



## **Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues**

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### **Abstract**

*The research aims to develop a social studies learning model using the ecopedagogy approach and engagement theory to increase students' critical awareness of environmental issues. Many studies indicate an ongoing environmental crisis in our environment. Universities have a responsibility to foster transformative awareness to act responsibly, beyond cognitive understanding of the environment. The ecopedagogy framework, as an approach to building critical pedagogy, prioritizes sustainability, environmental justice, and optimizes students' ability to understand the environment. In addition, engagement theory emphasizes meaningful learning through collaboration and the use of technology. This research uses a qualitative method with a Design-Based Research (DBR) approach that has a series of cycles starting from planning, implementation, evaluation, and reflection in social studies learning. Data collection techniques use observation, interviews, and documentation that are analyzed in an integrated manner. The results of the study show that the combination of the ecopedagogy learning model with engagement theory produces a social studies learning model that can significantly increase critical awareness, active participation, and critical thinking in social studies learning, namely the Eco-Engaged Learning Cycle (EELC). The EELC learning model*

## **Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues**

*is a real strategy that contributes to addressing environmental issues critically and participatory. Future research is recommended to test and refine this model in diverse educational contexts and across different levels of education, thereby expanding its applicability and impact on environmental education.*

**Keywords:** *ecopedagogy; engagement theory; eco-engaged learning cycle (EELC); critical environmental consciousness; environmental issues; social studies; critical and participatory pedagogy.*

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### **INTRODUCTION**

Indonesia has many social and environmental problems, especially the impact of poor industrial waste management (Miterianifa & Mawarni, 2024; Syahadat & Putra, 2022). Environmental damage caused by industrial waste management not only impacts various environmental components but also impacts living creatures, especially humans (Jayadinata et al., 2024; Rahayu et al., 2024). Various problems arise from industrial waste management that does not comply with regulations, especially in industries that produce liquid waste containing toxins (Firdaus, 2024). Various liquid wastes contain dangerous heavy metals, including copper (Cu), mercury (Hg), lead (Pb), chromium (Cr), arsenic (Ar), cadmium (Cd), and others (Ekasari & Sasono, 2024). These heavy metals become a source of environmental pollution problems if they are discharged into water bodies (Prasetya & Ali, 2024). The results of research findings on the impact of environmental pollution caused by heavy metals will cause damage to the nervous system, disruption of immune function, physical disability, poisoning in humans if accumulated over a long enough period of time, and will cause the risk of death in other living creatures (Husna, 2022; Soe'aiddy, 2024; Tareze & Astuti, 2022). In fact, environmental conditions will greatly affect human life. Therefore, understanding the relationship between humans and the natural environment is very important because human actions influence and are influenced by environmental conditions.

Humans, as multidimensional creatures, cannot be separated from nature and their surroundings, because every part of human life is interdependent and connected to the natural system (Zhang et al., 2022). This close relationship makes it so that humans in the development of the educational process cannot be separated from the natural environment (Korsant, 2024). This impact makes humans have an obligation to maintain harmony, preserve, maintain harmony, and a sustainable natural environment (Misiaszek, 2023). Therefore, critical reflection on environmental conditions in the form of ecological education is needed to build critical awareness of environmental issues.

Education has a strategic role in carrying out critical reflection in developing educated people so that they have critical awareness regarding the natural environment (Fauzi et al., 2022). Ecological competence that is born from the educational process does not produce people who are pragmatic-materialistic (Kinyota, 2021). However, it produces educated people

who are critically aware and care about the environment (Fadjarajani & As'ari, 2021). In this modern era, environmental damage has become a pressing issue that requires serious attention from various parties, including educational institutions (Fatahidin, 2024). Social Studies in higher education has great potential to be a medium in instilling critical awareness in students towards environmental issues (Pravitasari & Nugraheni, 2024; Rohsulina & Mulianingsih, 2024).

Building critical awareness and concern for students regarding environmental issues can be done through ecopedagogy-based learning (Kopnina & Bedford, 2024). Ecopedagogy-based social studies learning can be developed to achieve various aspects of material regarding environmental issues. So that ecopedagogy-based social studies learning is not only about cognitive aspects, but also tends to various aspects of attitudes, behavior, challenges, awareness of the environment, and attachment and concern regarding various environmental issues (Rohsulina & Mulianingsih, 2024). The development of skills, changes in mindset, and critical reflection used in ecopedagogy-based social studies learning will implement concern and awareness in students, so that they have critical awareness of the environment, and empower students' contributions for a better future (Fitriane & Nugraheni, 2024). Prioritizing the ecopedagogical paradigm that humans are not considered the rulers of the earth, but are part of the relationship with nature. To unite humans with nature into one unity (integral) (Muangasame & Wongkit, 2023). Ecopedagogical-based social studies learning teaches students to build awareness of the importance of uniting natural rights with human rights.

Ecopedagogical-based social studies learning will make students more involved if the engagement theory approach is used (Darracott, 2024; Misiaszek & Iftekhar, 2022). The engagement theory approach emphasizes the active involvement of students in the learning process through collaboration, creativity, and critical action in the form of real contributions (Fauzi et al., 2022; Muhsyanur et al., 2024). The engagement theory approach is relevant for use in social studies learning to create an interactive, contextual, and meaningful learning atmosphere (Lasekan et al., 2024). Some recent studies (Matto, 2024; Nikou, 2024; Schreuer et al., 2024) found that the implementation of engagement theory in learning can increase student engagement by approximately 30%, based on measurements using classroom participation survey instruments with a sample of higher education students ( $n \approx 100-150$ ). This increase also had a significant impact on students' ability to critically analyze social and environmental issues. In addition, ecopedagogy is very much in line with the engagement theory approach because the paradigm of critical, environmentally oriented education requires the involvement of integrating the values of sustainability and ecological responsibility into the learning process. This is in line with the results of the study (Chaudhry et al., 2024) showed that engagement in ecopedagogy-based learning can stimulate students' critical awareness of global environmental issues by 45%, as measured through rubric-based assessments in classroom discussions with a sample of undergraduate students ( $n = 85$ ). These findings also reinforce the importance of collective action. The harmonious combination of ecopedagogy

## **Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues**

with the engagement theory approach has great potential to build students' critical awareness of environmental issues holistically.

