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ORIGINAL

Moving Out Of The Class And Developing Environmental Awareness: Experiential Learning Based Ecopedagogy In Action

Salir del aula y desarrollar la conciencia ambiental: la ecopedagogía basada en el aprendizaje experiencial en acción

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ABSTRACT

Introduction: integrating experiential learning into ecopedagogy provides a practical framework for fostering students' ecological intelligence and environmental awareness through authentic, context-based experiences. However, conventional science education in Indonesia remains dominated by classroom-based instruction, limiting students' engagement with real environmental issues. This study aimed to develop and implement the Experiential Learning-Based Ecopedagogy (ELCoCare) model to bridge theoretical understanding with environmental action.
Method: this study employed a descriptive qualitative approach to design, implement, and evaluate an experiential learning-based ecopedagogy model (ELCoCare) to enhance students' environmental awareness. The model comprised five experiential stages—experiencing, reflecting, constructing, performing, and continuing—integrated with ecopedagogical principles. Data were collected through observations, questionnaires, reflective journals, and interviews, and analyzed using a mixed-methods approach that combined descriptive statistics and thematic analysis.
Results: the findings indicated a marked improvement in students' environmental awareness, reflective thinking, and sense of ecological responsibility. Participants exhibited higher sensitivity to local environmental problems and developed innovative solutions through vertical and straightforward farming projects. The structured ELCoCare cycle effectively linked theoretical knowledge with action-oriented sustainability practices.
Conclusions: the ELCoCare model successfully enhanced students' environmental awareness and ecological intelligence by merging experiential learning with ecopedagogy. The approach promoted critical reflection, problem-solving, and sustainable behavior, preparing students to act as environmentally responsible citizens. The model demonstrates strong potential for integration into higher education curricula to strengthen sustainability-oriented teaching and learning.

Keywords: Ecological Intelligence; Ecopedagogy; Environmental Awareness; Experiential Learning; Sustainability Education.

RESUMEN

Introducción: la integración del aprendizaje experiencial en la ecopedagogía ofrece un marco eficaz para fomentar la inteligencia ecológica y la conciencia ambiental de los estudiantes mediante experiencias

auténticas y contextualizadas. Sin embargo, la educación científica convencional en Indonesia sigue dominada por la enseñanza en el aula, lo que limita la participación de los estudiantes en problemas ambientales reales. Este estudio tuvo como objetivo desarrollar e implementar el modelo de Ecopedagogía Basada en el Aprendizaje Experiencial (ELCoCare) para vincular la comprensión teórica con la acción ambiental.
Método: este estudio empleó un enfoque cualitativo descriptivo para diseñar, implementar y evaluar un modelo de ecopedagogía basado en el aprendizaje experiencial (ELCoCare) con el fin de fortalecer la conciencia ambiental del alumnado. El modelo comprendió cinco etapas experienciales —experimentar, reflexionar, construir, actuar y continuar— integradas con principios ecopedagógicos. Los datos se recopilaron mediante observaciones, cuestionarios, diarios reflexivos y entrevistas, y se analizaron mediante un enfoque de métodos mixtos que combinó estadística descriptiva y análisis temático.
Resultados: los hallazgos indicaron una mejora significativa en la conciencia ambiental, el pensamiento reflexivo y el sentido de responsabilidad ecológica de los estudiantes. Los participantes mostraron mayor sensibilidad hacia los problemas ambientales locales y desarrollaron soluciones innovadoras mediante proyectos de agricultura vertical y sencilla. El ciclo estructurado de ELCoCare vinculó eficazmente el conocimiento teórico con prácticas sostenibles orientadas a la acción.
Conclusiones: el modelo ELCoCare mejoró con éxito la conciencia ambiental y la inteligencia ecológica de los estudiantes al integrar el aprendizaje experiencial con la ecopedagogía. Este enfoque promovió la reflexión crítica, la resolución de problemas y un comportamiento sostenible, preparando a los estudiantes para actuar como ciudadanos ambientalmente responsables. El modelo demuestra un gran potencial para su integración en los planes de estudio de la educación superior y para fortalecer la enseñanza y el aprendizaje orientados a la sostenibilidad.

Palabras clave: Inteligencia Ecológica; Ecopedagogía; Conciencia Ambiental; Aprendizaje Experiencial; Educación para la Sostenibilidad.

INTRODUCTION

Knowledge, worldviews, values, and positive dispositions are posited to impact pro-environmental behavior that contributes significantly to environmental sustainability.[1,2] However, they may not lead to behavioral change that encompasses active participation in environmental conservation endeavors.[3] According to Jensen et al. behavior that directly or indirectly addresses environmental challenges could be developed through an action-oriented pedagogical framework.[4,5] This approach focuses on enhancing students' competencies to address environmental challenges at both the local and global levels.[4] These researchers contend that imparting knowledge without taking action may lead to a phenomenon termed "action paralysis", wherein students perceive environmental issues as insurmountable and exceedingly complex to resolve,[3] thereby compelling them to assume the position of an "armchair critic",[6] rather than actively participating in remedial efforts.

Environmental action encompasses deliberate decision-making, systematic planning, execution, and reflective practices undertaken by individuals or collectives to attain specific environmental outcomes.[5] Exemplary cases of environmental action may involve advocating for local governmental entities to adopt erosion control strategies along a stream bank in response to water quality analyses that reveal heightened sediment concentrations,[7] or revitalizing an urban lot for agricultural purposes to produce food for a local community kitchen, addressing the issue of insufficient access to fresh produce.[8] As an educational paradigm, environmental action does not aim to alter specific behaviors, such as recycling or water conservation; instead, it aims to motivate youth to participate in the strategic planning and execution of initiatives addressing environmental challenges they deem significant.[5] Beyond enhancing both natural and constructed environments, such experiences may foster youth development as active citizens through genuine involvement in community-related issues.[5,9] Therefore, to effect changes in students' behavior, educational practices must engage them in individual or collective initiatives to directly or indirectly address environmental challenges within the school or community context. Ecopedagogy is one educational approach that encompasses these paradigms.

Ecopedagogy is recognized as a more humanistic paradigm within environmental education[10], signifying that it can be construed as an educational framework grounded in the reciprocal interactions between living organisms and their respective environments, encompassing both the natural and social dimensions.[10] Nature-oriented pedagogy, which positions the human-nature relationship as its central theme and foundational principle, is conceptualized through three dimensions: acquiring knowledge about nature, learning within natural contexts, and deriving insights from nature.[11] The fundamentals of ecopedagogy include the protection of nature (natural ecology), the repercussions of societal activities on the environment (social ecology), as well as the influence over civilization and economic, social, and cultural composition (integrated ecology);

therefore, essentially, it promotes respect for nature, humans, culture, and diversity.[12]

The implementation of various ecopedagogical projects within schools is effective in changing students' environmental attitudes.[10] Nevertheless, it is also stressful because adherence to this concept should start in schools and social groups.[10] Ecopedagogies encompass multifaceted and varied frameworks and focal points; however, the subsequent fundamental components will be elucidated: problem-posing pedagogical methodologies, authentically democratic dialogue, praxis-based teaching, conflict-centered teaching, and teaching spaces as research spaces.[13] Furthermore, ecopedagogy frequently requires collaboration with alternative educational paradigms.

