision-making process regarding environmental problems.[27] Goleman et al.[39] also stated that ecoliteracy is a person's ability to adapt to the ecological niche of the surrounding environment.

Ecoliteracy contains a description of how a person handles, minimizes, and resolves environmental problems as a form of improving the welfare of individuals, communities, the global environment, and wider life.[40] Ecoliteracy is always characterized by ecological understanding and action alongside nature. This is because humans must be able to live in harmony with nature without destroying the natural order and efforts to reduce environmental problems. The practice of ecoliteracy is an opportunity that can be utilized to prevent an increase in environmental crises in the future.

Based on the concept description of ecoliteracy, it can be concluded that ecoliteracy is an individual's awareness of understanding, appreciating, and interacting with the natural environment and the surrounding ecosystem wisely. This awareness includes adapting to the surroundings, saving the environment, and maintaining sustainability. This conclusion aligns with the concept of ecoliteracy proposed by Capra stating that ecoliteracy is awareness of the surrounding environment.[6] The conclusions of this study are also in line with the opinion of Lewinsohn et al.[41] who state that eco-literacy is awareness when making decisions regarding information to follow up on efforts to overcome environmental problems.

Based on the description above, it is known that ecoliteracy is called ecological awareness fosters self-awareness to always

maintain the environment and maintain the principles of ecological work in life. Individuals need to close all aspects of ecoliteracy to close all aspects of ecoliteracy so that good ecological self-awareness is fulfilled. Roth[42] suggests that there are four aspects of ecoliteracy, namely knowledge, skills, affective, and behavior. According to other experts, such as McBride et al.[28], the ecoliteracy aspect consists of knowledge and behavior about ecology, socio-politics, and environmental issues. A similar opinion was expressed by McBeth et al.[16] who stated that the four aspects of ecoliteracy consist of fundamental ecological knowledge, attitudes, and commitments towards the environment both verbally and non-verbally, skills in identifying issues and analyzing issues, the ability to plan actions, and pro-environmental actions and commitments.

The results of this review were also in line with the theory from previous findings stating that Ecoliteracy abilities can be measured from cognitive (head), attitude (heart), and skill (hands) aspects.[9] Cognitive or head contains competencies to describe ecoliteracy abilities in terms of understanding the environment. The attitude or heart aspect contains the ability to show empathy towards living creatures in the surroundings. The skills or hands aspect contains a person's behavior to apply their ecological knowledge in everyday life. Similarly, according to Warlenius, the success of ecoliteracy is determined by several aspects, namely: 1) the cognitive aspect, ecoliteracy education plays a role in promoting understanding of environmental problems, increasing awareness of safety and environmental evaluation; 2) socio-emotional aspects, ecoliteracy education functions as a regulator of the individual's human side in managing nature and is related to the feelings a person has as a form of concern and empathy for the environment; and 3) behavioral aspects, ecoliteracy education is related to how to organize the environment better.[43]

Based on the description of the ecoliteracy aspects, it can be concluded that the aspects of ecoliteracy are basic ecological knowledge (head/cognitive), emotional influence on the environment (heart/emotional), responsible behavior and appreciation of the environment (hand/activities), and adapting with the environment (spirit/connection). The outline as a conclusion of this study is relevant to the opinions of Capra and the Center for Ecoliteracy.[7,44] They explain that the ecoliteracy aspect contains four things. First, the cognitive aspect (head) focuses on the approach to environmental problems and situations. Individuals need to master the basic principles of ecology to a high level of thinking in problem-solving. Individuals must also implement their insights in different situations to consider the long-term impacts of the decisions taken. Second, emotional (heart) focuses on caring, empathy, and respect for the environment as part of living things. Individuals need to appreciate and work together with others from various backgrounds. Individuals must also be fair and respectful of living things. Third, spiritual (connection) focuses on making and using tools and objects as a way to maintain the sustainability of nature. Other things are also directed at practical and effective actions in line with insights into ecology. In addition, it is also manifested in the form of energy and resource-saving behavior. Fourth, the activity (hand) focuses on a sense of awe of nature by praising nature and its contents. Individuals feel nature is a manifestation of God's perfection so individuals will appreciate nature and its contents by showing their comfort.

