ECOLOGICAL SOLUTIONS TO ETHICAL DILEMMAS

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ABSTRACT

This study examines the decision-making processes employed by students when addressing ecology-related ethical dilemmas. A descriptive qualitative research design was employed to analyze students' written, verbal, and visual responses to scenario-based ethical dilemmas with a focus on sustainability, environmental responsibility, and social welfare. Data were collected through video recordings, researcher observations, written justifications, and student drawings produced during the instructional implementation. Descriptive analysis revealed that engagement with ecological ethical scenarios supported students' ethical reasoning, critical thinking, and perspective-taking skills. The findings further indicated that students demonstrated varying levels of ethical awareness, responsibility, and socio-ecological sensitivity depending on the complexity and contextual demands of the dilemmas presented. The study concludes that ecological ethical dilemmas constitute a meaningful instructional tool for fostering environmental awareness and ethical decision-making skills. Recommendations are provided for the systematic integration of ecological ethics into educational settings.

Keywords: ecological ethics; ethical dilemma; ecological awareness; sustainability; scenario-based learning

INTRODUCTION

Ethical dilemmas emerge when individuals are confronted with two or more moral obligations that cannot be fulfilled simultaneously, requiring a decision that inevitably compromises at least one ethical principle. For an ethical dilemma to exist, three essential conditions must be present: a decision-maker, multiple alternative courses of action, and the moral cost associated with each of these alternatives. Such situations generate unavoidable moral tension and complexity in decision-making processes (Allen, 2012; McConnell, 2020).

Ecological problems cannot be reduced to technical challenges alone, as they are deeply rooted in human behavior and cultural values (Kals & Müller, 2010). In this regard, the ecological crisis can be understood not merely as an environmental phenomenon but as a fundamentally human one. As Mueller (2009) emphasizes, "the ecological crisis is not so much ecological as it is human," highlighting the central role of human values, decisions, and responsibilities in shaping environmental outcomes. Environmental and sustainability education increasingly requires engagement with ethical dimensions, as environmental issues are closely intertwined with social and human development concerns (Öhman, 2016). Contemporary social, cultural, and environmental transformations increasingly challenge individuals' capacity to sustain a balanced understanding of ethical responsibility (Gardner, Csikszentmihalyi, & Damon, 2001; Gardner, 2006). In particular, the escalation of environmental problems has underscored the need to extend ethical decision-making beyond human-centered concerns to include ecological dimensions. Ethical reasoning related to environmental issues requires individuals to position themselves within an interconnected ecosystem and to recognize the consequences of human actions on the natural world. According to Kronlid and Öhman (2013), environmental and sustainability education increasingly positions ethical dilemmas at the core of learning processes, as new generations are expected to confront complex moral challenges related to ecological crises.

Ecological awareness is closely associated with practices that promote responsibility toward nature, such as conserving resources, reducing waste, and understanding fundamental ecological processes (Climate Sustainability Directory, n.d.). Sustainability, as a multidimensional concept, emphasizes the need to maintain balance among environmental, social, and economic systems (UCLA Sustainability, n.d.). Achieving a sustainable future depends on establishing harmonious relationships between human societies and natural ecosystems (U.S. Environmental Protection Agency, n.d.).

Within educational contexts, the integration of ethics and sustainability has been supported by various theoretical frameworks. Gardner's Five Minds for the Future provides a particularly relevant perspective by emphasizing disciplined, synthesizing, creative, respectful, and ethical modes of thinking (Gardner, 2006). These cognitive and moral domains offer significant potential for fostering ethical sensitivity and ecological awareness, especially during childhood and adolescence.

Empirical studies have demonstrated that instructional approaches such as scenario-based learning, role-playing, and discussions of ethical dilemmas can effectively support students' ethical reasoning and sustainability-oriented thinking. Research indicates that such approaches encourage empathy, perspective-taking, and evidence-based reasoning in relation to environmental and socio-ecological issues (Bielefeldt, 2011; Esquivel-Martín et al., 2023; Rahmawati et al., 2021; Schrier, 2015). Despite this growing body of literature, studies that simultaneously examine children's ethical decision-making processes, ecological awareness, and affective responses through multiple data sources remain limited. In particular, there is a need for research exploring applications of ecological ethical dilemmas that integrate written responses, discussions, drawings, and role-playing activities.