Research and implementation of learning design that integrates ecopedagogy with engagement theory approach in social studies learning is still relatively limited. The research results found that social studies learning in higher education has not fully optimized the potential of students as agents of social change who have awareness of the environment (Fitriane & Nugraheni, 2024; Pravitasari & Nugraheni, 2024; Rohsulina & Mulianingsih, 2024). Thus, there are still students who do not have critical awareness to contribute to solving environmental problems.

The problem of critical awareness of environmental issues is becoming increasingly relevant, considering the current importance of facing the global environmental crisis. All elements of society need to actively participate in overcoming it (Mulianingsih et al., 2024). Recent findings indicate that approximately 35% of university students in Indonesia demonstrate critical awareness of environmental issues, based on a survey of 420 students from various higher education institutions (Mulianingsih et al., 2024; Rohsulina & Mulianingsih, 2024). Meanwhile, other findings show that students still tend to be passive and do not understand their role in overcoming environmental problems (Fitriane & Nugraheni, 2024; Pravitasari & Nugraheni, 2024). Based on various findings from the study, the design of social studies learning based on ecopedagogy with an engagement theory approach is needed to build critical awareness of students towards environmental issues. These social studies learning design is designed so that students have a learning experience that is not only informative but also transformative, so that students can take an active role in environmental conservation efforts.

In practical terms, the implementation of ecopedagogy in social studies learning with an engagement theory approach can be carried out through project-based assignments that address local environmental issues, collaborative discussions linking social and ecological contexts, and reflective activities that encourage students to propose concrete solutions. Teachers can implement various sustainability values in the learning process, such as case studies, field observations, and activities that engage students cognitively, emotionally, and socially, fostering a sense of environmental responsibility. This reinforces the principles of ecopedagogy that will be used in classroom learning.

Based on the empirical and theoretical studies that have been conducted, the research questions are focused on: (1) how is the development of social studies learning design using the ecopedagogy and engagement theory approaches in building students' critical awareness of environmental issues? and (2) how effective is the social studies learning design using the ecopedagogy and engagement theory approaches in building critical awareness of environmental issues?

This research provides a novel approach to social studies learning, a field not widely explored by previous researchers. Social studies learning, combining an ecopedagogical

approach with engagement theory, can foster students' critical awareness of environmental issues. These findings will then serve as a valuable resource for formulating sustainable learning strategies.

Based on theoretical studies, the use of ecopedagogy and engagement theory approaches will contribute to the development of social studies learning. This is an opportunity because there is still little research that combines ecopedagogy and engagement theory approaches in social studies learning in building students' critical awareness of environmental issues. The results of previous studies on social studies education and environmental education are generally studied using learning models that can build environmental awareness. However, there are still very few and even rare studies that examine the use of ecopedagogy and engagement theory approaches simultaneously in building students' critical awareness of environmental issues in the context of higher education. Therefore, the innovation in this research lies in combining ecopedagogy and engagement theory approaches into a social studies learning design that can build critical awareness of environmental issues. This approach not only provides a conceptual framework but also concretely demonstrates the effectiveness of this method in fostering critical environmental awareness among students, thus providing a new perspective for the development of learning models and future research in environmentally focused social studies education.

## **METHOD**

### **Research Design**

This study uses a multiphase mixed-method evaluation design approach with a Design-Based Research (DBR) design, which is used to develop and test interactive learning. This method combines one stage of qualitative and quantitative data collection in several phases to achieve the research objectives. The quantitative method is used to analyze the effectiveness of the ecopedagogy-based social studies learning design with an engagement theory approach in building critical awareness of environmental issues. The data is in the form of changes in the results of critical awareness of environmental issues after using ecopedagogy-based social studies learning design with an engagement theory approach. While the qualitative method is used to determine the stages of research, starting from preliminary studies, the development of ecopedagogy-based social studies learning design with an engagement theory approach, expert validation, and exploring the process of using ecopedagogy-based social studies learning design with an engagement theory approach.

## Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues

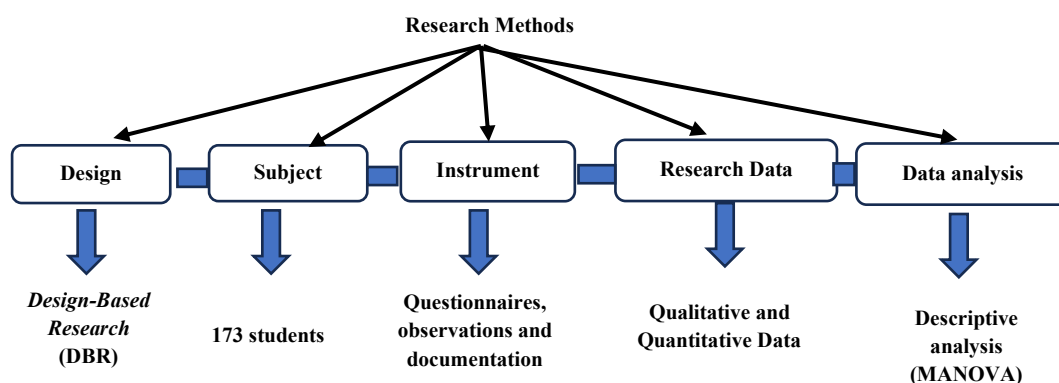


Figure 1. Research method

This study employed a Design-Based Research (DBR) approach, which proceeded through iterative cycles of grounding, conjecturing, iterating, and reflecting. To evaluate the effectiveness of the developed intervention, a non-equivalent pretest–posttest quasi-experimental design was embedded within the DBR framework. Thus, the study combined the ecological and iterative strengths of DBR with a comparative evaluation of learning outcomes. The DBR approach has four stages: grounding, conjecturing, iterating, and reflection. The DBR method emphasizes planning, implementation, evaluation, and reflection. Initial activities begin with searching for references, conducting preliminary studies, identifying problems, and developing a theoretical framework regarding the ecopedagogy and engagement theory approaches as a social studies learning design. The next stage involves creating a prototype of a social studies learning design that combines the ecopedagogy and engagement theory approaches to build students' critical awareness of environmental issues. The next stage involves implementing the model resulting from the integration of the ecopedagogy and engagement theory approaches into the classroom to obtain data on students' critical awareness of environmental issues. Finally, the effectiveness of the integration of the ecopedagogy and engagement theory approaches in building students' critical awareness of environmental issues is tested.

### Timeline of the Cycles

The research was conducted using three cycles over six months. Each cycle consisted of stages ranging from planning, implementation, evaluation, and reflection. For more details, described as follows.

#### *Cycle 1 (January – February 2025)*

In the initial phase, a needs assessment was conducted, and a prototype was developed combining the ecopedagogy approach and engagement theory. The resulting prototype was then applied to the social studies learning process. Afterward, evaluations were conducted at the beginning, before, and at the end of the prototype implementation. Data collection techniques used included observation, student learning outcomes, and feedback from lecturers.

### *Cycle 2 (March – April 2025)*

The reflection results from cycle 1 provided recommendations for improvements to the social studies learning design prototype that had been implemented in the classroom. After improvements were made, it was re-implemented in the classroom with evaluations at the beginning and end of the lesson. Cycle 2 provided information on student engagement in social studies learning.

### *Cycle 3 (May – June 2025)*

The final step is verification to determine the suitability, effectiveness, and usefulness of the developed learning model. This stage represents a refinement of the previous stage.

## **Research Participants**

The population used in this study was 1,612 students, consisting of 1,378 students from the Social Studies Education Department of the Faculty of Teacher Training and Education at the University of Lampung and 234 students from the Social Studies Education Department at UIN Jurai Siwo Lampung. The sampling technique used was cluster random sampling with 4 research classes, with a sample size of 173 students. The participants were two intact classes from the same faculty program. One class was assigned as the experimental group (EELC), and the other served as the control group. Randomization at the individual level was not feasible due to institutional constraints; therefore, the design followed a non-equivalent group structure. To avoid bias in the application of the developed IPS learning model, the teaching lecturers have been balanced by considering the lecturers' workload and teaching experience in both groups.

## **Research Instruments**

Data collection techniques were carried out in accordance with research procedures to obtain accurate and reliable data. Data collection included classroom observations, focus group discussions, student projects and portfolio analysis, questionnaires, and field notes. These data collection techniques produced both qualitative and quantitative data. Qualitative data were obtained from observations, group discussions, and observations during the learning process. Quantitative data were obtained from questionnaires and assessment scores.

## **Data Collection Procedure**

Data collection techniques in this study included questionnaires, document reviews, group discussions, observations, project results in learning, and evaluations. To understand the characteristics and development of students regarding critical awareness of environmental issues, questionnaires, observations, and learning observations were conducted using a predetermined assessment rubric. Furthermore, to obtain evidence from learning activities,

## **Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues**

documents, and student portfolios were reviewed. All data collection techniques provided comprehensive knowledge for in-depth analysis.

### **Data Analysis**

Qualitative data analysis was conducted using NVivo to determine the implementation and results of the use of the ecopedagogy approach and engagement theory. Meanwhile, quantitative data analysis used several stages, namely: data validation using Aiken's V, then reliability testing using the inter-rater reliability method, and to measure students' critical awareness of environmental issues using descriptive statistics. Data analysis used descriptive statistics (M, SD, n) and inferential analysis using MANOVA analysis. Effect sizes are presented using partial  $\eta^2$  and Cohen's d (with 95% CI). Meanwhile, to determine the effectiveness of the intervention, Multivariate Analysis of Variance (MANOVA) was used to analyze pretest and posttest data and to analyze data between the experimental and control groups. The results of the quantitative analysis will produce qualitative reflections based on the Design-Based Research (DBR) cycle, so that it can provide a more holistic analysis of the effectiveness and incremental improvement of the intervention that has been carried out.

## **RESULTS AND DISCUSSION**

The results and discussion are presented in the development stages of an ecopedagogy-based social studies learning design using an engagement theory approach. This stage culminates in achieving the goal of building critical awareness of environmental issues. Further details are as follows.

### **Grounding Phase**

The underlying factors for developing social studies learning designs are examined based on global challenges, the cyclical crisis, environmental degradation, and ecological injustice. Social studies learning has so far focused on instructional and cognitive aspects and has not yet addressed ecological action and empowerment. Therefore, the integration of ecopedagogy and engagement theory provides the foundation for developing more meaningful, collaborative, and reflective learning in addressing various environmental issues.

