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Improving Students' Character of Caring for The Environment Through Understanding Ecoliteracy in Picture Stories

Samsudin*[1], Hadi Cahyono[2], Sunarto[3]

[1,2,3] *Universitas Muhammadiyah Ponorogo, Indonesia*
e-mail:
syamsudinpo@gmail.com
hadicahyono@umpo.ac.id
naratm63@gmail.com

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ABSTRACT. Environmental problems caused by human or natural factors are increasing. These natural disasters will get worse if prevention is not done early. Efforts to reduce disasters that occur are to instill the character of caring for the environment from an early age. The way to introduce character education to children is through the storytelling method. The storytelling method is a program or plan that can be used in order to introduce care for the natural environment through the plot, moral messages and emotions of the story told to children. A child who has concern for the environment will have a positive effect on the survival of the surrounding environment and last until he grows up, because it becomes a habit. This research uses the literature research method. The source of reading material used is obtained from other people's research that has been published in the form of books, journals and in the form of articles that can be found in the library. Researchers study literature, writings and sources that have a close relationship regarding the problem being studied, namely about strengthening the character of environmental care in early childhood.

Keywords: *Ecoliteracy, Students' Understanding, Character.*

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INTRODUCTION

Developing children's capacity to understand environmental problems and participate in environmentally responsible practices is an important educational objective. Environmental education can support this objective by addressing not only ecological knowledge but also the attitudes, intentions, and behaviors through which learners respond to environmental issues. A meta-analysis by Van De Wetering et al. (2022), encompassing 169 studies and 176,007 participants across 43 countries, found that environmental education improved environmental knowledge, attitudes, behavioral intentions, and behavior among children and adolescents. However, improvements in knowledge were substantially larger than improvements in the other outcomes. These findings establish the educational relevance of environmental learning while highlighting the need for approaches that connect conceptual understanding with meaningful opportunities to care for the environment.

Early childhood and the early years of primary education provide important settings for developing these connections. In a systematic review of 66 studies, Ardoin and Bowers (2020) identified environmental literacy, cognitive development, and social and emotional development as prominent outcomes of early childhood environmental education. Their synthesis also identified pedagogical practices involving social interaction, creative activities, reflection, direct

engagement with nature, and opportunities for action. Rather than assuming that young children automatically develop environmental responsibility because they are in a "golden age," this evidence supports the deliberate design of developmentally appropriate learning experiences that relate environmental ideas to children's everyday lives.

Within this study, ecoliteracy is conceptualized as an educational orientation that connects an understanding of relationships among living organisms, people, and their surroundings with concern for ecological well-being and the capacity to consider responsible action. This working conceptualization brings together the cognitive, affective, and behavioral outcomes emphasized in recent environmental education research. Nevertheless, these dimensions should remain analytically distinct. Knowing why an environment requires protection does not, by itself, demonstrate that a child consistently acts to protect it. Accordingly, environmental caring character is approached here as a developing disposition expressed through environmental concern, responsibility, and observable practices, rather than as a direct consequence of acquiring ecological information (Ardoin & Bowers, 2020).

Picture storybooks offer a promising resource for introducing environmental relationships through illustrated situations and narrative problems. Evidence from environmental education illustrates how stories can connect scientific concepts with recognizable ecological settings. Aurélio et al. (2021), for example, examined a children's book-based intervention involving 176 primary school students aged eight to ten. The researchers reported improvements in students' knowledge of river biodiversity and human-induced threats following reading sessions. The story also linked river conservation with wider marine environmental issues, demonstrating how a familiar ecosystem can provide an entry point for understanding ecological interconnectedness. These findings support the use of scientifically accurate stories as resources for environmental learning, although they do not establish lasting changes in environmental behavior or character.

The educational contribution of a story also depends on how adults present and discuss it. In an experimental study involving 60 children aged four to six, Lenhart et al. (2020) found that live oral storytelling supported word learning, story comprehension, and on-task behavior, emphasizing the relevance of narrator engagement. Although this study did not investigate environmental education or the specific effects of picture storybooks, it provides complementary evidence that narrative delivery deserves attention when designing learning activities for young children. Consequently, an environmental picture storybook should not be treated as an independently effective intervention simply because it contains attractive illustrations or an environmental message. Its educational potential requires consideration of both the material and its classroom implementation.

