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Exploration and formulation of an appropriate environment education approach for early childhood learners

I Made Lestiawati[1*], Sofia Hartati[2], Mohamad Syarif Sumantri[3]
[1,2,3]Universitas Negeri Jakarta, Indonesia; lestiawati_9920922001@mhs.unj.ac.id (I.M.L.) sofiahartati@unj.ac.id (S.H.) syarifsumantri@unj.ac.id (M.S.S.).

Abstract: This study aims to explore and develop an effective environmental care learning approach for early childhood to achieve maximum results. It employs a literature study method, specifically an integrative literature review. The study is conducted in four stages: designing the review, conducting the review, analyzing the data, and writing the review. Data were collected from scientific journals that are accredited or indexed nationally and internationally. The data collection was conducted online using the Publish or Perish application with several keywords related to the research objectives. The gathered data were analyzed using content analysis. The results indicate that the learning strategy employed in environmental education must meet several criteria, including a holistic approach, empowerment through age-appropriate activities, education through play and stories, daily experiences, family and community-based socialization, and evaluation of engaging content. Regarding learning media, it should also meet several criteria such as interactivity, visual appeal, exploratory activities, repetition, technology use, and cultural relevance. Furthermore, to evaluate environmental education, the aspects to consider include students' knowledge, attitudes, and behavior, experimental methods, social and environmental context, parental involvement, connection with nature, psychological well-being, and both short-term and long-term impacts. The findings of this study provide valuable contributions to implementing environmental education for early childhood by guiding the execution of effective environmental education strategies.

Keywords: *Environmental care education, Early childhood, Learning approach.*

1. Introduction

Environmental issues are still a global issue, and there are various problems. The industrial revolution in the 19th century was a milestone in the acceleration of the natural cycle, which began with the disruption of environmental balance due to the rapid development of industrialization [1]. In the late 1960s, environmental damage occurred due to rapidly increasing industrial development; environmental damage occurred from water, air, and land pollution, radioactive waste, and flooding of toxic substances [2].

The environment has been a significant focus from the past until now. The environmental crisis can threaten the survival of humans' survival in the future [3]. Environmental problems that are currently becoming more serious are global warming [4, 5]. Global problems trigger climate change and natural disasters [6]. Furthermore, the problem of climate change also affects agricultural output; unpredictable weather often causes crop failures [7]. In addition, hot weather also triggers discomfort and disrupts people's activities, especially sleep quality [8, 9]. Therefore, the impact of global warming not only affects the environment but also hurts human mental health [10].

These environmental problems certainly cannot be ignored. Public understanding of global warming, climate change, and its impacts is still relatively low, making many people skeptical and

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* Correspondence: lestiawati_9920922001@mhs.unj.ac.id

indifferent [11]. Public perception of global warming impacts their concern for the environment [12]. For this reason, new methods are needed to be developed so that humans have environmental awareness. Education is one way to form understanding, awareness, and behavior of the community in loving the environment [13, 14]. To form an understanding from an early age and to prevent environmental damage better, environmental education is essential and must be done from an early age [15, 16]. The application of environmental attitudes must be carried out continuously and through the involvement of educators and parents by integrating meaningful and character-based learning [17].

Given the importance of protecting the environment, this study explores the learning approach to environmental education for early childhood. By knowing the right learning approach, educational outcomes will be more optimal. In other words, the results of this study contribute to formulating a learning approach that can implement environmental care learning to achieve the expected goals, namely building knowledge, understanding, and implementing an environmental care culture from an early age. It is hoped that by creating an environmental care culture from an early age, environmental problems can be overcome.

2. Method

Following the purpose of this study, namely to explore and formulate an appropriate approach to environmentally conscious learning for early childhood, this study was conducted using the integrative literature review research method. According to Snyder [18] an integrative literature review is a type of literature review that is conducted by critically evaluating and synthesizing available literature to produce or offer new theories or practical recommendations for a particular topic.