Experiential learning (EL) is a continuous learning cycle where students acquire knowledge by forming connections, observing, and engaging in reflective practices related to abstract concepts (theories) and their application to tangible experiences.[14] The criteria for experiential learning are predicated on participatory and interactive engagements, interactions with the environment, elements of variability and uncertainty, and student assessment and feedback.[15] Participatory engagements necessitate critical analytical and decision-making abilities, whereas interactive engagements encourage students to collaborate with peers, extending beyond the influence of the instructor.[15] Interaction with the environment involves "real-world" experiences, which inherently introduce aspects of variability and uncertainty that students must navigate.[15] EL theory is broad in scope, and understanding it requires effort.[16] As a result, establishing relevant learning activities for students, individually or in groups, requires careful planning. Besides, learning activities must be student-centered. Consequently, what the instructor has done, the students should do as well, and what teachers offer must be planned well.[16] Creating relevant learning activities for students, whether individually or in groups, that positively influence the social environment, as seen in ecopedagogy, offers a potential solution to these obstacles.

In Indonesia, science learning mainly occurs indoors, isolated from the natural environment, and focuses on transmitting environmental knowledge. For instance, at a public university in Indonesia, a significant number of students show little concern for environmental issues. Furthermore, the researchers discovered numerous brochures affixed to tree trunks throughout the campus, less harmonious peer relationships, and a notable lack of student awareness of environmental preservation. This phenomenon can be attributed to several determinants, including students' environmental awareness. This limits students' development of attitudes, skills, and engagement with environmental issues.[17] This situation arises from the absence of innovative learning model designs and educational tools to attain optimal conditions.[18] Another contributing factor is students' insufficient active participation in environmental initiatives. Based on the background mentioned above and the researchers' temporary observations of universities, this study focuses on developing a learning model that positively influences students' attitudes toward the environment by integrating real-life learning experiences that enhance critical thinking skills and enable self-evaluation. The experiential learning model guided by ecopedagogy is the focal point of this study. The proposed experiential learning framework, grounded in an ecopedagogical approach, aims to foster environmental awareness through a hands-on educational process. The learning activities promote students' environmental awareness by engaging with contentious issues and utilizing the environment as a vital educational resource. This paper will elucidate the methodology for developing such a learning model and its impact on students' environmental awareness.

Experiential Learning Based Ecopedagogy Model

Science education involves a wide range of elements beyond concepts, principles, and facts; it should include a systematic investigation of the natural world, frequently through discovery.[19] Unfortunately, science education often emphasizes theoretical constructs that lack practical application in real-world contexts, thereby hindering students' development of environmental awareness. Experiential learning represents an educational paradigm that prioritizes the development of behavior through prior experiential engagement.[20] Following Kolb's experiential learning cycle, students gain direct, collaborative, and reflective learning experiences through the four phases: concrete experience, reflective observation, abstract conceptualization, and active experimentation.[21] During the concrete experience phase, learners initiate their journey with hands-on engagements, collaborating in teams or individually to interact with authentic tasks derived from the real world. In the second phase, reflective observation, learners step back from their practical experiences to contemplate their actions and encounters. In the third phase, abstract conceptualization, learners aim to interpret what happened during the concrete experience phase by connecting the theories learned, ideas from the textbook, and ideas from their peers and instructors. Finally, in the fourth phase, active experiments, learners deliberate on the potential applications of their acquired knowledge to current and prospective practices. Within experiential learning environments, students can navigate real-life scenarios, experiment with novel behaviors, and receive constructive feedback within a secure context.[22] Assignments rooted in experiential learning facilitate students' ability to connect theoretical knowledge with practical application and to scrutinize real-world situations related to course content.[23] A recent study reveals that applying

experiential learning has significant benefits in the development of students' soft skills, encompassing critical thinking, advanced cognitive processing, curiosity, intrinsic motivation, and reflective capabilities[24] and allows group learning, where students exchange information, manage diverse perspectives, and can ask questions and address real problems.[25] Therefore, it is posited that experiential learning is a viable means of teaching science in a contextualized manner, thereby fostering environmental awareness among students.

Experiential learning frameworks often focus on short-term outcomes or isolated individual experiences, frequently overlooking the broader long-term effects on the environment and society,[16] which presents significant challenges for experiential learning in educational practices. According to,[16] there are four main challenges in applying the EL model to learning: (1) inadequate learning spaces and facilities; (2) a shortage of practical experience among teachers and instructors; (3) less focus on additional experiences aligned with students' competencies; and (4) ineffective classroom management. To overcome this, experiential learning can be combined with ecopedagogy.

As stated earlier, ecopedagogy comprises five fundamental aspects: problem posing, genuinely democratic dialogue, praxis-oriented instruction, conflict-oriented pedagogy, and educational environments.13 Paulo Freire describes problem-posing as a foundational framework for fostering critical thought, creativity, active engagement, and experiential problem-solving.[26] This approach encompasses a collaborative learning community dedicated to collective inquiry to enhance comprehension of pertinent issues and initiate action on significant concerns.[27] Dialogue is a pivotal element in a learning community, where students do not merely passively absorb the foundational knowledge disseminated by the educator. At the same time, praxis-based teaching is the core component of ecopedagogy.[27] Within this praxis, individuals cultivate a critical awareness of their socio-political reality (critical consciousness), which is posited to possess transformative potential for societal change. This enables students to understand the root causes rather than just surface-level solutions to problems. Conflict-centered learning holds that ecopedagogy is rooted in socio-environmental issues,[27] positioning the environment at the center of sustainability.[28] The last aspect is teaching space as a research space where students and teachers co-construct socio-environmental understandings and arguments with everyone in the learning space.[13] This requires ecopedagogy to engage in continuous self-reflection, analyzing and re-analyzing how teachers teach and interact with their students.[13] Ecopedagogies may function as independent methodologies or as pedagogical instruments integrated within other environmental educational frameworks, such as environmental education (EE) and/or education for sustainable development (ESD).[29] Praxis-based teaching, which means action and reflection, is the most crucial aspect of ecopedagogy because it profoundly influences the capability and the intrinsic motivation to engage in transformative action. In the praxis-based teaching, it can be combined with experiential learning.[30] Experiential education operationalizes theoretical constructs through curricula that may include service learning, international study programs, and student employment opportunities.[31,32,33]

Collaboration between experiential learning and ecopedagogy aims to cultivate environmental awareness through an experiential educational approach that positions learners as active contributors to the learning ecosystem. Learning activities concentrate on developing environmental awareness by engaging with controversial issues and utilizing the environment as an educational resource. This enables learners to take initiative, make informed decisions, and sustain both intellectual and emotional involvement with the environmental challenges at hand[31] with the environmental issue. In the teaching model that combines experiential learning with ecopedagogy, students are encouraged to reflect on and learn from outcomes, errors, and achievements, with mentors, peers, or educators providing support and guidance on current environmental issues. In experiential learning based ecopedagogy, more attention is placed on comprehensive activities across the subject to improve environmental awareness.