Data collection techniques using observation, interviews, and group discussions were converted into qualitative data using NVivo software. Analysis began with data reduction by transcribing and grouping unprocessed data based on predetermined categorizations. Next, coding was performed to connect various findings to create meaningful results. Finally, the coding was adjusted and the findings were refined to align with the research questions. These steps were carried out consistently to obtain accurate and reliable data. The themes that emerged from this analysis provided the empirical foundation for the discussion, and their interpretation was subsequently compared with and contextualized by findings from previous studies.

Ecopedagogy is an appropriate approach to provide environmental education to the community through educational institutions (Adzani et al., 2024). The importance of ecopedagogy being included in the curriculum so that the school community has awareness and responsibility in maintaining, preserving, and protecting the environment from damage and natural resources (Seran et al., 2024). Ecopedagogy is an approach to learning as an effort to develop cognitive, affective, and psychomotor aspects to understand environmentally based sources and media (Fatahidin, 2024).

The pedagogical approach not only teaches students about the human environment, but also introduces them to the wider environment (Misiaszek, 2022). Ecopedagogy not only teaches about cognitive, affective, and psychomotor skills. However, it builds concern, awareness, challenges, perspectives, and sensitivity regarding environmental issues (Misiaszek, 2023). Ecopedagogy fosters critical awareness in students who have a role in their relationship with nature (Maslani et al., 2023).

Ecopedagogy, as an approach to building critical awareness carried out through critical reflection on environmental living conditions, is often not in accordance with what society expects (Korsant, 2024). Efforts to build critical awareness of students towards environmental issues as a form of building a better future life (Asli et al., 2024). Ecopedagogy is carried out through a movement that has a goal for the future. Building public awareness by optimizing the collective potential of humans by prioritizing social justice, which will give birth to critical ecoliteracy (Herwanto et al., 2024). In line with (Hjorth Warlenius, 2022) that ecopedagogy is a movement to return to nature to be able to explore cultural heritage values in order to preserve nature.

A different perspective in conceptualizing ecopedagogy rationally is that ecopedagogy is learning based on love, creativity, and participation (Lombardi et al., 2023). At least three main areas are studied in ecopedagogy learning, namely technical (functional) ecoliteracy, cultural ecoliteracy, and critical ecoliteracy (Misiaszek, 2023). Technical (functional) ecoliteracy deepens students' understanding of ecological and biological concepts, the foundations of science, and analyzes the positive and negative impacts of humans on ecological systems (Herwanto et al., 2024; Kinyota, 2021; Koprina & Bedford, 2024). Then, cultural ecoliteracy builds students' awareness and understanding, and increases insight into cultural perspectives in the close relationship between humans and the environment, so that it can have a sustainable impact on life (Pratiwi & Yarliani, 2023). Meanwhile, critical ecoliteracy is built through critical and communicative dialogue and involves students in understanding the context of ecological politics, communication, and technological progress that are closely related to environmental issues (Dentith et al., 2022).

Social studies learning design based on ecopedagogy using teaching material references, namely (1) using the concept of ecological-social flexibility, cultural literacy, and critical and creative use of technology (three pillars of ecopedagogy) (Rohsulina et al., 2024), (2) building balance in the process, the ability to think (head), behave (heart), and act (hand) (Dentith et al.,

## **Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues**

2022), (3) designing learning into a social process that can build students' social skills to live in society (Fauzi et al., 2022), and (4) improve students' critical awareness skills in responding to various environmental issues (Lombardi et al., 2023).

Essentially, it is necessary to study and understand ecopedagogy because ecopedagogy studies critical pedagogy and transformative pedagogy. In fact, when students learn with a pedagogical approach, it is not only the environment that is studied, but also more broadly than that. In various countries, the application of ecopedagogy has developed together as a form of concern for the environment (Kinyota, 2021; Korsant, 2024; Zhang et al., 2022).

Ecopedagogy has made various parties aware that human exploitation of nature and groups in power with other groups is indeed true. Therefore, ecopedagogy needs to be used as an approach in social studies learning to support critical theory and critical pedagogy as an effort to empower students in releasing the shackles of political, economic, cultural power, and various ideologies and social environmental problems (Rohsulina et al., 2024). Ecopedagogy is oriented towards critical awareness of environmental issues from multiple perspectives that are built through wisdom regarding the dimensions of human life (Misiaszek, 2022).

The basics of ecopedagogy include the protection of nature (natural ecology), its impact on human society on nature (social ecology), and the influence on civilization and economy, social and cultural composition (ecological integration) (Asli et al., 2024; Muangasame & Wongkit, 2023). Therefore, it basically promotes respect for nature, people, culture, and diversity. Thus, as a critical approach, ecopedagogy allows for educating students by connecting the environment and social issues.

Ecopedagogy helps realize the shared hope for sustainable ecology by combining young people with environmentally based education. The paradigm of ecopedagogy is that humans are not the rulers of the earth, but rather the guardians of the earth (Pratiwi & Yarliani, 2023). In other words, humans are actually an integral part of nature. A unity that cannot be separated between humans and nature. Ecopedagogy seeks to unite human rights with the rights of nature (Fadjarajani & As'ari, 2021).

Lack of engagement in Higher Education has attracted the attention of researchers for decades because of students' interest and attitudes towards student knowledge in school (Summers et al., 2023). This decline often coincides with the transition from high school to college (Leal Filho et al., 2023). However, researchers suggest that decreased engagement is not an inevitable outcome of the high school to college transition (Awacorach et al., 2021; Gibbs et al., 2022). Students have rich developmental potential to engage cognitively by reasoning abstractly, considering multiple perspectives, and weighing multiple strategies simultaneously (Lasekan et al., 2024).