The data for this study were obtained from scientific articles published online in national and international scientific journals. Researchers collected data by utilizing the publish or perish application using keywords related to inclusive education for early childhood. Several criteria were determined in this study to select articles that are used as data sources. First, the journal that publishes the article must be Sinta accredited or Scopus/WoS indexed. Second, the article was published in the past five years, namely between 2019 and 2024. Third, the article discusses the implementation of inclusive learning for early childhood education.

Data that meet these criteria are then analyzed using content analysis techniques. As explained by Elo and Kyngäs [19] Content analysis involves organizing data from the literature into relevant themes, categories, or concepts so that researchers can identify patterns, relationships, and differences in the literature to gain new insights. The stages of this content analysis are reading and understanding the literature, determining the main themes, coding data based on these themes, and synthesizing findings to produce new insights [19].

3. Result and Discussion

From the data collection process, this study found 15 articles that meet the study's criteria. Those 15 articles cover three topics: teaching strategy for environmental education, teaching media, and assessment/evaluation. The following are the explanations of the findings of the four topics.

3.1. Teaching Strategy

Research conducted by Mousavi, et al. [20] identified five basic strategies for environmental education for children under four years of age: child empowerment, indirect education, content production and review, environmental-based socialization, and appropriate infrastructure development. Child empowerment increases their ability to understand and engage in environmental issues through age-appropriate activities. Indirect education is implemented through games, stories, and everyday experiences that naturally introduce environmental concepts. This strategy is supported by producing and evaluating educational content that is relevant, interesting, and effective for early ages. In addition, environmental-based socialization encourages interaction within families and communities to build

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environmental awareness. Finally, infrastructure development, such as green open spaces and educational props, is essential in creating a learning environment that holistically supports environmental education.

Similar results were also found by Mukhlis, et al. [21] who emphasized that the environmental education learning model for early childhood should involve direct experiences that allow children to observe the natural life cycle, environmental care practices, and the sustainability of natural resources. This approach aligns with previous research findings that highlight the importance of indirect education through everyday experiences and play and empowering children to understand environmental issues. By combining direct experience and a socialization-based approach, this model contributes to forming environmental awareness from an early age, supporting sustainable development goals. This strategy also emphasizes the need for relevant infrastructure and content to support a holistic learning process.

Research conducted by Batubara [22] examines the application of environmental learning strategies to improve science learning in MI/SD, considering gender differences in children. Environmental learning strategies utilize the surrounding environment as a learning medium that allows students to understand the material easily through observation. In this strategy, students are expected to be able to love and apply the learning obtained from the surrounding environment voluntarily, without coercion. The teacher's job is to make this strategy fun and not boring for students. This study uses a qualitative method with data collection techniques through observation, interviews, and documentation studies. The results of the study show that with environmental learning strategies, students can better understand learning materials when they are outside the classroom and increase their learning motivation because they feel a different learning atmosphere than usual.

Table 1.
Teaching Strategy for Environment Education.

No	Title	Writers	Keywords
1.	Identifying environmental education strategies for children with an emphasis on children under four years old: A qualitative study in Iran	Mousavi, et al. [20]	• Child Empowerment • Indirect Education • Educational Content Production • Content Review • Environmental-Based Socialization • Educational Infrastructure Development • Family and Community Interaction • Daily Experience • Holistic Approach • Early Environmental Awareness
2.	An Environmental Education Learning Model for Early Childhood: Achieving Sustainable Development	Mukhlis, et al. [21]	• Sustainable development, • Holistic learning, • Natural life cycles, • Environmental stewardship, • Hands-on experience-based education.
3.	Application of Environmental Learning Strategies to Increasing Science Learning in MI/SD Given Children's Gender	Batubara [22]	• Environmental Observation • Application of Material to the Surrounding Environment • Fun Learning Atmosphere • Learning Outside the Classroom • Student Involvement • Natural Learning Resources

The results of the three studies emphasize the importance of a holistic approach to learning strategies for environmental education, especially for early childhood. Effective strategies include empowering children through age-appropriate activities, indirect education through games and stories, and everyday experiences that naturally introduce environmental concepts. In addition, direct

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experiences, such as observing natural life cycles and sustainable practices, are essential in building environmental awareness. In addition, support from family and community-based socialization also strengthens the learning process. At the same time, the provision of infrastructure, such as green open spaces and educational props, is a crucial supporting factor. The production and evaluation of relevant and interesting educational content are also needed to ensure the effectiveness of learning. By combining these strategies, environmental education can encourage the formation of environmental awareness and skills from an early age while supporting sustainable development goals.