Accordingly, the present study aims to examine how scenario-based applications grounded in ecological ethical dilemmas influence primary and secondary school students' ethical reasoning, environmental awareness, and perceptions of responsibility.

METHOD

Research Design

A descriptive qualitative research design was employed to explore students' decision-making processes, ethical reasoning patterns, and interpretive meanings within the context of ecological ethical dilemmas. This design enabled an in-depth examination of students' cognitive and affective responses to scenario-based ethical challenges.

Participants

The study group comprised sixteen volunteer primary and secondary school students representing different age groups and grade levels. This diversity allowed for comparative insights into ethical decision-making processes across developmental stages.

Data Collection

Data were collected using multiple qualitative data sources, including ecological ethical dilemma scenarios, students' written justifications, drawings, video recordings of instructional sessions, and researcher observation notes. The instructional implementation was conducted in four stages:

1. Students were assigned professional roles aligned with the scenario context (e.g., CEO, surgeon, engineer, investment banker).

2. An ecological ethical dilemma scenario was presented.

3. Group discussions were conducted to facilitate collective reasoning.

4. Students produced written responses and/or drawings reflecting their ethical decisions.

Data Analysis

All student products were evaluated using an analytic rubric specifically developed to assess ecological ethical reasoning. The rubric consisted of five criteria—problem comprehension, thinking strategies, metacognitive awareness, solution generation and creativity, and expression skills—across four performance levels, yielding a total score of 20 points. Descriptive analysis was employed to categorize written responses, drawings, and observation notes into themes related to ethical sensitivity, ecological awareness, and justification patterns.

FINDINGS

The findings of the study were organized under five main themes derived from the descriptive analysis of students' written responses, group discussions, drawings, and role-playing activities. These themes reflect how students

reasoned about ecological ethical dilemmas and how they articulated their decisions across different modes of expression.

1. Ethical Justification

A majority of the students demonstrated a clear tendency to justify their decisions when confronted with ecological ethical dilemmas. Analysis of their responses revealed three primary forms of ethical justification. First, outcome-oriented justifications were frequently observed. Students emphasized reducing harm to the environment, protecting the right of living beings to exist, and considering the broader social consequences of decisions. These justifications were often framed in terms of minimizing negative environmental impact and preventing long-term damage to ecosystems. Second, principle-based justifications were grounded in moral rules and ethical norms. Students referred to general principles such as "nature should not be harmed," "waste is wrong," and "one should act fairly and honestly." These statements indicate that students relied on internalized ethical rules rather than situational benefits alone when evaluating dilemmas. Third, emotion-centered justifications reflected affective responses such as empathy, conscience, sadness, or feelings of guilt. In these cases, students explained their decisions by expressing concern for living beings or discomfort with causing harm. Taken together, these findings indicate that students evaluated ecological ethical dilemmas using both cognitive and affective dimensions, integrating rational reasoning with emotional sensitivity.

2. Responsibility and Social Benefit

Responsibility emerged as one of the most salient themes in students' responses. Students frequently emphasized the necessity of taking responsibility not only at the individual level but also at the societal level. Many participants articulated an awareness of shared responsibility for protecting common living spaces such as nature, water resources, and public environments. Students also highlighted the idea of social benefit, stating that decisions should prioritize "what is best for society" rather than personal gain. References to the common good suggest that ethical dilemmas encouraged students to move beyond self-centered reasoning and to consider collective outcomes. This theme indicates that ecological ethical dilemmas can activate social consciousness and foster an understanding of shared ethical obligations.

3. Ecological Sensitivity

The analysis revealed strong indicators of ecological sensitivity in students' evaluations of ethical dilemmas. Across written and oral responses, students frequently mentioned the importance of protecting nature, reducing water and energy waste, and managing waste responsibly. Students also referred to the interdependent relationship between humans and nature, emphasizing that harm to the environment ultimately affects all living beings. These expressions demonstrate an awareness of ecological balance and sustainability. The findings suggest that when ethical dilemmas are presented through concrete and relatable scenarios, students' ecological awareness becomes more visible and articulated.