The aim of designing social studies learning based on ecopedagogy with an engagement theory approach is (1) to help convey clearly to students issues of environmental care and concern in close relation to economics, politics, social and ecology in urban and rural areas (Kopnina & Bedford, 2024), (2) provide space for students to develop attitudes, knowledge,

values, commitment and abilities to play a role in protecting and improving the environment (Fatahidin, 2024), and (3) building patterns of behavior of individuals, groups, and society as a whole with the environment (Rohsulina et al., 2024). The achievement of this goal requires not only knowledge but also attitude, concern, skills, and participation.

Based on the explanation above, the goal of ecopedagogy is to build critical awareness collectively to play a role in protecting and caring for the environment. Nature as a giver of meaning about life (*lebenstraum*) and not only as a living environment (Misiaszek, 2023). In addition, ecopedagogy is also understood as an approach to changing the paradigm of science, which was initially mechanistic, partial, reductionist, and value-free, into learning that is ecologically meaningful, holistic, and bound by values, so that it can grow into wisdom (Herwanto et al., 2024; Rohsulina et al., 2024). Ecopedagogy teaches students not only to know nature, but also to grow a sense of love, care, and a desire to protect and preserve nature and its contents (Lombardi et al., 2023). Ecopedagogy teaches students to be environmentally literate, so they will have a sense of responsibility to care for it.

Ecopedagogy-based learning design with an engagement theory approach as a manifestation of sustainable development education offers four learning systems, namely (1) learning about the environment and nature, namely in this system the lecturer as an educator prepares material in the form of environmental issues for students to invite students to respond to current environmental issues, the root causes of these issues, and the right steps to respond to these issues individually and collectively (Hossain, 2024), (2) learning about the social and natural environment, namely, making students aware of the close relationship between humans and the environment, or the relationship between society and nature (Rohsulina et al., 2024), (3) learning through social and natural environments, namely adapting class assignments, practicing pouring analysis results into written form, working in groups, experience, carrying out critical actions in society regarding environmental concerns, environmental justice, welfare, and sustainability (Zeng et al., 2024), and (4) learning that connects creatures in a sustainable way (Muhsyanur et al., 2024).

Ecopedagogical-based learning design with an engagement theory approach was developed by considering comprehensive principles through holistic learning, namely: (1) learning is designed not only to focus on cognitive aspects alone, but to include various aspects or multi-dominance, both cognitive, affective, and psychomotor (Rohsulina et al., 2024), (2) learning is designed to emphasize the development of materials that are not only textual, but also more contextual. Learning will be developed essentially by bringing students' living environment closer to learning, so that they can construct meaningful knowledge (Muhsyanur et al., 2024), (3) learning with nuances of engagement and building student activeness in obtaining solutions to problems studied cooperatively and collaboratively (Lombardi et al., 2023), and (4) learning emphasizes an interdisciplinary approach as an effort to enrich students' knowledge and understanding comprehensively (Sarangi, 2024).

## Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues

Based on the above explanation, the development of ecopedagogy-based learning design with an engagement theory approach is not based on a conservative approach, but is developed comprehensively through various approaches that can support effectiveness in implementing learning.

### Conjecturing Phase

The paradigm in social studies learning based on ecopedagogy and engagement theory uses the paradigm of critical, transformational, and participatory constructivism. The construction of these social studies learning designs becomes the Eco-Engaged Learning Cycle (EELC). The integration of ecopedagogy and engagement theory has created the conceptual framework of EELC. This study further confirms that the ecopedagogy approach focuses on environmental literacy, building critical awareness of environmental issues, and is a transformative approach to achieving sustainability. Meanwhile, engagement theory reinforces collaboration, meaningful involvement, and student participation in building knowledge regarding students' critical awareness of environmental issues. Thus, when these two approaches are combined, they offer normative and ethical perspectives on sustainability and ensure students' active cognitive and emotional involvement in learning. The integration of these two approaches has resulted in EELC as a highly transformative learning model in building students' critical awareness of environmental issues and maintaining consistent student involvement in building critical, transformative, collaborative, and participatory awareness. The EELC construction design is presented in the following figure.

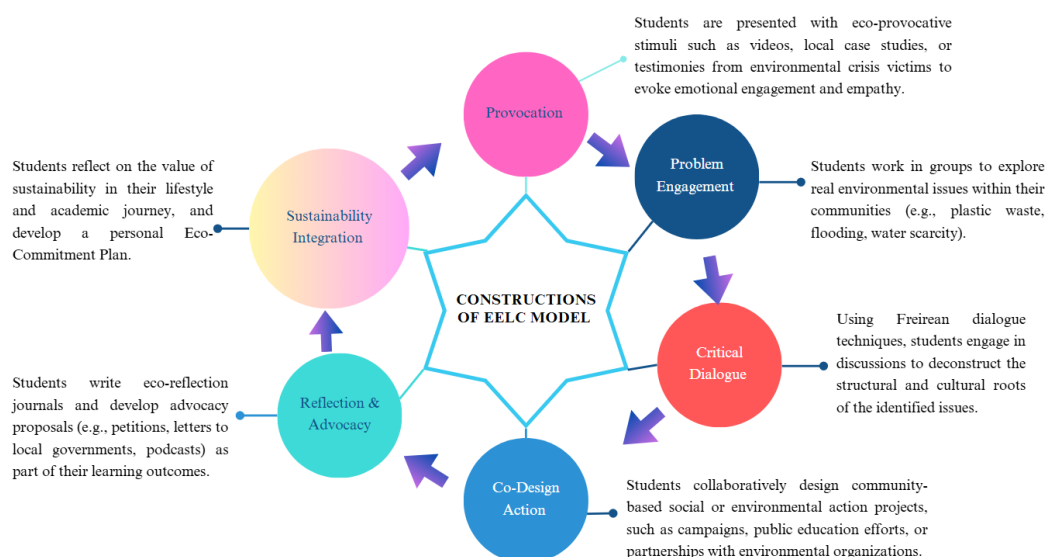


Figure 2. EELC learning model construction

The EELC model is present as an innovative approach that integrates two mutually reinforcing learning theories, namely ecopedagogy and engagement theory. Ecopedagogy is a

learning approach rooted in Paulo Freire's thinking by placing Education as a practice of liberation. In this case, freeing students from ecological unconsciousness to active involvement in environmental issues. Then, engagement theory provides a pedagogical basis that learning becomes effective when students are cognitively, affectively, and socially involved through meaningful and collaboration-based activities.