Table 2.
The Aspect/Criteria for Strategy in Teaching Environment Education.

No	Aspect/Criteria	Explanation
1.	Holistic Approach	Integrates multiple methods and dimensions of learning, addressing cognitive, emotional, and social aspects to create a comprehensive experience.
2.	Empowerment Through Age-Appropriate Activities	Encourages children's active participation using activities suitable for their developmental stage, promoting engagement and understanding.
3.	Indirect Education via Play and Stories	Utilizes creative and fun methods like games and storytelling to introduce environmental concepts naturally and enjoyably
4.	Daily Experiences	Embeds environmental learning into everyday life, helping children grasp concepts organically through routine activities.
5.	Direct Experiences	Provides hands-on opportunities, such as observing life cycles or practicing sustainability, to foster tangible connections with nature.
6.	Family and Community-Based Socialization	Involves parents and the community in reinforcing environmental education, ensuring consistent support outside the classroom.
7.	Supporting Infrastructure	Includes green spaces and educational tools like models and visual aids to enhance the learning process.
8.	Production and Evaluation of Engaging Content	Develops and assesses relevant, appealing educational materials to ensure that learning objectives are effectively met.

3.2. Teaching Media

Various studies have identified several important factors that must be considered when using learning media to improve environmental literacy in early childhood. Research by Izhar, et al. [23] shows that effective learning media for early childhood must be interactive, visually appealing, and easy to use. The media must integrate exploration activities, educational games, and visualizations that are relevant to everyday environmental issues. By fulfilling these aspects, environmental learning can be delivered in a fun way, encouraging children to care more about and understand environmental issues. In addition, Rachman, et al. [24] emphasize the importance of visual, narrative, and interactive media to support environmental education in early childhood. Media such as Kamishibai, which combines simple images and stories, is effective in helping children understand environmental concepts. Through this approach, children can be emotionally involved with the stories conveyed, strengthen their memory through repetition of narratives and visualizations, and connect learning to everyday life. The use of technology also plays a significant role in environmental education. Research by Buchanan, et al. [25] showed that digital technologies, such as mobile applications and virtual reality, can provide more engaging and immersive learning experiences. These technologies allow children to learn about environmental conservation directly through real-world experiences in local and broader environments while collecting data and sharing their findings.

Furthermore, research by Safitri, et al. [26] and other related studies show that Augmented Reality (AR)-based learning media has a positive impact on increasing students' interest in environmental education. Applications such as Assemblr EDU allow students to learn through interactive experiences stimulating their curiosity. The use of AR can make learning materials more interesting and easier to understand, as well as increase student engagement in environmental topics.

Finally, research by Putri, et al. [27] revealed that bilingual picture books on climate change can be an effective learning medium for children. This kind of book not only helps improve environmental

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literacy but also enriches children's language skills. Picture books can provide a fun and immersive learning experience with attractive illustrations and interactive elements.

Table 3.
Teaching Media for Environment Education.

No	Title	Writers and Year	Keywords
1.	The Development of Environmental Literacy Media Learning for Elementary School Students	Izhar, et al. [23]	• Interactive • Engaging Visuals • Education through Games • Easy to Use • Responsive • Realistic Animations and Visualizations • Based on Everyday Context • Uses Educational Sound and Music • Involves Exploration • Supports Emotional Engagement • Activity-Oriented • Fun • Story-Based • Builds Environmental Awareness • Adaptive to Children's Abilities
2.	Using Kamishibai Media in Thematic Learning to Increase Students' Knowledge of Environmental Education	Rachman, et al. [24]	• Interactive • Contextual • Repetition • Emotional Engagement • Child Friendly • Thematic • Memory Reinforcement • Relevance to Daily Life • Appropriate to Child Development or Characteristics
3.	Indonesian Young EFL Learners' Experiences in Learning Environmental Literacy through Digital Storytelling: A Case Study	Rusda, et al. [28]	• Digital Storytelling • Environmental Literacy • Active Learning • Student Engagement • Story-Based Education • Learning Enhancement through Creativity • Use of Digital Media • Interactivity
4.	Promoting environmental education for primary school-aged students using digital technologies	Buchanan, et al. [25]	• Interactive • Interesting Media • Flexible
5.	Development of Augmented Reality-based Interactive Learning Media to Increase Interest in Environmental Education	Safitri, et al. [26]	• Augmented Reality (AR) • Interactive Learning Media • Student Engagement • Knowledge Construction
6.	Empowering Young Learners: Integrating Climate Change Education with Bilingual Picture Books in ELT	Putri, et al. [27]	• attractive illustrations • interactive elements