The term ecological pertains to the understanding of organisms and their interconnections within ecosystems, whereas intelligence refers to the capacity to learn from experience and to manage our environment proficiently.[34] Ecological intelligence depends on cognitive components related to environmental issues, as well as on awareness and sensitivity to their ramifications. Cultivating ecological intelligence is of paramount importance for nurturing students who will proactively advocate for nature, make conscious decisions, and act in environmentally friendly ways to raise environmental awareness. Environmental awareness is an attitude of caring for the environment that is needed to solve environmental problems and promote a clean, healthy environment.[35] If a nurturing attitude towards the environment is manifested through tangible actions, then students who exhibit environmental awareness will consistently endorse practices that promote ecological sustainability.[36] This behavior is essential for every individual to maintain the environment in good condition so that it can be passed on to future generations.[37]

METHOD

General Background

This study employed a descriptive qualitative approach to design, implement, and evaluate an experiential

learning-based ecopedagogy model (ELCoCare) to enhance students' environmental awareness. The foundation of the ELCoCare model integrates Kolb's experiential learning cycle — experiencing, reflecting, thinking, and acting — with ecopedagogical principles emphasizing environmental consciousness, sustainability, and transformative education. The research was conducted over multiple learning cycles in the context of experiential learning of science education. The model was designed to encourage students to engage directly with environmental problems, reflect on their experiences, conceptualize their understanding, and develop sustainable solutions through community-based actions. The implementation aimed to shift students from passive recipients of knowledge to active participants in environmental awareness. This process begins with an observation that combines students' experiences with observations of their environment. As seen in the results of the observations, students will be asked to reflect and experiment in various ways, draw conclusions, engage in experiential learning through decision-making about the actions taken, and conclude with a reflection on the findings to determine whether they support sustainability. Regarding the thoroughly integrated experiential-ecopedagogy, the case study presented in this paper focused on improving environmental awareness through ecological intelligence, driven by the learning model.

This research was implemented during the 2024-2025 academic year, specifically from the second semester of 2024 to the first semester of 2025. The study was conducted at various public universities in Solo Raya Regency, Indonesia, a metropolitan area in Central Java Province. The selection of this location was based on its accessibility and the institution's representative characteristics of higher education institutions in the region.

Participant

The participants in the study were undergraduate students enrolled in an environmental education course at four public universities in Solo Raya, namely Sebelas Maret University (UNS), Slamet Riyadi University (UNISRI), Muhammadiyah University of Surakarta (UMS), and Veteran Bangun Nusantara University (UNIVET). The sample is selected based on the study program's accreditation status, the availability of students taking courses, and the institution's readiness to implement learning experiments. The research sample consisted of classes from each university, both experimental and control, with the total number of students adjusted to field conditions. A total of 177 students were purposively selected to participate in the implementation phase. The demographic characteristic was explained in table 1. The inclusion criteria are: active students, second-year students from a science class, and those willing to participate in this research (informed consent). The exclusion and exit criteria are the students who are not active or who resign from the study program and are not able to join this research (informed consent).

Table 1. Demographic participant

Characteristics / Criteria	Types / Description	Frequency (%)
Gender	Male	45
	Female	132
Highest Education	UNS	44
	UMS	45
	UNIVET	44
	UNISRI	44
Age	19-22	All the participants (177)

All the students involved in this research were selected randomly without any specific criteria, and the participants came from diverse academic backgrounds but shared an interest in environmental issues and sustainability education. During the implementation, students were divided into several small groups to facilitate collaboration and engagement in outdoor learning activities. Each group was assigned specific environmental topics related to campus and community sustainability, such as waste management, biodiversity observation, and eco-friendly practices.

Instrument Procedure

Several instruments were developed to assess the effectiveness of the ELCo-Care model. These include: (1) Observation sheets to monitor students' participation, collaboration, and involvement during experiential learning activities. (2) Questionnaires to measure changes in students' environmental awareness, attitudes, and understanding before and after the intervention. (3) Review Literature to document students' personal experiences and insights gained from each learning cycle. (4) Interview guidelines to collect qualitative feedback about the learning process and its perceived impact. The questionnaires or statements used were prepared based on the previous research and literature review.[38,39,40,41] Based on the experiential learning - ecopedagogy model indicators, 15 statement were developed for the questionnaire. The statement was designed using a

4-point answer-choice scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD), as shown in table 2.

Table 2. Sample question of Questionnaire

Aspect	Assessment Criteria
Experiencing	1. Students demonstrate active engagement throughout the experience-based learning process. 2. The experiencing phase effectively introduces students to simple agricultural techniques. 3. Students conduct environmental observations according to instructions.
Reflecting	1. Students can reflect on their learning experiences effectively. 2. Students can connect experiences with their prior understanding.
Constructing	1. Students can construct concepts from the experiences and reflections they have undertaken. 2. The constructing activities help students understand simple agricultural concepts. 3. Students formulate concepts/ideas based on reflection results. 4. Students demonstrate conceptual understanding from group discussions.
Performing	1. Students demonstrate the ability to apply the concepts they have learned. 2. Students can implement theory in accordance with what was learned in the constructing phase. 3. Students can provide concrete examples of concept application.
Continuing	1. Students possess motivation to continue environmental care actions after the learning session ends. 2. The continuing activities ensure students persistently apply the concepts they have learned. 3. Students demonstrate commitment to sustaining the learned practices in daily life.

The implementation process followed the stages of experiential learning — experiencing, reflecting, constructing, performing, and continuing — and will be described in depth in the research results.

Data Analysis

Data analysis used a mixed-method approach, combining quantitative and qualitative techniques. Quantitative data from questionnaires were analyzed using descriptive statistics (mean, percentage, and standard deviation) to assess improvements in environmental awareness and student attitudes. Qualitative data from observations, interviews, and reflective journals were analyzed using thematic analysis, focusing on recurring patterns in learning engagement, ecological awareness, and behavioral changes. The integration of quantitative and qualitative findings provided a comprehensive understanding of the ELCoCare model's effectiveness. In this paper, the researcher focuses on the qualitative data of Design-Based Research.

Ethical considerations

Universitas Sebelas Maret Surakarta granted permission to research on June 20, 2024 (letter Number 12383/UN27.02/PK.03.08/2024). This research has also been approved by the PGSD Study Program at Universitas Muhammadiyah Surakarta, Universitas Sebelas Maret, Universitas Slamet Riyadi, and Universitas Bangun Veteran Sukoharjo. In addition, written consent to participate was obtained from the students. Respondents gave their consent without coercion from anyone. All data obtained remained confidential to protect respondents' rights and privacy.