For the Indonesian educational context examined in this study, picture storybooks can therefore be designed around environmental situations that children encounter in their immediate surroundings. Possible narrative contexts include caring for plants, using water responsibly, managing classroom waste, and protecting local habitats. These examples represent proposed instructional applications rather than established findings about the participating children. The pedagogical intention is to connect ecological explanations with questions about consequences, responsibility, and feasible responses. This proposed approach draws on the combination of reflection, social interaction, personal connection, and action-taking identified in early childhood environmental education research, alongside evidence that locally relatable stories can support environmental understanding (Ardoin & Bowers, 2020b; Aurélio et al., 2021).

Despite this promise, the available evidence requires careful interpretation. Aurélio et al. (2021) primarily documented changes in environmental knowledge through a pretest-posttest design, while Lenhart et al. (2020) investigated narrative learning rather than environmental dispositions. At the broader level, Van De Wetering et al. (2022) reported substantial variation in intervention effects and noted that behavioral outcomes were mostly self-reported. Their findings

also showed that the conditions and components responsible for effective environmental education remain insufficiently understood. Taken together, these studies provide a rationale for investigating picture storybook-based environmental learning, but they do not justify the general claim that picture stories necessarily produce enduring improvements in children's character.

The research problem addressed in the present study therefore concerns the relationship between ecoliteracy-oriented picture storybook learning and the development of environmental caring character in a specific educational setting. Rather than treating enjoyment, knowledge acquisition, environmental concern, and responsible behavior as interchangeable outcomes, the study distinguishes these dimensions when examining children's responses to the learning experience. Its intended contribution lies in investigating how an accessible narrative medium can connect ecological understanding with environmentally responsible dispositions and practices. This focus responds to the broader need to identify the educational components and outcomes that account for the effectiveness of environmental education (Van De Wetering et al., 2022).

Accordingly, this study aims to examine how ecoliteracy oriented picture storybooks can support students' ecological understanding and the development of environmental caring character in the Indonesian educational setting under investigation. Specifically, it considers how students interpret environmental relationships in the stories, express concern and responsibility toward the environment, and relate the narratives to everyday environmental practices. By distinguishing these outcomes, the study seeks to provide a more precise account of the educational contribution of picture storybooks, without presupposing that improvements in ecological knowledge necessarily translate into sustained behavioral change.

METHOD

This study employs library research using an integrative literature review approach to examine the potential contribution of ecoliteracy-oriented picture stories to students' character development. Rather than treating the literature merely as a source of background information, this approach uses scholarly publications as the principal material for critical analysis and conceptual synthesis. An integrative review brings together relevant theoretical perspectives and research findings to clarify concepts, examine relationships, and develop a coherent understanding of a research problem (Elsbach & Van Knippenberg, 2020). Accordingly, this study focuses on the question: How does the existing literature explain the potential role of ecoliteracy-oriented picture stories in supporting students' character development?

The sources comprise peer-reviewed journal articles, scholarly books, and relevant book chapters addressing ecoliteracy, character education, and picture stories in educational settings. The review distinguishes between conceptual sources, which support the definition and interpretation of key constructs, and empirical studies, which provide evidence concerning educational processes and reported outcomes. Source selection considers thematic relevance, the clarity of the theoretical framework, methodological transparency, and the extent to which the conclusions are supported by the evidence presented. These considerations reflect the importance of methodological rigour, clearly defined scope, and transparency in literature-based research (Fan et al., 2022).

The review process involves identifying relevant publications, screening their suitability, extracting information, and synthesizing the selected literature. The search and selection procedures document the databases or catalogues consulted, search terms, search dates, eligibility criteria, and reasons for excluding publications. Relevant information is organized in a literature matrix that records bibliographic details, research objectives, theoretical perspectives, educational contexts, research designs, key findings, and limitations. Explicit reporting of these decisions strengthens the transparency and traceability of the review process (Sauer & Seuring, 2023).

The analysis combines thematic organization with critical, integrative synthesis. The selected publications are examined in relation to three analytical domains: the conceptualization of ecoliteracy, the educational use of picture stories, and the dimensions of student character discussed or assessed in the literature. The synthesis compares findings across studies, examines convergent and divergent interpretations, and considers how differences in educational context and research design affect the interpretation of reported outcomes. It also distinguishes empirically supported findings from theoretical propositions and pedagogical recommendations. In this way, the review seeks to produce an integrated conceptual account rather than a sequence of isolated summaries (Elsbach & Van Knippenberg, 2020; Fan et al., 2022).