4. Themes in Drawings

Student drawings provided additional insight into how learners conceptualized ecological ethical issues. Three dominant themes emerged from the visual data. The first theme was human–nature relationships, depicted through images of trees, animals, water sources, and humans interacting within shared environments. The second theme focused on environmental threats, such as pollution, drought, waste accumulation, and damaged ecosystems. These drawings often conveyed a sense of environmental degradation and risk.The third theme involved solution-oriented representations, including recycling bins, water-saving practices, tree planting, and symbols of environmental protection. The drawings indicate that students were able to translate abstract ethical reasoning into concrete visual forms and to use visual thinking as a means of understanding and expressing environmental problems.

5. Effects of Role-Playing

Role-playing activities played a significant role in supporting students' ethical decision-making processes. Findings indicate that students learned to adopt different perspectives by internalizing the viewpoints required by their assigned roles. Assuming roles such as CEO, surgeon, engineer, or investment specialist enabled students to evaluate ethical dilemmas within the context of professional responsibilities, societal impact, and personal values. The role-playing process encouraged students to consider the consequences of decisions from multiple angles rather than relying on a single viewpoint. Additionally, the discussion environment created through role-playing allowed students to listen to their peers' perspectives, compare alternative arguments, and restructure their own

reasoning. These findings suggest that role-playing fosters perspective-taking, reflective thinking, and collaborative ethical reasoning in the context of ecological dilemmas.

DISCUSSION

Socio-ecological dilemmas require individuals to engage in moral judgment processes that extend beyond rational cost–benefit calculations (Kals & Müller, 2010). The findings of the present study indicate that ecological ethical dilemmas provide a rich pedagogical context in which students engage in both cognitive reasoning and affective evaluation. Students' justifications reflected a combination of consequence-based reasoning, principle-oriented ethical considerations, and emotion-centered explanations, suggesting that even at early educational levels learners are capable of integrating rational judgment with empathy, moral values, and social awareness when confronted with ecologically grounded ethical dilemmas. The observed need for ethical justification reflects the inherently normative nature of sustainability-related decision-making (Öhman, 2016), while moral emotions such as empathy and responsibility play a central role in motivating sustainable behavior (Kals & Müller, 2010). This finding resonates with the argument that ethical learning is most effectively fostered through dilemmas characterized by genuine uncertainty and competing values. As Gurr and Forster (2023) emphasize, normative case studies aim to promote ethical reasoning by engaging learners with genuine uncertainty, competing values, and contextually grounded dilemmas that have not yet reached a social 'tipping point'. Ethical awareness toward ecosystem sustainability emerges primarily from internalized moral values and a sense of collective responsibility rather than from externally imposed rules or sanctions (Balontia, 2024). In line with this view, Żeber-Dzikowska et al. (2016) emphasize that ethical responsibility in environmental contexts is primarily grounded in individuals' internal value systems, moral sensitivity, and sense of responsibility rather than in external rules or sanctions. Environmental ethics functions as a core instrument within education for sustainable development by framing human–nature relationships in terms of moral responsibility, shared values, and ethical accountability rather than purely instrumental or anthropocentric considerations (Nasibulina, 2015). From this perspective, ecological ethical dilemmas engage learners with the interconnected social and ecological dimensions of sustainability by re-actualising long-standing ethical questions and reflecting the ethical and political challenges of contemporary environmental education (Öhman, 2016). Accordingly, such dilemmas can be understood not merely as instructional tools, but as intellectual frameworks that enable students to analyse and respond to morally complex sustainability-related problems (Kronlid & Öhman, 2013).

Ethical dilemmas related to sustainability inherently involve conflicts between ecological, social, and economic values, requiring a justice-oriented evaluation (Kals & Müller, 2010). One prominent theme emerging from the data was students' strong sense of responsibility and orientation toward social benefit. Participants frequently articulated the importance of acting not only in their own interest but also in consideration of collective well-being and shared environmental resources. This finding aligns with previous research emphasizing that ethical dilemmas related to sustainability can foster a sense of moral responsibility and encourage learners to consider the broader societal and environmental consequences of their decisions (Bielefeldt, 2011). The emphasis on "doing what is best for society" indicates that ethical dilemma-based instruction may support the development of civic consciousness and common-good reasoning alongside individual moral judgment.