This is in line with the challenges of social studies learning, which is still dominated by a social approach that is oriented towards knowledge transfer and conceptual memorization. Students often understand environmental issues cognitively, for example, recognizing the terms pollution or climate crisis. However, they have not internalized the urgency of the issue reflectively and transformatively. So, this is a novelty of the Eco-Engaged Learning Cycle (EELC) model.

Table 1. Implementation of EELC in social studies learning

<b>Innovation</b>	<b>Explanation</b>
Eco-Provocative Entry Point	Emotional and reflective triggers based on real environmental events
Co-Designed Action	Students are not just participants, but co-creators of social action
Freire-based Critical Dialogue	Shifting the discussion from the surface to the systemic roots of the issue
Eco-Reflection Journal	Metacognitive instrument for recording changes in consciousness
Eco-Commitment Plan	Emphasizing the continuity of learning after lectures are completed

The results of the implementation of the EELC learning model in social studies learning show that this approach is able to raise critical awareness of students gradually and sustainably. Based on qualitative findings from observation and reflection data, it was obtained that the provocation phase, or better known as emotional stimulation, obtained that the video about the impact of mining had significantly triggered empathy and a sense of urgency in students towards issues that were previously considered far from their lives. Similar findings were also reported by (Rohsulina et al., 2024), who emphasized that affective engagement through visual media can stimulate students' empathy and moral reasoning on socio-environmental issues. This is consistent with recent studies highlighting the role of emotional provocation in deepening critical learning processes (Lombardi et al., 2023).

Furthermore, the Problem Engagement and Critical Dialogue phases strengthen the reflexive aspect. Freire's thinking on critical discussion has provided new insights to encourage students to investigate structural issues, such as the difficulty of obtaining access to clean water and the overuse of land. This demonstrates a shift in questions from "what happened?" to "why did this happen and who benefits?" This is certainly in line with the principles of critical pedagogy (Freire, 1970), and the results of recent research has found that dialogic learning is an important factor in building critical awareness in social studies learning (Herwanto et al., 2024; Rohsulina et al., 2024).

The EELC learning approach, a finding of this study, combines ecopedagogy and engagement theory, a design that fosters concrete action through the community rather than simply developing hypothetical solutions. This aligns with recent research on transformative

## Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues

and project-based learning in building ecological identities relevant to the real world of students' environments (Kinyota, 2021; Korsant, 2024; Zhang et al., 2022). Students have undertaken various activities, including launching the "Zero Waste Campus" campaign, which educates university and elementary school students about plastic waste. This activity fosters collaboration between students and the community in managing household waste. This initiative aligns with research findings from (Lombardi et al., 2023), which provides information on community-supported environmental initiatives to increase community participation in environmentally friendly activities among students.

Finally, the stages to be undertaken are the Reflection, Advocacy, and Sustainability Integration phases to enhance students' ability to critically express their understanding. Learning activities during this reflection phase demonstrate students' critical awareness, sense of responsibility, and concrete plans for a sustainable lifestyle. These findings align with numerous studies that recognize the reflection process as a key to strengthening sustainable attitudes and long-term ecological commitment (Zeng et al., 2024). Therefore, the EELC model not only combines two main theories but also describes a learning framework that unites concrete experiences, deep reflection, and social action as one unit in a transformative learning process.

### Iterating Phase (Effectiveness of Ecopedagogic-Based Social Studies Learning Design with Engagement Theory Approach in Building Critical Awareness of Environmental Issues)

The trial of the effectiveness of the social studies learning design based on ecopedagogy using the involvement theory approach to build critical awareness regarding environmental problems has reached the iteration stage.

Table 2. Summary of reliability and inter-rater agreement results

Statistic	Value	Interpretation
Cronbach's $\alpha$	0.92	Excellent internal consistency
McDonald's $\omega$	0.93	Excellent factor-based reliability
ICC (2, k)	0.84	Excellent agreement between raters
Cohen's Kappa	0.72	Substantial agreement between raters

Source: Data processed

Table 2 shows that both Cronbach's  $\alpha$  (0.92) and McDonald's  $\omega$  (0.93) are in the excellent category, indicating that this measuring instrument has high internal consistency in assessing cognitive, affective, and critical behavioral dimensions. The ICC (2, k) value of 0.84 indicates a very good level of inter-rater agreement, indicating that the assessments given by several raters are consistent and interchangeable. In addition, the Cohen's Kappa value of 0.72 indicates significant agreement, meaning that raters tend to classify results (such as "pass" and "fail") in a similar manner. In general, the results of this study indicate that the measurement tool has

good psychometric standards, with strong internal consistency and adequate inter-rater agreement, making it suitable for use in research and project-based assessments.

Table 3 shows descriptive statistics (M, SD, n) for the treatment and non-treatment groups across the three learning aspects (cognitive, affective, and psychomotor).