According to Rigolon[13], the way to develop students' ecoliteracy is through the process of developing affection, building knowledge, and maintaining concern for the environment and stewardship. In line with this opinion, Yeap and Rao added that students' ecoliteracy can be improved through activities at school such as 3R activities, namely recycling, reusing, and reducing. Reuse activity is carried out by processing and reusing waste/used items that can still be used creatively, holding lessons about transforming waste into resources, and processing materials that can still be used. The reduced activity is carried out by reducing dependence on electricity supply sources, organizing lessons on water conservation for children, providing passive ventilation in classrooms, reducing energy consumption, providing parks, teaching children to do gardening, increasing biodiversity, filtering rainwater with soil beds, as well as making schools the center of a spatial planning community. Lastly, recycling activity can be done by carrying out an organic recycling process, making compost using dry leaves as fertilizer, making the classroom walls into artboards to store recyclables, and using a practical and multisensory approach in sorting and recycling waste. On the other hand, Riastini et al.[45] stated that ecoliteracy can be maximized by implementing eco-schools, including: 1) making school policies regarding the environment, 2) integrating environmental education into the curriculum, 3) holding participatory environmental activities, and 4) providing facilities and infrastructure. which is environmentally friendly.

Apart from that, ecoliteracy can also be improved by using public transportation, recycling, using renewable energy sources, saving energy, reforestation, and managing waste.[46] Ecological intelligence can also be maximized by implementing project-based learning.[47] The application of ecoliteracy can begin with an understanding of changes in the physical environment and their impacts, as well as ways to prevent environmental damage. Project-based ecoliteracy learning can increase ecological intelligence as demonstrated by understanding the causes of environmental problems, understanding the impact of environmental problems, being able to predict the possibility of occurring as a result of environmental problems and offering applicable solutions to these environmental problems.

In addition, previous research concluded that students' ecoliteracy and ecopreneurship abilities can be developed through the Art project-based learning (PjBL) model.[10] Ecoliteracy is demonstrated by environmentally literate students. Students are aware of the importance of the environment so they use reused materials (used wires, used bulbs, electrical terminals, and used drawing paper decorated with interesting pictures) when doing lamp-making projects. Students understand that the practice of using used goods can save costs, reduce household waste, and produce environmentally friendly work.

According to Scarinci et al.[48], a place-based approach can be used to increase ecoliteracy by connecting individual and social needs with regional needs so that local educational institutions can develop intervention strategies in facing local sustainability challenges. Educators can create special experiences for children such as presenting combined physical and virtual reality games so that students are interested in facing the challenges of these games.[49] Another study supported these findings by stating that ecoliteracy can be developed with garden-based internship programs that are structured holistically and deliberately.[50]

According to Orr[51], ecological literacy is based on six premises: (1) every aspect of education becomes part of environmental education; (2) environmental debate becomes a comprehensive problem that requires insights from various disciplines; (3) education takes place through dialogue between living things; (4) the educational process has the same importance as the educational content; (5) environmental experiences become the basis for environmental understanding; and (6) continuing education facilitates the development of students' ecological intelligence. These premises imply that ecoliteracy is learned when the curriculum and school programs integrate environmental understanding into them, such as the availability of ecological principles from all fields of science and academic levels.

Ecoliteracy increase can also be done by implementing a guided inquiry model. From the results of previous research, it was proven that the guided inquiry model was able to increase pre-service chemistry teachers' environmental awareness.[52] These results were demonstrated by teachers using socio-scientific issues related to the environment and participating in environmental activities with their students. Furthermore, research by Setiawati et al.[12] concluded that students' understanding of ecoliteracy increased through storytelling methods, field trips, and environmental project activities.Through field visits, students can directly observe matters related to environmental conservation. Students' ecoliteracy abilities also increased because they got learning materials concerning the ways to maximize local potential. The introduction of ecoliteracy through this visit was well received by students.

Based on the description of methods or ways to develop ecoliteracy, it can be concluded that ecoliteracy development methods can be carried out using varied models or approaches, such as practical or direct application (practices that support the environment and 3R activities), project-based learning, and integrating learning with technology or digital.

CONCLUSIONS

Ecoliteracy is an individual's awareness of understanding, appreciating, and interacting with the natural environment and surrounding ecosystem wisely. This awareness includes awareness to adapt to the surrounding environment, awareness to save the environment, and awareness to maintain its sustainability from aspects of basic ecological knowledge, emotional influence on the environment, cognitive skills, and environmentally responsible behavior. The development of ecoliteracy can be done by involving a person's emotional side in the form of affection for the environment, practical activities to protect the environment such as 3R activities, project-based learning, and technology-based learning such as digital eco-learning.

Considering the urgency of ecoliteracy, it is hoped that educators (teachers and lecturers) can design environment-based learning programs. Apart from that, it is necessary to empower school committees, the community, or stakeholders in efforts to instill ecoliteracy among students in their respective environments. Various parties need to be involved in planning, implementing, and evaluating programs that support ecoliteracy education at every level of education. Next, future research using the literature study method should focus on one or two models or strategies that can improve ecoliteracy capabilities. The SLR method can examine one model thoroughly and in-depth or compare two strategies based on their superiority in learning. Thus, the research results obtained can clearly illustrate the differences in the ecoliteracy capabilities of the interventions provided.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

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