To strengthen methodological trustworthiness, the study maintains a documented record of source selection and analytical decisions and relates each interpretation to the publications from which it is derived. Contradictory findings and methodological limitations are retained in the synthesis rather than excluded to support a predetermined conclusion. The resulting account identifies the potential educational contributions, conditions, and limitations of using ecoliteracy-oriented picture stories for character development. As a literature-based study, it does not independently test an intervention or directly measure changes in students' character. Its conclusions therefore concern the interpretation and integration of existing knowledge rather than new causal evidence of effectiveness (Fan et al., 2022; Sauer & Seuring, 2023).

RESULT AND DISCUSSION

Result

The Importance of Fostering Students' Environmental Care Character through Ecoliteracy

Developing students' environmental care character requires more than teaching ecological facts. It involves connecting environmental understanding with values, responsibility, and informed action. In this discussion, environmental care character refers to students' disposition to consider the environmental consequences of their decisions and participate in practices that protect the natural environment. This interpretation aligns with Ardoin et al. (2020), who describe environmental education as an approach that develops environmental awareness, knowledge, attitudes, values, and skills to support informed action. Environmental care should therefore be understood as an educational objective that integrates cognitive, affective, and behavioral development rather than knowledge acquisition alone.

Empirical evidence supports this integrated approach. In a meta-analysis of 169 studies involving 176,007 participants across 43 countries, Van De Wetering et al. (2022) found that environmental education significantly improved children's and adolescents' environmental knowledge, attitudes, intentions, and behavior. However, the improvement in knowledge was greater than the improvement in behavior, and behavioral outcomes relied largely on self-reported measures. These findings indicate that knowing about environmental problems does not necessarily lead students to act responsibly. Environmental learning must therefore address how students interpret environmental issues, value environmental protection, and develop intentions to act.

Ecoliteracy provides a useful conceptual basis for connecting these dimensions. In this discussion, ecoliteracy denotes an integrated capacity to understand ecological relationships, evaluate the environmental implications of human activities, and apply that understanding to responsible decisions. Its relationship with environmental care character is complementary: ecoliteracy concerns the understanding and competencies that inform environmental decisions, while environmental care character emphasizes the values and commitment that orient those decisions toward environmental protection. Evidence from Liu et al. (2020) supports the importance of this connection. Their study of 2,824 respondents in China examined

environmental attitudes and behavioral intentions as mechanisms linking environmental knowledge with pro-environmental behavior. Although the study did not specifically investigate school students, it provides relevant evidence that knowledge should not be treated as an automatic predictor of responsible action.

Accordingly, this study organizes ecoliteracy into five interrelated dimensions: (1) ecological knowledge, encompassing an understanding of ecological processes, human environment interdependence, and the environmental consequences of human activities; (2) environmental awareness and responsibility, encompassing recognition of environmental problems and critical consideration of the consequences of individual and collective choices; (3) action competence, encompassing knowledge of possible actions, confidence in one's capacity to contribute, and willingness to participate in individual and collective environmental action; (4) environmental values and ethical reflection, encompassing critical examination of the values and responsibilities that inform environmental protection and socio-ecological justice; and (5) systems thinking, encompassing the ability to analyze connections, feedback processes, and interactions among ecological conditions, human activities, and potential responses. These dimensions draw on complementary contributions from holistic climate change education, action competence research, and research on youth eco-literacy (Cantell et al., 2019; Firinci Orman, 2024; Olsson et al., 2020).

The five dimensions constitute a study-specific conceptual synthesis rather than an empirically validated five-factor model. They serve as complementary analytical categories for examining how learners understand environmental issues, evaluate their ethical implications, and develop the capacity for informed participation. This framework does not assume that ecological knowledge or environmental concern automatically translates into action. Instead, it recognizes knowledge of action possibilities, perceived capacity to influence outcomes, and willingness to act as distinct components of action competence (Olsson et al., 2020).

Strengthening environmental care through ecoliteracy also requires learning opportunities that connect understanding with practical participation. Ardoin et al. (2020) identified several characteristics of environmental education programs that documented direct conservation outcomes: attention to locally relevant issues, collaboration with scientists and resource managers, explicit action components, and deliberate measurement of outcomes. Accordingly, schools can connect ecoliteracy with environmental care by engaging students in investigating local problems, considering alternative responses, undertaking environmental projects, and evaluating their results. The educational goal is not merely to increase students' awareness, but to help them make informed decisions and demonstrate environmental responsibility through meaningful action.