Students also demonstrated a high level of ecological sensitivity across written responses, discussions, drawings, and role-playing activities. References to nature conservation, reduction of waste, responsible use of water and energy, and the interdependence between humans and the natural environment were consistently observed. These findings support the argument that ecological awareness is strengthened when abstract ethical issues are embedded in concrete, relatable scenarios. In this respect, the results are consistent with Esquivel-Martín et al. (2023), who found that One Health–based scenarios enabled students to reason more holistically about the interconnectedness of human, animal, and environmental health. Similarly, in the present study, students' justifications often reflected an integrated understanding of ecological systems and social responsibility.

The analysis of student drawings further revealed that learners were able to translate abstract ethical reasoning into concrete visual representations. Themes such as human–nature relationships, environmental threats, and solution-oriented actions (e.g., recycling, water conservation, reforestation) suggest that visual expression served as a meaningful medium for ethical and ecological sense-making. These findings highlight the value of multimodal data sources in capturing students' ethical thinking processes and support calls in the literature for research designs that move beyond single-method approaches when examining children's ethical decision-making.

Role-playing emerged as a particularly influential instructional strategy in supporting students' ethical reasoning processes. By assuming roles such as engineers, surgeons, CEOs, or investors, students were encouraged to adopt diverse perspectives and to evaluate ethical dilemmas within the context of professional responsibility, societal impact, and personal values. This finding is consistent with Schrier's (2015) work, which demonstrated that role-playing–based sustainability scenarios enhance empathy, perspective-taking, and ethical justification. In the present study, the role-playing process similarly enabled students to reconsider their initial positions, compare alternative viewpoints, and refine their ethical decisions through dialogue and reflection.

The observed outcomes are also in line with Rahmawati et al. (2021), who emphasized the pedagogical value of ethical dilemma narratives in promoting value clarification, collaboration, and sustainability-oriented decision-making. Students' engagement in respectful discussion, collective reasoning, and shared problem-solving in this study further supports the notion that ethical dilemmas function as social learning tools that strengthen cooperative learning and moral discourse.

From a theoretical perspective, the findings can be interpreted through the lens of Gardner's (2006) Five Minds for the Future framework. Evidence of the ethical mind and respectful mind was apparent in students' concern for fairness, responsibility, and empathy, while the synthesizing mind was reflected in their ability to connect environmental, social, and individual dimensions of ethical issues. Additionally, the creative mind manifested in students' solution-oriented proposals and imaginative representations of sustainable practices. Taken together, these results suggest that ecological ethical dilemmas offer holistic learning opportunities that simultaneously engage multiple dimensions of moral, cognitive, and ecological development.

Overall, when considered alongside existing literature, the findings of this study suggest that ecological ethical scenarios represent an effective instructional approach for fostering ethical reasoning, environmental awareness, and responsibility consciousness in children. Integrating ethics and ecology within educational practice may contribute to the development of interdisciplinary thinking skills and value-based decision-making processes, supporting learners in becoming ethically informed and environmentally responsible citizens.

CONCLUSION

The findings indicate that instructional activities based on ecological ethical dilemmas contribute to the development of holistic ethical perspectives among children. The ecological ethics approach implemented in this study enabled students to engage with environmental issues not merely at a cognitive level, but through moral reasoning, empathy, and a sense of social responsibility. This is particularly important given that the harmonious development of economic, social, and environmental systems requires a sound understanding of sustainability grounded in ethical action. Conceptualizing sustainability within an ethical framework necessitates consideration not only of the technical dimensions of environmental problems, but also of their underlying value-based aspects (Li & Wei, 2023). The findings of the present study suggest that activities grounded in ecological ethical dilemmas support the development of such a holistic perspective in children.

Within this context, the ecological ethical approach adopted in the study allowed students to evaluate environmental issues through multiple dimensions, including ethical justification, empathy, and societal responsibility. The integration of role-playing, group discussion, written explanations, and drawing activities enriched students' ethical decision-making processes at both cognitive and affective levels. This multimodal engagement provided students with opportunities to articulate, negotiate, and reflect upon their ethical positions in diverse ways. These findings are consistent with prior research demonstrating that role-playing games enhance ethical reasoning and empathy-based thinking (Schrier, 2015), and parallel studies indicating that scenario-based learning strengthens students' capacity to address human–animal–environment relationships in an integrated manner (Esquivel-Martín et al., 2023).