RESULT

The Framework Model

The researchers have formulated a model design of Experiential Learning-based Ecopedagogy that prioritizes direct experience as the fundamental resource for comprehending and addressing environmental challenges. This model integrates experiential learning principles with the ecopedagogy framework, defined as environmental education grounded in environmental awareness. The subsequent outline delineates the design of the Ecopedagogy-based Experiential Learning model, designated as ELCoCare (experiential learning and ecopedagogy for cultivating awareness and responsibility for the environment).

The initial stage is experiencing. This stage facilitates students' knowledge acquisition through diverse, tangible experiences that utilize natural learning resources. According to Kolb, experience is the central element of the learning process.[42] Concrete experiences can facilitate the development of immediate personal experience, imbuing abstract concepts with life, texture, and subjective meaning, while concurrently

offering a tangible, collectively shared reference point for evaluating the implications and validity of the ideas formulated during the learning process.[42] At this stage, each learner participates in an activity or task. Kolb posited that the essence of learning lies in active engagement with the designated task. [21] During this stage, students participate in outdoor learning experiences that extend beyond the traditional confines of the classroom, engaging in activities such as (a) traversing their local neighborhoods, (b) visiting riverbanks, (c) exploring gardens, forests, or other locales where they can observe the environmental issues manifesting within their vicinity.

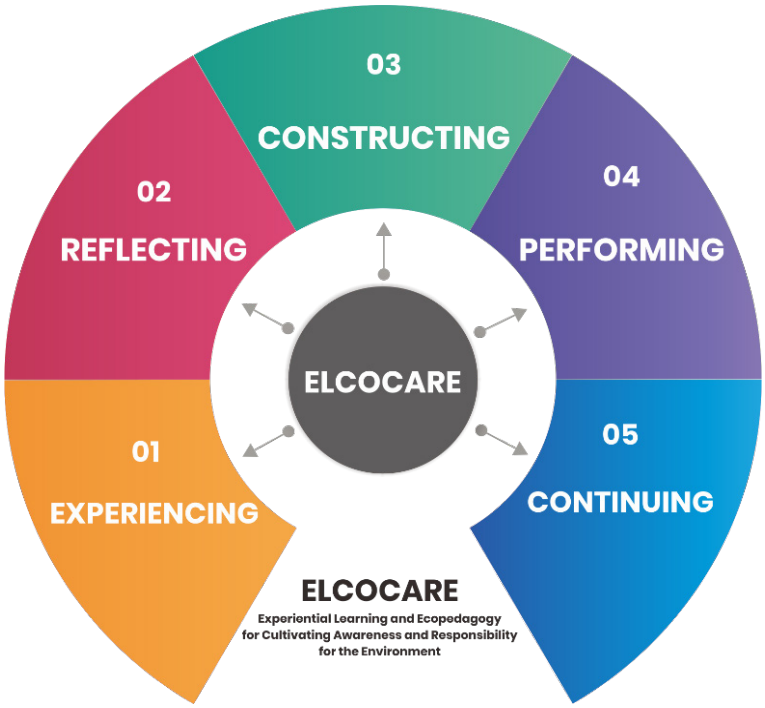

Figure 1. Desain Experiential Learning Based Ecopedagogy Model

The second stage is reflection, in which, following participation in the Experiencing stage, the learner retreats to contemplate the task undertaken. During this stage, the learner formulates inquiries and engages in discourse with peers about the experience. A critical facet of this stage is "communication," which enables the learner to discern discrepancies.[21] This stage enables students to pursue answers by contemplating the occurrences in their environment through their observations, thereby fostering the development of inquiries regarding the reasons and mechanisms underlying these events. The reflecting stage can help students to continue learning through experience and reflection in their self-learning journey.[43]

The third stage is constructing. This stage requires students to logically analyze various concepts and take actions based on their comprehension of specific situations. Subsequently, the learner acquires a deeper understanding of the experience through abstract conceptualization, which is integrated through active experimentation.[44] At this stage, students are empowered to investigate references in the form of texts to ascertain their capacity to elucidate environmental concerns, their origins, and potential resolutions.

The fourth stage is performing. This stage allows students to apply the concepts, theories, or regulations they have assimilated in real-world contexts. This process may engender in students a learning style characterized by assimilation,[45] wherein instruction and elucidation are essential, potentially undermining the efficacy of a more experiential, learning-by-doing approach.[24] Students collaborate on group initiatives to devise solutions to environmental challenges, aiming to translate knowledge into actions that foster environmental sustainability.

The final stage is continuing. This stage encompasses formulating a follow-up strategy designed to ensure the continued success of environmental conservation efforts after initial activities are completed. Here, students create more specific measures to address their environmental challenges. They plan long-term initiatives to foster positive change and ensure conservation efforts endure and have a meaningful impact on future generations. More recently, an experiential learning technique has been assigned to students on real projects.[43] These projects allow students to collaborate with organizations and solve actual environmental issues. It has been noted that real projects serve as a bridge between theory and practice, helping students integrate classroom knowledge and maintain continuity.[43] For sustainability, continuing means committing to an environmentally friendly lifestyle.[46] Meanwhile, from a humanist perspective, continuing demonstrates the importance of sustainable ecological solidarity through the establishment of green communities, the education

of future generations, and the strengthening of a sense of collective responsibility towards the earth.[47] This stage ensures that actions are not temporarily stopped but develop into a collective ecological culture centered on moral values and sustainability.