From the six studies on learning media for environmental education, it can be understood that effective environmental learning media for early childhood must meet several main aspects that support each other. Media needs to be designed interactively, visually appealing, and easy to use to attract

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children's attention and motivate them to learn. In addition, integrating exploration activities, educational games, and visualizations relevant to children's daily lives will strengthen their understanding of environmental issues. In addition, narratives in the form of stories can also be an alternative to create emotional connections, while repetition elements help strengthen children's memory of the concepts being learned. Furthermore, using technology, such as digital applications, Augmented Reality (AR), and Virtual Reality (VR), can provide a more profound and more immersive learning experience. Media based on bilingual content also has additional benefits, namely developing environmental literacy and children's language skills. Another thing that also needs to be considered is cultural relevance; learning media must also follow the child's local context so that learning becomes more meaningful. These recommendations can be the basis for designing or selecting environmental learning media to effectively improve early childhood environmental literacy.

Table 4.
The Aspect/Criteria for Teaching Media in Teaching Environment Education.

No	Aspects/Criteria	Explanation
1.	Interactivity	Media should allow children to actively participate and engage with the content.
2.	Visual Appeal	Bright colors, attractive images, and well-designed layouts capture children's attention.
3.	Exploration Activities	Media must be simple and intuitive for early childhood learners to navigate and understand.
4.	Educational Games	Incorporates gamified elements to make learning fun and engaging while reinforcing concepts.
5.	Relevant Visualizations	Depicts environmental issues and concepts in ways that relate to children's everyday lives.
6.	Repetition	Reinforces concepts through repeated exposure to improve retention and understanding.
7.	Technology Use	Utilizes digital tools like mobile apps, AR, and VR for immersive and interactive experiences.
8.	Cultural Relevance	Aligns with children's local contexts to make learning relatable and meaningful.

3.3. Assessment/Evaluation

Research conducted by Salazar, et al. [29] evaluated children's environmentally friendly behavior, especially in managing plastic waste. The assessment was carried out by measuring children's knowledge, attitudes, and habits related to the use and disposal of plastic. The results showed that schools with higher certification tended to help children have more environmentally friendly behaviors, especially in practices that involve their own decisions, such as bringing food.

A similar study was also conducted by Whitburn, et al. [30] who conducted an evaluation using a quasi-experimental field study approach to assess the impact of a nature-based environmental education program on environmentally friendly behaviors, connections with nature, and children's psychological well-being in Wellington, New Zealand. Data were collected through questionnaires measuring connections with nature, environmentally friendly behaviors, vitality, and life satisfaction to assess support for conservation. Data collection was carried out before and four weeks after the field visit. The results showed a slight increase in environmentally friendly behavior and support for conservation, but the program had little effect on connections with nature and psychological well-being. In addition, the increase in connections with nature was only seen in children who already had a strong relationship with nature.

In addition, another similar study was conducted by Jaime, et al. [31] who used a randomized field experiment to evaluate the impact of an environmental education program with values-based content on children's and parents' knowledge, attitudes, and practices regarding plastic consumption and disposal. The evaluation results showed that the program significantly impacted children's knowledge, attitudes, and practices, especially for children in more vulnerable schools. However, no effect was found on parents' behavior. Further analysis indicated that because parents play a significant role in determining

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the limits of acceptable behavior for children, more permanent behavior changes require additional programs that also target parents. The evaluation method used focused on measuring the program's direct impact on children's knowledge, attitudes, and practices, as well as the indirect impact on parents, with particular attention to differences in outcomes across social groups. This approach highlights the importance of involving both generations in environmental education programs to ensure sustainable behavior change.