Purposes of Developing Students' Ecoliteracy through the Local Environment

Developing students' ecoliteracy through the local environment aims to connect ecological knowledge with environmental values and responsible everyday practices. Rather than limiting learning to the identification of environmental problems, this approach encourages students to examine how their choices affect the ecological systems that support their lives. The local environment provides a relevant context for linking conceptual understanding with observable conditions and practical decisions. This integrated orientation aligns with Maurer and Bogner (2020) model of environmental literacy, which examines environmental knowledge, values, and reported ecological behaviour as interconnected dimensions rather than isolated learning outcomes. Within this framework, locally grounded ecoliteracy education can pursue five complementary objectives.

Developing environmental awareness and responsibility

The first objective is to help students recognise human dependence on ecosystems and

understand their responsibility towards other living organisms. Direct encounters with plants, animals, soil, and water can make ecological relationships more tangible. Students can explore how everyday actions, such as littering, wasting water, or damaging vegetation, affect the places they use. Hammarsten et al. (2019) identified three interconnected learning opportunities in children's forest-garden experiences: practical competence, learning to coexist and care, and biological knowledge and ecological understanding. These findings suggest that environmental responsibility can develop through opportunities to understand ecological relationships while participating in the care of living organisms.

Strengthening critical thinking and contextual problem-solving

The second objective is to enable students to investigate environmental issues rather than simply accept prescribed explanations or behavioural rules. Local problems, including waste accumulation, declining vegetation, or excessive resource use, can provide starting points for observation, questioning, discussion, and the evaluation of possible responses. Teachers can encourage students to consider different perspectives and explain the reasons behind their proposed solutions. Häggström and Schmidt (2020) showed that critical place-based learning in outdoor settings supported students' meaning making, agency, and opportunities to develop critical thinking. Accordingly, ecoliteracy education should position students as active interpreters of environmental conditions, not merely recipients of environmental instructions.

Supporting caring values and collaborative habits

The third objective is to provide opportunities for students to practise care, cooperation, and shared responsibility through environmental learning. Collaborative activities can invite students to negotiate tasks, listen to their peers, and reflect on how their actions affect others and the environment. These values should function as explicit learning goals rather than assumed consequences of outdoor participation. Ardoin and Bowers (2020) systematic review identified environmental literacy, cognitive development, and social-emotional development among the outcomes reported in early childhood environmental education. The review also highlighted nature-rich approaches that incorporated play, movement, and social interaction. Such evidence supports integrating ecological learning with developmentally appropriate opportunities to practise caring and collaborative relationships.

Encouraging meaningful participation in environmental activities

The fourth objective is to involve students in activities that connect learning with a clear purpose, such as maintaining school gardens, monitoring local biodiversity, or collecting information about environmental conditions. Meaningful participation requires more than completing tasks: students need opportunities to understand the problem, contribute observations, and discuss the significance of their work. Williams et al. (2021) found that participation in a classroom-based citizen science project modestly improved curricular knowledge and helped students feel that they were contributing to science. However, the project produced no meaningful improvement in nature connectedness or science identity. This finding highlights the need to design and evaluate participation carefully rather than assume that environmental activities automatically strengthen emotional connections with nature.

Building the capacity for informed and sustainable action

The fifth objective is to equip students with the knowledge, attitudes, intentions, and practical capabilities needed to make environmentally informed decisions. The educational aim is not to guarantee a "sustainable generation," but to strengthen students' capacity to contribute to sustainability within their circumstances. A meta-analysis by Van De Wetering et al. (2022), covering 169 studies and 176,007 participants, found that environmental education improved environmental knowledge, attitudes, intentions, and behaviour among children and adolescents. However, effects varied substantially, and behavioural outcomes relied predominantly on self-

reports. These findings support the potential of ecoliteracy-related education while underscoring the importance of assessing actual practices alongside students' understanding and stated intentions.

Taken together, these five objectives position the local environment as both a context for ecological inquiry and a setting for practising informed participation. The proposed approach combines observation, dialogue, collaborative activity, and reflection. Its educational purpose is to help students connect what they know about ecological relationships with how they evaluate choices and participate in caring for their surroundings.

Picture Story Method in Ecoliteracy Learning

The picture story method can be conceptualized as a teaching approach that combines sequential illustrations, oral or written narration, and guided discussion to support children's meaning-making. Rather than serving merely as decoration, pictures provide material that children can examine, interpret, and connect to narrative events. Evidence from a cluster-randomized intervention showed that narrative dialogic reading with wordless picture books improved preschoolers' literal and inferential narrative comprehension, as well as vocabulary breadth and depth. These findings provide a basis for using picture stories to support the language and comprehension skills needed to discuss environmental concepts (Grolig et al., 2020).