Furthermore, the results reinforce previous research highlighting the effectiveness of ethical dilemma–based learning environments in supporting students' value clarification, collaboration, and sustainability-oriented reasoning skills (Rahmawati et al., 2021). Students' tendency to perceive environmental protection as an ethical responsibility aligns with earlier findings suggesting that even short-term sustainability-focused interventions can foster an ethical orientation toward sustainability (Bielefeldt, 2011). Sustainability-oriented ethical awareness is strengthened when learners recognize ecosystem preservation as a shared moral obligation requiring cooperation among individuals, institutions, and society as a whole (Balontia, 2024). In this sense, ethical dilemma-based learning environments may help address the democratic challenge of promoting sustainability-related values while

preserving students' opportunities for free and reflective opinion formation (Öhman, 2016). In this respect, ecological ethical dilemmas appear to function as a powerful pedagogical tool for promoting both environmental awareness and ethical reasoning skills in educational contexts.

From a theoretical perspective, the findings also correspond with Gardner's Five Minds framework, particularly in activating ethical, respectful, synthesizing, and creative modes of thinking. Students demonstrated ethical sensitivity through moral justification and responsibility, respectful thinking through consideration of others and shared environments, synthesizing thinking through the integration of ecological, social, and individual factors, and creative thinking through solution-oriented proposals. According to Kals and Müller (2010), introducing sustainability principles at an early age and reinforcing them through ethical and experiential learning is essential for long-term impact. Overall, the integration of ecology and ethics in educational practice from an early age appears to support the development of value-based decision-making skills and to provide a meaningful foundation for students' active participation in the construction of a sustainable society.

RECOMMENDATIONS

Ethical dilemma pedagogy should be systematically integrated into teacher education programs through practice-oriented training components. Pre-service teachers need structured opportunities to learn how to introduce, facilitate, and assess ethical dilemmas in classroom settings, as such competencies are essential for strengthening sustainability and ethics education.

Ecological ethics content may be systematically embedded across teacher education curricula, particularly within courses related to values education, science education, and social studies education. This interdisciplinary integration can support prospective teachers in developing a coherent understanding of sustainability as a value-based and ethical construct.

Instructional strategies such as role-playing, scenario-based learning, and case analysis should be used more frequently in teacher education. These methods can foster pre-service teachers' ethical reasoning and empathy skills and prepare them to implement similar practices in their future classrooms. Prior research indicates that role-playing and ethical dilemma–based pedagogies are particularly effective in enhancing ethical judgment, empathy, and collaborative reasoning (Schrier, 2015; Rahmawati et al., 2021).

Age-appropriate ecological ethical dilemmas should be designed for different grade levels and implemented through discussion, written responses, drawing activities, and group work. Using multiple modes of expression can help students articulate their ethical reasoning and ecological awareness more effectively.

To monitor students' decision-making processes, analytic rubrics may be employed to systematically assess ethical justification, responsibility awareness, and ecological sensitivity. Such assessment tools can support teachers in tracking students' developmental progress in ethical and sustainability-related competencies.

Classroom instruction should be enriched with examples drawn from students' immediate environmental contexts. Presenting realistic dilemmas connected to learners' local surroundings can increase relevance, promote meaningful engagement, and strengthen the connection between ethical reasoning and real-life environmental issues.

Future studies may adopt longitudinal research designs to examine the long-term effects of ecological ethics–based instruction on students' thinking patterns, values, and environmentally responsible behaviors. Such studies would provide insight into the sustainability of ethical learning outcomes over time.

Mixed-method research designs, combining quantitative and qualitative approaches, could offer a more comprehensive understanding of students' ethical reasoning processes and decision-making strategies. Integrating multiple data sources may help capture both cognitive and affective dimensions of ethical development.

Additionally, ecological ethical dilemmas may be integrated into digital and game-based learning environments, including serious games or augmented reality applications. Exploring the use of technological approaches in conjunction with ethical dilemma pedagogy could contribute to the development of innovative instructional models for sustainability and ethics education.

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