Table 5.
Evaluating Environment Education.

No	Title	Writers	Keywords
1.	Environmental education and children's pro-environmental behavior on plastic waste. Evidence from the Green School Certification Program in Chile	Salazar, et al. [29]	• Environmental Knowledge • Attitudes towards the Environment • Habits in Plastic Management Practices • Children's Independent Decisions • Impact Consistency
2.	Do environmental education field trips strengthen children's connection to nature and promote environmental behavior or wellbeingwell-being?	Whitburn, et al. [30]	• Quasi-Experimental Field Study • Longitudinal Approach • Questionnaire • Experiment, data collection before and after intervention • Eco-Friendly Behavior • Connection to Nature • Children's Psychological Wellbeing • Vitality and Life Satisfaction • Support for Conservation
3.	Can school environmental education programs make children and parents more pro-environmental?	Jaime, et al. [31]	• Randomized Field Experiment • Direct and Indirect Impact Evaluation • Evaluation Based on Educational Intervention • Knowledge of Plastic Consumption and Disposal • Attitudes towards the Environment • Pro-Environmental Practices • Parents' Role in Children's Behavior

The three studies on environmental education evaluation show that a comprehensive approach is required that considers various methods and aspects. First, the evaluation must measure students' knowledge, attitudes, and behavior as the leading indicators. The method used should be an experimental method to directly measure the effectiveness of environmental education's impact. In addition, the evaluation must consider the social and ecological context of the participants. Additionally, involving parents in the program is essential to support sustainable behavior change. Additional aspects such as connection with nature and psychological well-being, are also worth measuring although the impact may be more significant in children with a strong relationship with nature. Therefore, environmental education evaluation should use an approach that includes various indicators, is tailored to the background of the participants, involves parents, and monitors the short and long-term impact to ensure the sustainability of behavior change.

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Table 6.
The Aspect/Criteria in Evaluating Environment Education

No.	Aspect/Criteria	Explanation
1.	Knowledge, Attitudes, and Behavior	The evaluation must measure these as primary indicators of the program's impact on students.
2.	Experimental Methods	Utilize experimental approaches to directly assess the effectiveness and impact of environmental education.
3.	Social and Environmental Context	Evaluation should consider the learners' social and environmental backgrounds to ensure relevance and inclusivity.
4.	Parental Involvement	Engaging parents in the program supports sustainable behavioral change and reinforces learning at home.
5.	Connection with Nature	Measures the emotional and experiential bond with nature, which can be incredibly impactful for children already connected to it
6.	Psychological Wellbeing	Assesses how environmental education contributes to students' mental and emotional health.
7.	Short-term and Long-term Impact	Evaluation should monitor both immediate results and long-term behavioral changes for sustainability.

4. Conclusion

Environmental education plays a vital role in preserving the environment, especially in overcoming environmental problems such as global warming and climate change, the negative impacts of which are increasingly worsening the quality of human life. From previous studies on environmental education, three essential things can be identified that must be considered in implementing environmental education. First is the learning strategy used in environmental education. The learning strategy must meet several criteria or aspects, such as a holistic approach, empowerment through age-appropriate activities, indirect education via play and stories, daily experiences, direct experiences, family and community-based socialization, supporting infrastructure, and production and evaluation of engaging content. Second, in terms of the learning media used, as much as possible the learning media meets aspects or criteria such as interactivity, visual appeal, exploration activities, educational games, relevant visualizations, repetition, technology use, and cultural relevance. Third, to evaluate the implementation of environmental education, the aspects or criteria that need to be considered are knowledge, attitudes, and behavior experimental methods, social and environmental context, parental involvement, connection with nature, psychological well-being, short-term and long-term impact. The results of this study provide a clear contribution to the implementation of environmental education in terms of providing theories regarding strategies, learning media, and evaluation of environmental education, which can then be used to support or improve the quality of the implementation of environmental education.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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