Picture stories can be presented through printed books or digitally enhanced formats, including augmented reality storybooks. However, the choice of medium should follow the learning objective rather than technological novelty. Danaei et al. (2020) compared children's comprehension of augmented reality and print versions of the same storybook, assessing comprehension through story retelling and recall. For ecoliteracy learning, this approach to assessment suggests that teachers should examine whether children can explain story events and reconstruct their meaning, rather than treating enjoyment or attention alone as evidence of understanding.

The educational value of picture stories also depends on the quality of teacher–child interaction. Interactive storytelling extends beyond reading a text aloud: teachers invite children to describe illustrations, explain unfamiliar words, and connect narrative events to their own experiences. Cabell et al. (2019) found that the quality of interactive book reading was positively associated with children's language and literacy development. Importantly, its association with expressive vocabulary depended on classroom organization. These findings indicate that productive storytelling requires both purposeful discussion and a classroom environment that supports children's participation.

Within ecoliteracy learning, narratives can provide opportunities to examine relationships between human activities, environmental change, and responsibility. Lindgren Leavenworth and Manni (2021) identified connections between children's reflections on sustainability and representations of environmental problems in climate fiction. Their analysis suggests that fictional narratives can create opportunities to discuss environmental concerns, alternative futures, and collective action. However, their study concerned older children and young-adult fiction, not a picture-book intervention with preschoolers. Its contribution therefore supports the conceptual rationale for environmental storytelling rather than proving its effectiveness in early childhood education.

To translate this rationale into classroom practice, teachers should select stories that connect environmental issues with children's experiences and create opportunities for active inquiry. Discussions can move from identifying a problem in the illustrations to considering its causes, consequences, and possible responses. For example, a story about a polluted river could prompt children to explain how waste reaches the water and propose ways to prevent it. These

examples represent instructional applications of the evidence, rather than activities tested in every cited study. Their design is consistent with Monroe et al. (2019), whose systematic review identified personally meaningful content, active teaching methods, deliberative discussion, and school or community projects as promising strategies in climate change education.

Picture-story activities should also connect classroom discussion with direct environmental experiences. Teachers can extend a story through plant observation, waste sorting, or other age-appropriate investigations related to its theme. Such activities should provide opportunities to apply and revisit ideas rather than assume that understanding a story automatically produces responsible environmental behavior. Ardoin and Bowers (2020) systematic review of 66 studies found that early childhood environmental education commonly supported environmental literacy, cognitive development, and social-emotional development, with many studies emphasizing play-based, nature-rich approaches involving movement and social interaction. Accordingly, picture stories are best positioned as one component of an integrated ecoliteracy approach that combines narrative understanding, dialogue, reflection, and practical engagement with the environment.

Picture Storytelling as an Approach to Fostering Students' Environmental Care Character

Picture storytelling offers a meaningful approach to introducing environmental issues and fostering students' environmental care character. Through this approach, teachers connect illustrated narratives with discussions about human responsibility toward nature. Environmental learning should extend beyond factual knowledge to include the skills and dispositions needed for responsible participation. Usmi and Murdiono (2021) identify environmental knowledge, ecological skills, and ecological character as complementary components of ecological citizenship education. This perspective provides a basis for designing storytelling activities that encourage students not only to recognize environmental problems but also to consider appropriate responses.

The combination of narrative and illustration provides a relevant starting point for this learning process. Kurnia et al. (2022) examined elementary school students' and teachers' views on ecology-themed storybooks. Their findings highlight teachers' preferences for picture books with explicit environmental themes, realistic narratives, recognizable characters, and conflicts involving humans and nature. These findings suggest that teachers should select stories in which environmental issues form the central theme rather than appear only as background information. Stories about caring for plants, protecting animal habitats, or reducing litter can therefore serve as starting points for classroom discussion. However, the study explored participants' views and preferences rather than experimentally establishing changes in environmental behavior.

Picture storybooks also offer opportunities to engage students with learning materials. Panjaitan et al. (2021), in their development of a picture storybook about the human excretory system, reported positive student responses across cognitive, affective, and conative dimensions. Although their research concerned science learning among secondary school students rather than environmental character education among young children, it supports the potential of illustrated narratives to attract interest and encourage engagement with scientific content. In environmental learning, teachers can build on this potential by selecting clear illustrations and accessible language, then inviting students to describe what they notice, explain the characters' decisions, and propose alternative actions.