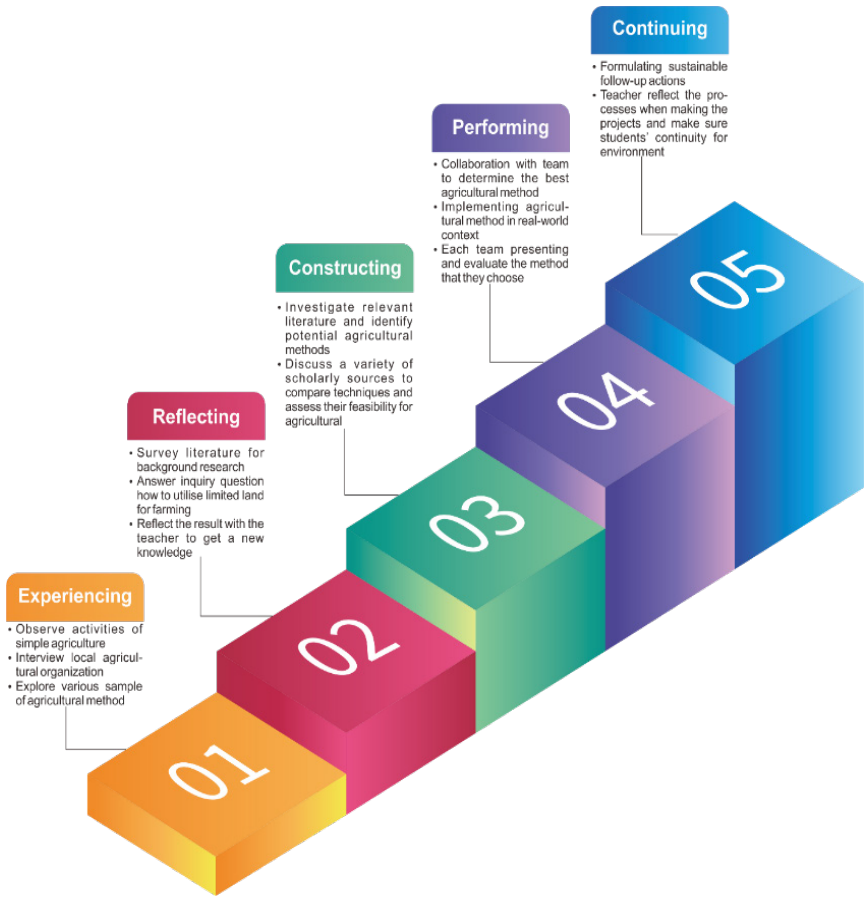

Figure 2. Implementation Process

The Implementation Model of ELCoCare

This model was carried out in an offline, outdoor learning environment across three themes: waste management, simple farming, and environmental pollution. The model was established within six weeks, with each theme taking two weeks. The presentation of the work was made the following week after they received the syntax of the ElCoCare Model. The time allocated to the topic in both the control and experimental classes is shown in table 3. Each activity lasted 2 hours of class time (100 minutes).

The ElCoCare model is only taught in an experimental class. In the lectures and practical courses, the pre-service teachers were questioned and observed on the environmental issues related to the topics. There was a discussion about how to build a solution for the environmental issue based on their prior knowledge and literature review. In the reflection section, students must present their results and discuss with the lecturer the best solution for the topics. The methodology applied in the control class (CC) is a traditional approach that delivers theoretical lectures, each covering a listed topic. Concerning the lecturer (L), presentational methods were used to discuss the learning content. A practical class (PC) was established based on the initial lecturer orientation of exercises and problems at the beginning of each period. The last is a reflection session to review the responses given to the project that had been made.

Table 3. Time Distribution of the study plan in the Experimental Class (EC) and Control Class (CC)

	Topic 1 (Waste Management)		Topic 2 (Environmental Pollution)		Topic 3 (Simple Farming)	
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
EC	L & PC	Ref	L & PC	Ref	L & PC	Ref
CC	L & PC	Ref	L & PC	Ref	L & PC	Ref

EC: Experimental Class; CC: Control Class; L: Lectures; PC: Practical Classes; Ref: Reflection

This paper will explain how simple farming works. Under the lecturers' instructions, the project was

implemented independently and in groups, so each group produced a different design result. A group consists of 3–4 students. Figure 2 illustrates the implementation of this learning model. Students from the four universities demonstrated diverse outcomes, reflecting differences in their backgrounds and the universities' learning cultures. The experience was established during the initial meeting. In contrast, the second meeting encompassed reflecting and constructing, the third meeting facilitated the application of the project (performing), and the last meeting focused on continuing.

In the experiencing stage, students engaged in empirical fieldwork by visiting a densely populated urban village that exemplified initiatives centred on community-based food security. This location was intentionally selected for its alignment with the principles of simple urban agriculture, which emphasize optimizing agricultural outputs despite limited land. During this phase, students documented various local farming practices, such as veltikultural, hydroponic, and polybag systems, implemented by local women's farming organizations that had adeptly established small-scale food production systems within confined areas. The observational methodology employed in this phase facilitated students in acquiring personal experience in sustainable food resilience strategies applicable in contexts of constrained urban land.

Following the observation, students moved on to the reflection stage, which was supported by structured inquiry questions designed to encourage critical analysis of small-scale farming practices. The reflection focused on effectively utilizing limited land resources to enhance food resilience at both household and community levels. Particular attention was given to the role of local women's farming organizations, which actively promote urban agriculture through collective efforts. Students completed guided worksheets (LKPD), as shown in figure 3, to strengthen the reflection process, foster analytical thinking, and link their field observations to broader agricultural issues.

During the constructing stage, students were encouraged to investigate relevant literature and identify potential agricultural methods to address the issues observed during the experiencing stage. At this point, students had not yet determined the specific techniques used in the field. However, they were tasked with exploring a variety of scholarly sources to compare techniques and assess their feasibility within similar contexts. This stage emphasized the importance of grounding their understanding and subsequent actions in evidence-based agricultural strategies derived from academic research.