Table 3. Descriptive statistics (M, SD, n) per Group

Domain	Group	n	M	SD
Cognitive	Experimental	123	68.53	13.35
	Control	50	60.00	12.00
Affective	Experimental	123	49.41	9.43
	Control	50	45.00	10.00
Psychomotor	Experimental	123	43.79	8.86
	Control	50	40.00	9.00

Source: Data processed

Prior to conducting MANOVA, assumption tests were performed. Multivariate normality was satisfied (Mardia's test,  $p > .05$ ). Linearity was confirmed based on scatterplot inspection. The homogeneity of covariance matrices was supported (Box's M test,  $p = .217$ ). These results indicate that the data were appropriate for MANOVA.

Table 4. Effect sizes (Cohen's d and 95% CI) by domain

Domain	Cohen's d	95% CI Low	95% CI High	Interpretation
Cognitive	0.657	0.321	0.993	Medium to Large
Affective	0.460	0.127	0.792	Medium
Psychomotor	0.426	0.094	0.758	Medium

Source: Data processed

In addition to partial  $\eta^2$ , effect sizes were calculated using Cohen's d with 95% confidence intervals (CI). As presented in Table Y, the experimental group outperformed the control group across all domains. The effect size for the cognitive domain was medium to large ( $d = 0.66$ , 95% CI [0.32, 0.99]), while affective ( $d = 0.46$ , 95% CI [0.13, 0.79]) and psychomotor ( $d = 0.43$ , 95% CI [0.09, 0.76]) domains demonstrated medium effects. These results indicate that the intervention produced not only statistically significant but also practically meaningful improvements.

Based on the results of data analysis, the following data were obtained.

Table 5. Multivariate test

	Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.982	3023.999 <sup>b</sup>	3.000	169.000	.000	.982
	Wilks' Lambda	.018	3023.999 <sup>b</sup>	3.000	169.000	.000	.982
	Hotelling's Trace	53.680	3023.999 <sup>b</sup>	3.000	169.000	.000	.982
	Roy's Largest Root	53.680	3023.999 <sup>b</sup>	3.000	169.000	.000	.982
Group	Pillai's Trace	.573	75.481 <sup>b</sup>	3.000	169.000	.000	.573
	Wilks' Lambda	.427	75.481 <sup>b</sup>	3.000	169.000	.000	.573
	Hotelling's Trace	1.340	75.481 <sup>b</sup>	3.000	169.000	.000	.573
	Roy's Largest Root	1.340	75.481 <sup>b</sup>	3.000	169.000	.000	.573

## Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues

The results of the MANOVA test showed that there was a very significant difference between the treatment group (EELC) and the control group on all dimensions of students' critical awareness, namely cognitive, affective, and psychomotor, simultaneously obtained data  $F(3, 169) = 75.481, p < .001, Wilks' \Lambda = 0.427, \text{Partial Eta Squared} = 0.573$ . This states that the EELC learning model is able to explain more than 57% of the variance in changes in students' critical awareness, so that the strength of its effect is large.

Theoretically, the findings of this study are in line with the concept of ecopedagogy developed by Paulo Freire and further contextualized by (Dickmann & Consorte-McCrea, 2025). Ecopedagogy emphasizes the importance of liberating and transformative education, so that students are not only given information but are invited to discuss critically, to reflect on social and ecological realities, and engage in actions of change. The EELC context functions as a form of critical pedagogical praxis that combines reflection, awareness, and action on real environmental crises.

The EELC learning design combines the principles of ecopedagogy and engagement theory. The ecopedagogy approach is strongly grounded in environmental awareness, in-depth reflection, and sustainable action on environmental issues. Meanwhile, engagement theory provides a pedagogical framework for building collaborative skills, active participation, and cognitive, social, and emotional engagement. Therefore, EELC is a social studies learning design that can build critical pedagogy by combining awareness, reflection, and critical action on environmental issues. Furthermore, it ensures active and meaningful student involvement and the ability to collaborate in resolving various environmental issues in society.

Table 6. Tests of between-subjects effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Cognitive	15184.146 <sup>a</sup>	1	15184.146	167.699	.000	.495
	Affective	7886.235 <sup>b</sup>	1	7886.235	181.950	.000	.516
	Critical Action	7213.837 <sup>c</sup>	1	7213.837	196.344	.000	.534
Intercept	Cognitive	755409.210	1	755409.210	8343.027	.000	.980
	Affective	392718.605	1	392718.605	9060.749	.000	.981
	Critical Action	311409.906	1	311409.906	8475.867	.000	.980
Group	Cognitive	15184.146	1	15184.146	167.699	.000	.495
	Affective	7886.235	1	7886.235	181.950	.000	.516
	Critical Action	7213.837	1	7213.837	196.344	.000	.534
Error	Cognitive	15482.987	171	90.544			
	Affective	7411.626	171	43.343			
	Critical Action	6282.672	171	36.741			
Total	Cognitive	843043.000	173				
	Affective	437658.000	173				
	Critical Action	345264.000	173				
Corrected Total	Cognitive	30667.133	172				
	Affective	15297.861	172				
	Critical Action	13496.509	172				

a. R Squared = .495 (Adjusted R Squared = .492)

b. R Squared = .516 (Adjusted R Squared = .513)

c. R Squared = .534 (Adjusted R Squared = .532)

The results of the study that have been analyzed using MANOVA found that the Eco-Engaged Learning Cycle (EELC) approach can have a significant impact on increasing students' critical awareness in three main aspects, namely (1) cognitive ( $F(1,171) = 167.699$ ), (2) affective ( $F(1,171) = 181.950$ ,  $p < .001$ ,  $\eta^2 = .516$ ), and (3) critical action ( $F(1,171) = 196.344$ ,  $p < .001$ ,  $\eta^2 = .534$ ). Based on these findings, it shows that the three dimensions state that EELC not only increases students' knowledge of environmental issues, but can also build empathy and encourage real community-based action.