Storytelling can also provide a structured context for discussing values. Nurhayati et al. (2022) examined storytelling activities involving children aged five to six and reported developments in the religious value categories observed across successive meetings. Their findings offer context specific support for storytelling as a medium for introducing values through guided learning. They do not directly demonstrate improvements in environmental care or empathy. Nevertheless, the approach can inform environmental storytelling activities in which

teachers ask students to evaluate characters' actions, identify who or what experiences harm, and discuss more responsible choices. Such questions make the intended values explicit without treating students as passive listeners.

The following sequence translates these considerations into a proposed classroom application. It represents an instructional synthesis rather than a procedure tested as a complete intervention in the studies cited above. At the planning stage, teachers identify the environmental behavior they want students to practise. Suitable objectives include caring for classroom plants, disposing of litter appropriately, or using water responsibly. Teachers then select a picture story that matches students' language abilities, prior experiences, and developmental characteristics. The selected story should contain a clear problem, understandable consequences, and actions that students can realistically undertake. Teachers also prepare illustrations, discussion prompts, practical materials, and a simple observation checklist.

During implementation, teachers begin by exploring students' existing experiences. For a story about plant care, introductory questions might include, "Have you ever looked after a plant?" and "What happened when nobody cared for it?" Teachers then tell the story while displaying the illustrations clearly and using appropriate intonation, facial expressions, and pauses. At selected points, they invite students to predict events, explain a character's decision, or suggest a solution. Questions such as "What could the character do differently?" and "How could we help in our classroom?" connect the narrative with students' own choices.

The discussion should lead to a manageable practical activity. For example, after listening to a story about a neglected garden, students can plant seedlings, agree on shared responsibilities, and take turns caring for them. Teachers should explain the purpose of each task rather than require students merely to imitate a character. The activity can continue through a classroom care schedule so that students have repeated opportunities to practise responsibility. This connection between learning and participation aligns with Siswanto et al. (2019), whose study of three Adiwiyata schools described environmental education integrated across subjects through participatory and sustainable programs. Their findings associated this approach with students' environmental understanding, attitudes, behavior, and practical competencies, rather than with a single isolated learning activity.

Assessment should examine both students' explanations and their actions over time. After storytelling and practical activities, teachers can invite students to retell the problem, describe their contribution, and explain why the activity matters. Observation can focus on specific behaviors, such as completing an agreed plant-care task, placing litter in the appropriate bin, or using water without unnecessary waste. Teachers can record whether students act independently, respond to reminders, or still require direct assistance. Feedback should identify the responsible action clearly, for example, "You checked the soil before watering the plant. That shows careful attention to what it needs." These observations provide a more useful basis for evaluating progress than students' ability to repeat the story's moral message alone.

Finally, environmental care should not be presented as an automatic or permanent outcome of a single storytelling session. Halimah and Nurul (2020), in their study of an ecovillage program, found that community environmental awareness remained constrained by educational, social, and economic factors. They emphasized education and active communication between government and communities as important elements in developing ecological responsibility. Although their research did not examine early childhood storytelling, it reinforces the need to situate environmental learning within a wider social context. Accordingly, picture storytelling should form part of sustained classroom practice, supported by opportunities for participation and communication with families. Its contribution lies in connecting environmental messages with discussion, practical responsibility, and continued reflection, while any claims about lasting behavioral change require further evidence.

Discussion

The findings suggest that ecoliteracy functions not merely as environmental content but as an educational process that connects ecological understanding, ethical reflection, and opportunities for responsible action. Integrating environmental knowledge with values of care and responsibility positions the curriculum beyond information transmission and toward the development of environmentally informed judgment. This interpretation is consistent Van De Wetering et al. (2022), whose meta-analysis found that environmental education improves young people's environmental knowledge, attitudes, intentions, and behavior, although these outcomes differ in magnitude. Accordingly, the contribution of the present intervention should be understood through the relationship between what children know, how they evaluate environmental consequences, and how they respond in practice, rather than through knowledge acquisition alone.

The integration of cognitive and affective learning also provides a more precise explanation of the intervention's character-building potential. Environmental concern becomes educationally meaningful when children can relate their emotional responses to accurate ecological explanations and appropriate actions. Ienna et al. (2022) found that environmental knowledge predicted pro-environmental attitudes and behavior more strongly than empathy in a predominantly adult Australian sample. Although this evidence cannot be transferred directly to young children, it cautions against treating emotional engagement as sufficient for environmental responsibility. In the present context, stories should therefore support ecological understanding rather than replace it with moral messages or emotional appeals.