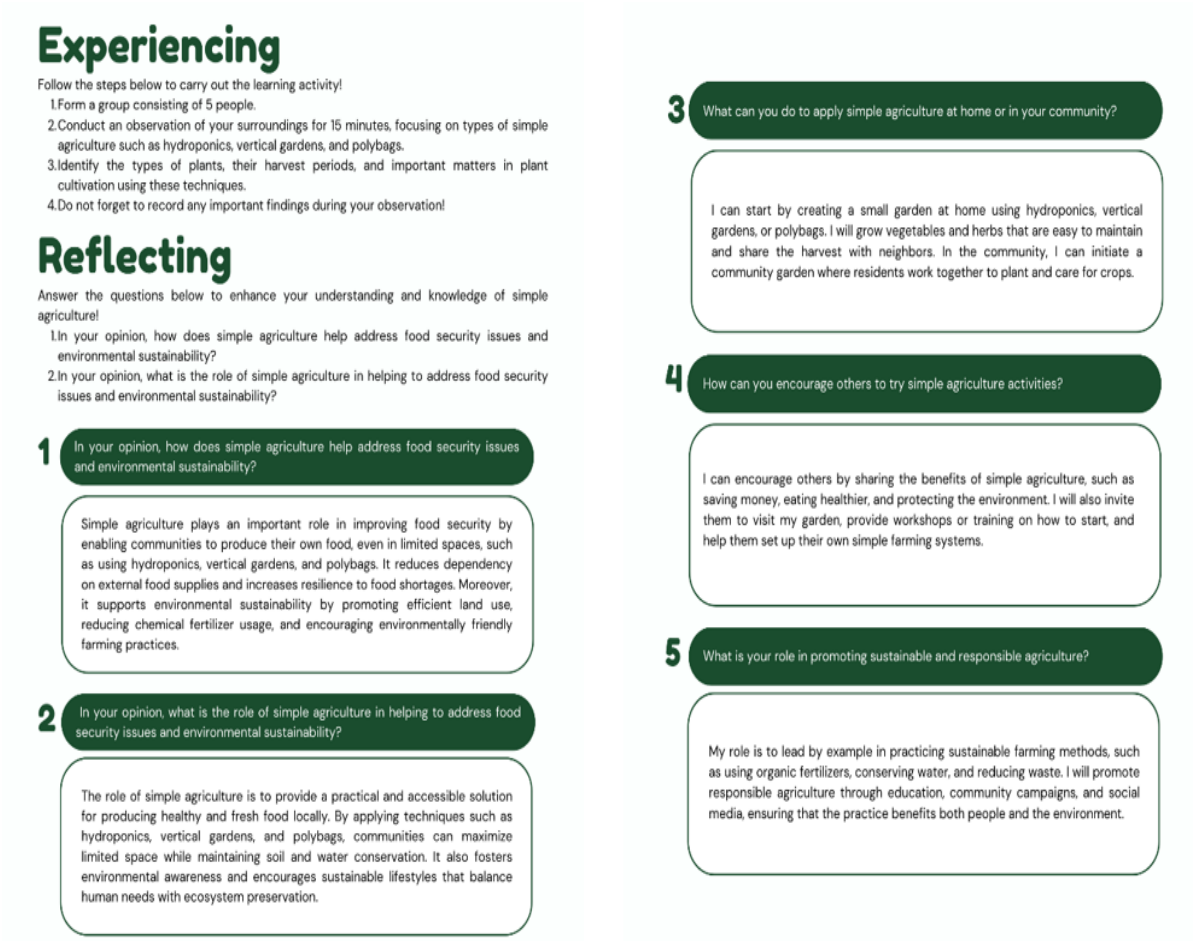

Figure 3. Student Worksheet of Simple Farming

In the performing stage, students selected one of the agricultural methodologies examined during the constructing phase and implemented it in a real-world context. They conducted site assessments to identify areas within the community that were conducive to applying their chosen method. This experiential activity involved hands-on practice and experimentation with urban farming techniques, allowing students to evaluate the effectiveness of their approach in an authentic setting. This stage aims to apply knowledge to action for social and environmental justice, health, and sustainability.

The final stage, continuing, focused on guiding students in formulating sustainable follow-up actions based on the methodologies they had employed. Students were encouraged to devise community outreach strategies, especially targeting familial environments, to advocate for adopting simple farming practices that contribute to food security. This stage culminated in a reflection on prospective actions, including the design of individual or group action plans to ensure the continuity and scalability of their initiatives. Finally, students could propose long-term strategies to advance their projects beyond the course duration.

The results of the learning implementation using the Experiential Learning model based on Ecopedagogy, conducted by students, are presented in table 4.

Table 4. Observation Results of Experiential Learning Implementation Based on Ecopedagogy

No	Aspect	UNS	UMS	UNISRI	UNIVET	Mean	Category
1	Opening activities	4,00	4,00	4,00	4,00	4,00	Good
2	Core activities						
	a. Experiencing	3,50	4,00	4,00	4,00	3,87	Good
	b. Reflecting	4,00	4,00	3,50	4,00	3,87	Good
	c. Constructing	4,00	3,50	4,00	4,00	3,87	Good
	d. Performing	4,00	4,00	4,00	4,00	4,00	Good
	e. Continuing	4,00	4,00	4,00	3,50	3,87	Good
3	Closing activities	4,00	4,00	4,00	4,00	4,00	Good

Based on table 4, the opening and closing activities had a mean score of 4,00, indicating good execution and optimal performance. The core activities showed significant improvement across all dimensions of the Experiential Learning framework. The Experiencing phase earned a mean score of 3,87 across the four institutions, with PGSD UMS, UNISRI, and UNIVET reaching the maximum score of 4,00, while PGSD UNS scored 3,50. This indicates that students are actively engaged in practical experiences and hands-on activities throughout the learning process. The Reflecting phase also achieved a mean score of 3,87, with three institutions (PGSD UNS, UMS, and UNIVET) attaining 4,00, while PGSD UNISRI scored 3,50. This suggests that students were actively involved in reflective observation and critical analysis of their learning experiences. The Constructing phase had a mean score of 3,87, with PGSD UNS, UNISRI, and UNIVET reaching 4,00, while PGSD UMS scored 3,50. This demonstrates students' ability to construct new knowledge and develop conceptual understanding through abstract conceptualization. The Performing phase achieved the highest mean score of 4,00 across all institutions, reflecting exemplary implementation of active experimentation and skill demonstration. All students effectively applied their newly acquired knowledge and skills in practical contexts. The Continuing phase recorded a mean of 3,87, with PGSD UNS, UMS, and UNISRI reaching 4,00, while PGSD UNIVET scored 3,50. This indicates that students showed a strong commitment to maintaining and expanding their learning beyond the classroom, in line with ecopedagogy principles of ongoing environmental awareness and action.

Overall, the execution of Experiential Learning grounded in Ecopedagogy yielded optimal outcomes, with all components rated Good. The consistent performance across all phases of the experiential learning cycle and among different institutions substantiates the efficacy of the pedagogical approach. The incorporation of ecopedagogy principles augmented students' active engagement in experiencing, reflecting, constructing knowledge, performing skills, and perpetuating their environmental learning journey. These findings indicate that the model successfully facilitated meaningful learning experiences while advancing ecological literacy and sustainable practices among pre-service teachers.

DISCUSSION

Outdoor learning, or moving out of the classroom, constitutes a participatory pedagogical approach in which recreational activities situated in natural landscapes are central to the educational experience.[25] Within this context, outdoor learning, a specific domain of experiential education, entails an educational

process in which learners are immersed in distinctive physical and social contexts, subsequently engaging in a series of problem-solving tasks that induce a state of adaptive dissonance,48 which learners navigate through mastery, consequently reorganizing the meaning and trajectory of their educational encounters.[49] The high scores achieved in the Experiencing phase (M = 3,87) across all four institutions substantiate this theoretical premise, indicating that students actively engaged with natural environments as primary learning contexts rather than passive classroom settings. The high scores achieved across all phases—Experiencing (M = 3,87), Reflecting (M = 3,87), Constructing (M = 3,87), Performing (M = 4,00), and Continuing (M = 3,87)— assertion that learners immersed in distinctive physical and social contexts engage in meaningful problem-solving tasks that induce adaptive dissonance, which they navigate through mastery, consequently reorganizing their educational experiences.[50] The progression from the Experiencing phase to the perfect score in the Performing phase provides empirical evidence that students successfully transformed cognitive disequilibrium into demonstrable competencies.[51] and that optimal learning occurs when environmental challenges appropriately match learner capabilities. Furthermore, the integration of ecopedagogy principles, as reflected in the Continuing phase, extends beyond traditional experiential learning frameworks by embodying commitments to sustained environmental awareness and ecological consciousness.