This is in line with the idea of ecopedagogy, which highlights the importance of critical understanding and transformative action (Dickmann & Consorte-McCrea, 2025; Verma et al., 2025). In addition, this is in line with the basics of engagement theory, which encourages active student participation through collaborative and meaningful activities (Melissa & Samia, 2022; Quibrantar & Ezezika, 2023). The novel findings from the EELC learning design demonstrate clarity in the structure demonstrated in the learning syntax, which begins with provocation on environmental issues, critical dialogue, social action planning, and ongoing reflection. This learning syntax has shifted cognitive knowledge into concrete actions in accordance with students' daily lives. The EELC learning design offers solutions not provided by conventional learning models. Conventional learning models tend not to combine values and behaviors in a sustainable manner.

The findings of this study are contextually highly relevant to the state of higher education in Indonesia. The environmental crisis requires awareness and concrete action from students as the younger generation. The EELC learning design has proven effective in developing students' critical awareness of environmental issues.

### **Reflecting Phase**

Reflection has been conducted in depth to determine the limitations of the EELC learning design that has been implemented in social studies learning. The reflection process has been carried out using qualitative data triangulation conducted from the results of observations, documentation, and student reflective journals. The results of reflection using data triangulation found that students have begun to understand environmental issues from various perspectives. Then, based on the results of quantitative analysis using the MANOVA test, the analysis results showed that there were significant differences between the EELC model and the control group in three dimensions of cognitive, affective, and critical action awareness,  $F(3, 169) = 75.481$ ,  $p < 0.001$ , Partial Eta Squared = 0.573. This stage proves that the results of qualitative and quantitative data analysis show that qualitative research results can describe the student learning process and show the student learning experience in social studies learning using the EELC learning design. While the quantitative research results provide statistical analysis. The combination of qualitative and quantitative data analysis can analyze the development of the EELC learning design comprehensively (Setianingsih, 2024).

## **Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues**

The reflective analysis that has been conducted shows that students have had a significant transformation of knowledge, namely: (1) increased ability to understand environmental issues at the local and global levels and recognize the root of the problem, (2) having a sense of empathy, emotional concern, and a sense of connectedness with society and nature, and (3) growing sense of active participation in community activities, online campaigns, and sustainability projects. This stage illustrates that the EELC learning design can grow starting from the stage of being aware of issues (cognitive), forming a caring attitude (emotional), until students can engage in real action (practical action) (Kinyota, 2021; Korsant, 2024; Zhang et al., 2022).

After reflection, the implementation of the EELC learning model had several limitations. One of these was time constraints, which prevented some groups from optimizing collaborative action. Furthermore, the success of critical dialogue and eco-reflection was crucial for the success of this learning design. These findings indicate that the EELC learning design relies on sound planning, high flexibility, and logistical support for social activities (Asli et al., 2024; Muangasame & Wongkit, 2023). Thus, the success of the EELC model depends heavily on detailed planning, good schedule adjustments, and sufficient logistical support during the implementation of social projects.

The EELC learning design, based on the overall reflection results, shows that this learning design not only influences students' mindsets but can foster critical awareness of the environment, collaboration, and change. Therefore, the EELC learning design can build students' critical awareness of environmental issues (Suwarno et al, 2024).

### **CONCLUSION**

The research aims to develop a social studies learning model using the Ecopedagogy approach and engagement theory to increase students' critical awareness of environmental issues. Many studies show an ongoing environmental crisis in our environment. Universities have a responsibility to foster transformative awareness to act responsibly, not just limited to cognitive understanding, in understanding the environment. The ecopedagogy framework, as an approach in building critical pedagogy, prioritizes sustainability, environmental justice, and optimizes students' abilities in understanding the environment. The development of the EELC learning design has gone through structured instructional stages, including analysis, design, implementation, and assessment. Then, a validation test was conducted from expert reviews and initial trials. It has been validated through expert evaluation and initial trials. The results of the study show that the combination of the ecopedagogy learning model with engagement theory produces a social studies learning model that can significantly increase critical awareness, active participation, and critical thinking in social studies learning, namely the Eco-Engaged Learning Cycle (EELC). The EELC learning model is a real strategy that contributes to addressing environmental issues critically and participatory.

The theoretical implications of this research are that the combination of ecopedagogy and engagement theory provides a strong theoretical foundation for social studies learning. Practically, the EELC learning design provides a syntax that can facilitate lecturers in building critical awareness and active student engagement. Furthermore, universities are a highly strategic location for transforming social and environmental change.

Some limitations in this study include: first, the study only used a single sample group, so the results are unlikely to be generalizable to various social, educational, and cultural contexts. Second, analytically, although content validity, internal consistency, and inter-rater reliability were proven, other types of validity, including criterion validity and test-retest reliability, were not conducted in the study. Third, the project assessment rubric was tested with only a small number of raters, and some reliability measures used mock data, so they may not fully reflect the complexities of real-world classroom assessment.

Future research should therefore expand the validation process across varied populations, explore additional forms of validity, and involve a larger pool of assessors. Furthermore, given the unique contribution of the EELC model, subsequent studies could investigate its adaptability to other subject areas and its long-term impact on students' ecological literacy and civic engagement.

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## Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues

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## **Designing social studies instruction grounded in ecopedagogy and engagement theory: Cultivating university students' critical consciousness of environmental issues**

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