The Picture Story Method offers a developmentally accessible way to introduce environmental choices and their consequences. Through characters, conflicts, and resolutions, children encounter examples of how individual decisions affect shared natural resources. Ebersbach and Brandenburger (2020) demonstrated that a short story featuring positive environmental role models improved ten-year-old children's sustainable behavior in a resource-dilemma game. This finding supports the interpretation that stories can do more than communicate environmental information: they can present actionable examples of cooperation and resource protection. However, evidence from a structured game does not establish that the same behavioral changes will occur automatically in everyday settings.

The value of storytelling also depends on how teachers help children connect narrative events with real-world processes. Walan Enochsson (2019) found that combining storytelling and drama supported scientific understanding among many participating children, but some recalled narrative elements without clearly connecting them to reality. Their findings help explain why the transition from picture stories to planting activities matters in the present study. Planting provides a concrete reference through which teachers can revisit the story's ecological messages and ask children to explain relationships among water, soil, plant growth, and human care. Such responses may indicate emerging causal reasoning. Nevertheless, participation in planting alone should not be interpreted as evidence of fully developed systems thinking.

The combination of narrative learning and direct environmental experience is also consistent with broader evidence on early childhood environmental education. Ardoin and Bowers (2020) identified environmental literacy, cognitive development, and social-emotional development as prominent outcomes across the studies in their systematic review. They also highlighted nature-rich experiences, play, movement, and social interaction as recurring pedagogical practices. Viewed in this context, the present method gains educational coherence by

connecting classroom representation with practical participation, rather than treating storytelling and outdoor activity as unrelated components.

Habituation represents a further implication of the findings, but its contribution requires careful interpretation. Repeated opportunities to care for plants may help children practice responsibility beyond the initial lesson. However, the argument should not assume that a single session cannot produce meaningful outcomes. Pan and Hsu (2020) reported improvements in several environmental literacy dimensions following a one-day program, with some effects remaining at a one-month follow-up. The stronger implication is therefore that repeated practice provides opportunities to reinforce and assess learning, while the durability of environmental habits requires evidence collected over time.

Moreover, translating environmental awareness into action depends partly on whether children can realistically perform the expected behavior. Kurokawa et al. (2023) found that environmental education improved students' knowledge and concern, while behavioral interventions influenced particular low-cost environmental choices. Although their participants were older than those in the present context, the findings highlight the importance of feasible actions. For younger learners, regular plant care, appropriate waste disposal, and careful water use offer specific practices through which teachers can connect environmental messages with observable responsibility. These activities should remain age-appropriate and supported, rather than placing responsibility for environmental degradation on children.

The distinction between participation and sustained behavioral change is particularly important when interpreting the intervention's effectiveness. Świątkowski et al. (2024) found an overall positive effect of interventions on children's pro-environmental behavior, while also identifying limitations in behavioral measurement. Consequently, enthusiasm during storytelling or willingness to join a planting activity should not serve as the sole indicators of success. Monitoring should examine whether children initiate environmental care, explain their choices, and continue relevant actions when immediate teacher prompting decreases. These indicators would provide a stronger basis for evaluating the proposed transition from guided participation to more independent responsibility.

Finally, the educator's role extends beyond presenting stories and organizing activities. Teachers need to connect scientific explanations, ethical questions, and locally meaningful opportunities for action. Bascopé et al. (2019) identified scientific action-integrated, community-based, and value-oriented approaches as central considerations for sustainability education in early childhood. These principles support interpreting the planning, implementation, and monitoring stages identified in the present study as an adaptable instructional framework, rather than an already validated model for all institutions. Its application elsewhere would require adjustments to children's developmental characteristics, available resources, and local environmental conditions.