Ecopedagogy's fundamental aspects, including problem posing, genuinely democratic dialogue, praxis-oriented instruction, conflict-centered interest, and teaching space, are the primary foundation for successfully developing environmental awareness through experiential learning. This hierarchy is explained in figure 4. As stated by Paulo Freire, problem posing encompasses a collaborative learning community dedicated to collective inquiry,[27] It needs abstract conceptualization to connect ideas, linking to existing knowledge to foster creativity, active engagement, and experience-based problem-solving. In the context of problem-posing, abstract conceptualization enables learners to transcend the particulars of immediate experience by identifying underlying patterns, principles, and theoretical frameworks. In the context of simple farming, this approach addresses pressing environmental concerns while simultaneously cultivating students' creative and critical capacities. Simple farming—encompassing practices such as vertical farming, hydroponics, and other low-resource-intensive methods presents viable solutions for optimizing food production within confined urban and peri-urban settings. To effectively integrate experiential learning-based ecopedagogy, a project called Simple Farming is designed, as shown in table 5.

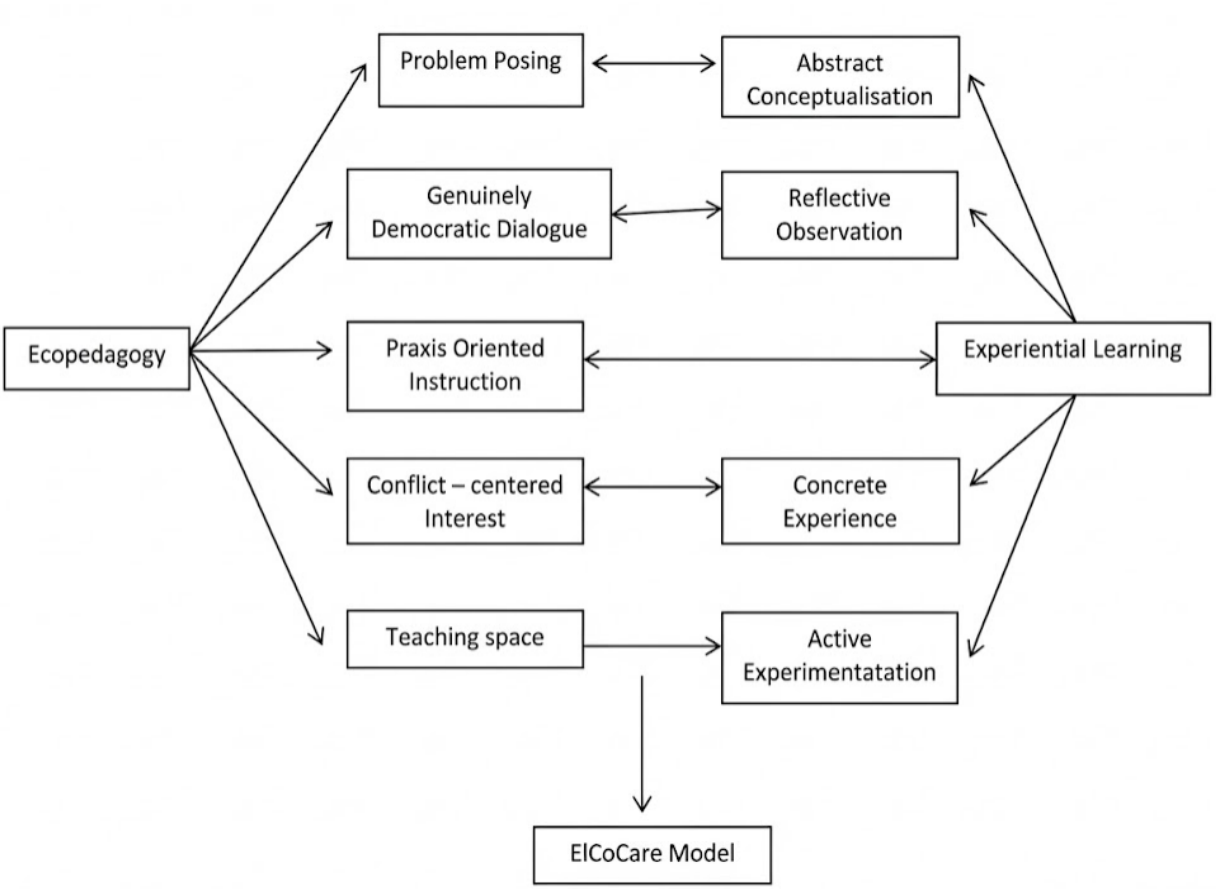

Figure 4. The hierarchy of the Experiential learning based ecopedagogy model

Table 5. Matrix of Experiential Learning Based Ecopedagogy Model in line with environmental awareness

Stage of Experiental Learning based Ecopedagogy	Activity based on the Students' Worksheet		Environmental Awareness
	Lecturer	Students	
Experiencing	Directing students to engage in a critical examination of the conditions of their surrounding environment.	Engaging in observation, participation, and direct interaction with the environment.	Students can perceive the ramifications of environmental degradation, which inspires a commitment to stewardship and proactive measures.
Reflecting	Guiding students to respond to reflective inquiries grounded in their observations. Responding to reflective inquiries through collaborative discussions with peers.	Answering reflective questions through discussions with group members	Students critically evaluate the consequences of human activities on the environment, thereby enhancing their understanding of the significance of nature conservation.
Constructing	Instructing students to explore relevant literature and cultivate a comprehension of concepts pertinent to the observed environmental issues.	Reviewing literature and participating in group discussions	Through literature review and group discourse, students construct a nuanced understanding of concepts and theories associated with environmental challenges
Performing	Encouraging students to implement their understanding in practical contexts via experimental endeavors.	Applying the knowledge and skills gained through experimental activities	By applying the knowledge and competencies acquired through experimental activities, students assume direct responsibility for environmental conservation.
Continuing	Guiding students to formulate follow-up strategies within their respective ecological contexts.	Formulating follow-up strategies intended for implementation after the conclusion of activities.	Students are dedicated to environmental sustainability.

The genuinely democratic dialogue, designed to emerge from reflective observation, is intended to analyze the experience from multiple perspectives, using dialogue to help students actively absorb knowledge. This collaborative framework requires that all participants—both educators and students—engage as co-learners, bringing diverse perspectives, experiences, and knowledge to the collective inquiry process. Students observe and explore directly by asking local women's farming organizations to acquire knowledge and gain their own experience. Their own experience can change their behavior, especially their interaction with the environment. [50] Behavior exerts a profound influence on and induces changes in the environment, while, conversely, environmental factors significantly shape and alter behavior.[50,52] Through dialogue, knowledge construction emerges faster than unidirectional transmission.

The core of the ecopedagogy is praxis-oriented instruction. Combining experiential learning encourages learners to analyze issues from multiple perspectives, question underlying assumptions, and develop critical consciousness under examination.[31] Experiential ecopedagogy provides authentic contexts wherein theoretical knowledge is applied, tested, and refined through direct interaction with real-world phenomena. Conflict-centered interest arises from concrete experience rooted in socio-environmental issues and positions the environment as a sustainable means for developing the critical consciousness, practical competence, and transformative agency necessary for addressing contemporary ecological challenges. To maintain its existence, the organism must survive, adapt to its environment, remain active, and meet its needs in highly variable environments.[53] This situation can only be achieved through learning activities in natural environments, which help develop interpersonal relationships and help individuals better understand their relationships with the natural environment. The researcher's chosen topic is simple farming. Simple farming systems have emerged as a strategic response to contemporary environmental challenges, particularly those associated with limited arable land availability. In the context of rapidly increasing population density, the demand for food continues to escalate, while the expansion of agricultural land is severely constrained. This imbalance necessitates the development of innovative and space-efficient agrarian practices. Providing individuals with environmental attitudes, environmentally friendly behaviors, and competencies essential for protecting and enhancing the environment will facilitate the development of environmental awareness.[54]

The last aspect is teaching space. Teaching space means a methodology of teaching.[13] Active experimentation encourages students to modify existing techniques, combine approaches synergistically, or develop novel solutions responsive to specific environmental and social contexts. The teacher's role shifts from authoritative knowledge dispenser to facilitator, posing authentic problems that resonate with students' lived realities and societal concerns. Simple farming serves as a particularly effective instructional tool for this approach, as agricultural systems encapsulate the intricate interrelations among ecological, social, and economic dimensions that define sustainability challenges. Involving students in the assessment and selection of suitable agricultural

techniques—taking into account environmental ramifications, contextual relevance, and practical viability—nurtures both critical analytical abilities and innovative adaptability skills that are indispensable for the practice of sustainability.

Knowledge or concepts acquired in external settings exhibit higher retention among students and, in many instances, provoke a novel array of inquisitive inquiries.[34] Following the observation phase and the assimilation of personal experiences, learners participate in a structured reflective process to consolidate and restructure their conceptual understanding. This reflection is implemented through the completion of a guided worksheet (LKPD). Such reflective engagement is believed to foster the cultivation of critical thinking abilities, innovative thought processes, and creativity, as a cognitive reaction elicited by initial observational tasks, as articulated by Charyton and Merrill[55] and Wurdinger.[56] Constructivist theorists state that experiential learning occurs when individuals are "consciously involved in the construction of units" by observing how they are developed.[57]

The most crucial stage in the ELCOCARE model is performing, which encompasses stimulation training wherein students operationalize their acquired knowledge in reflective and constructive contexts. Our assessments indicate that students value discussions of various simple agricultural techniques and the opportunity for hands-on practice. The outcomes of the students' initiatives can be illustrated in figure 5.

The evaluations further elucidate that interactions with and feedback from educators are perceived as exceedingly beneficial. This aligns with the existing simulation literature, underscoring the importance of practical guidance from teachers and of providing feedback to enhance the learning experience.[58] Students operationalize theoretical constructs and foster an embodied connection with sustainability principles by actively implementing these practices in simulated or real-world microenvironments.[41] Empirical evidence from garden-based learning and similar hands-on pedagogical approaches consistently demonstrates that students who engage in direct cultivation exhibit significantly heightened environmental awareness and a more profound sense of ecological responsibility.[50,54] Consequently, such experiential engagement fosters greater environmental sensitivity, equipping learners to be more attuned to pressing ecological issues in their future academic and civic lives.[59]

Figure 5. Student's Project of Simple Farming

The improvement of students' environmental awareness through the implemented model can be attributed to its provision of direct experiential learning opportunities in ecopedagogy via investigative activities addressing local environmental issues. Such activities enable students to interact with natural settings and examine diverse

environmental problems, thereby allowing them to formulate appropriate solutions and fostering a heightened sense of environmental awareness and responsibility.[60] From an environmental perspective, students are allowed to assume responsibility for their surroundings, directly influencing their own lives and developing a personal approach to addressing global environmental challenges.[61] Moreover, student environment interaction facilitates a holistic understanding of how and why a given environment affects their lives and the reciprocal impacts of their actions on the environment. [62] In other words, students can perceive phenomena encountered in their environment from multiple perspectives, enhancing their capacity to determine appropriate attitudes and actions for environmental stewardship and responsibility.[63]

Students explored several responses and suggestions after finishing the projects. Based on their responses, the researchers use it to reflect on and improve the projects. Some of the reactions are:

"*Implementing this learning model has enhanced my activeness and creativity during the learning process*." (Students 1, March 2025)

"*Direct experience through this model has facilitated a deeper understanding of the subject matter*." (Students 31, March 2025)

The participants expressed their enthusiasm for completing the project. They enjoy learning science related to everyday life, thereby enabling them to understand and address the challenges posed by environmental concerns. Regarding their interest in this project, it will affect their understanding of learning science. Teachers can significantly shape students' interests in science; the support and influence of science instructors ultimately dictate students' outlook, determining their level of engagement or disinterest. Teachers can also influence students' interest in science.[60] The support and role of science teachers will also be evaluated to determine whether they are interested or not.[64] Researchers argue that one reason for students' interest in science is the teaching methodology.[65] Consequently, teachers must deliver instructional experiences that captivate students' interest in science. This pedagogical model may be a viable alternative. This framework aims not only to contextualize scientific concepts but also to raise students' awareness of environmental issues, thereby equipping them with the knowledge needed to address future challenges related to environmental sustainability. Furthermore, the model encourages students to take initiative in proposing and maintaining ecological solutions, highlighting the potential of experiential ecopedagogy to prepare future citizens who are knowledgeable and dedicated to tackling local and global environmental challenges. Therefore, ELCoCare offers a pedagogically strong and flexible framework for integrating sustainability education into higher education curricula, with promising potential for expansion across diverse socio-ecological settings.

The ElCoCare model is characterized by several limitations that warrant acknowledgment. Firstly, the sample size was comparatively constrained and comprised exclusively of Indonesian pre-service educators, which may limit the generalizability of the findings to alternative contexts or populations. The cultural and educational specificity of the sample suggests caution when extrapolating these results to pre-service teachers in different geographical or institutional settings. Secondly, the nature of this study precluded long-term follow-up on participants' behavioral modifications and professional practices. As a result, it remains unclear whether the observed effects persisted over time or translated into sustained changes in teaching methodologies once participants transitioned into the profession. Future research employing longitudinal designs with diverse, larger samples across multiple contexts would provide more robust evidence regarding the durability and transferability of these findings.

CONCLUSIONS

This study shows that the Experiential Learning-Based Ecopedagogy Model (ELCoCare) effectively enhances students' environmental awareness and ecological responsibility by combining direct, reflective, and action-oriented learning experiences within real environmental contexts. Students can connect theoretical ideas with practical actions through a structured sequence of experiencing, reflecting, constructing, performing, and continuing, fostering critical thinking, problem-solving skills, and a deeper grasp of sustainability principles. Using simple farming as a key project provides a relevant, context-sensitive platform to address the urgent issue of land scarcity while also fostering environmental sensitivity. Empirical results support earlier research, indicating that hands-on, community-engaged environmental projects can lead to lasting changes in attitudes and behaviors related to environmental awareness.

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CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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