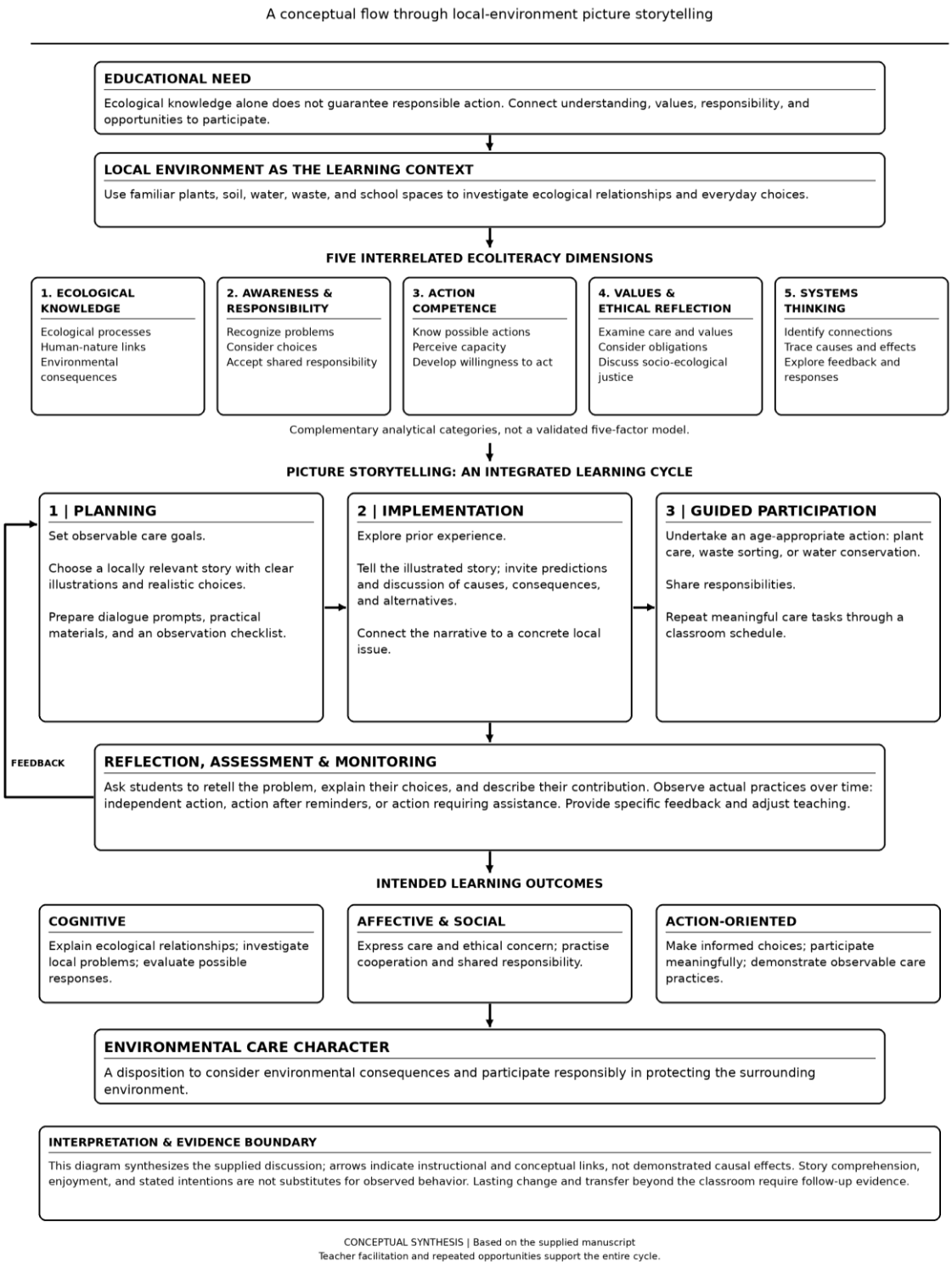


Figure 1. Conceptual framework for fostering students' environmental care character

Within this framework, interactive dialogue enables teachers to examine children's interpretations, address misconceptions, and connect environmental learning with daily experience. Monroe et al. (2019) identified personally meaningful information, active engagement, deliberative discussion, and school or community projects as important strategies in climate change education. Although their review addresses a broader educational context, these principles strengthen the rationale for combining picture stories, discussion, and practical environmental care. The contribution of the present method therefore lies in its integration of

narrative, ecological explanation, and supported action, while claims about enduring character development and transfer beyond the classroom remain questions for subsequent evaluation.

CONCLUSION

Environmental awareness character education needs to be introduced to students. One of the introductions made is through increasing understanding of ecoliteracy. The application of environmental care character is carried out to motivate the habit of managing the environment properly, avoiding the nature of damaging the environment, increasing sensitivity to the environment, fostering a spirit of care and responsibility for the environment. Environmental care character education for students is certainly given in accordance with the learning principles of pre-primary and primary level students, namely playing while learning. The way to introduce the early stages of environmental care to students is through habituation - habituation of environmental care characters at school using the picture story method. Storytelling with pictures is an effective way to introduce the environment to children. because stories are an effective method to increase children's awareness of social relationships and relationships with the surrounding nature.

Environmental awareness character education needs to be introduced to students because stories are an effective method to increase children's awareness of social relationships and relationships with the surrounding nature.

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