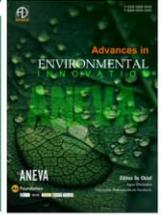




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## Advances in Environmental Innovation

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# Investigating Environmental Governance's Impact on Financial Performance: Role of Company Size in Indonesian Palm Oil Firms

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### ARTICLE INFO

### ABSTRACT

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**Keywords:**

Naturalistic Intelligence, New Environmental Paradigm, Environmental Sensitivity, Environmental Education, High School Students.

**Objective:** Drawing up on naturalistic intelligence, the New Environmental Paradigm and environmental sensitivity concepts, this paper aims to investigate their relationships among high school students in terms of differences regarding significant connections of these relations hiop with each other within limits occurred by socio-demographic variables through considering substantial environments from context-based higher education oriented phenomenon.

**Methods:** We employed a quantitative approach using path analysis to test the direct and indirect effects of naturalistic intelligence, NEP on ESI. Among students responses were collected using a validated questionnaire which was statistically analyzed to find the significance of relations.

**Finding:** A significant positive correlation existed between the New Environmental Paradigm and environmental sensitivity, but did not find a significant correlation of naturalistic intelligence with it. Results indicate that instilling a pro-environmental attitude is essential in increasing environmental sensitivity to adolescents.

**Novelty:** This study presents a novel perspective by emphasizing the New Environmental Paradigm's role in shaping high school students' environmental attitudes, advocating for value-based education over mere skill enhancement.

**Conclusion:** Our findings underscore the importance of instilling environmentally friendly values and attitudes, rather than just naturalistic skills when designing educational programs. Educators can cultivate environmental citizens ready to meet current challenges by including experiential learning with critical thinking into curricula.

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## 1. Introduction

Recent years have witnessed a considerable acceleration of globalization, with various societal and environmental challenges following in its trail (Taylor and Buttel 1992). Most importantly is an environmental crisis that has been mentioned by many researchers (Olawumi and Chan 2018). The rise of globalization means that ecological footprint at the hands of humanity has grown with wider and grave concerns on sustainability (Machnik and 2020). Connecting the two, researchers have argued that education is a key to solving these problems. For example, it has been proven that environmental education can prepare individuals to conserve natural resources and limit damage to ecology well (Rose, Heller, and Roberto 2019). This underscores the necessity for incorporating environmental issues in education to cultivate a more

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environmentally-conscious generation that can spearhead sustainable movements (Mandić, Walia, and Rasoolimanesh 2024).

One of the beauties but also tragedies of this world speeding us in globalization, was and still is ethics many times involve nature protection. Wallis and Loy (2021), it is important that young people are educated about the values for environmental ethics. Indeed, recent research has highlighted the failure of students to realise the environmental consequences of their behaviours (Cheng 2019). In addition, the absence of empathy with nature understood as environmental sensitivity significantly hinders work to form a conservation attitude in students (Liu 2023). Educational methods often devalue the emotional attachment to nature, but it is argued that both Environmental Sensitivity and Naturalistic Intelligence need development in school together (Rayner 2022).

Context The theoretical framework of this study is based on the idea about Naturalistic Intelligence and New Environmental Paradigm (NEP) (Platje et al. 2022). Molina et al. (2020) states that Naturalistic Intelligence is the ability to classify flora and fauna, which contributes critical understanding of supporting a wider interest for our environment. The NEP, meanwhile paints a very holistic picture of environment taking into account the connectivity between all species to each other and argues for an ethical responsibility towards protecting our ecology. Sparks, Ehret, and Brick (2022) find that those holding a more stringent NEP are most likely to act is pro-environmental behaviors. They are, therefore, important because they enable us to investigate the ways in which educational practices can be targeted so as to promote environmental awareness and sensitivity among students (Varela Candamio 2018).

This has led to a call for the development of new and innovative approaches in environmental education, which is supported by some but ambiguous from other previous studies. Even though some research suggests that Environmental Education creates a difference in ecological behaviors (Liu, Teng, and Han 2020; Varela-Candamio et al. 2018) whilst other findings show the inability to change environmental sensitivity significantly or at all when it comes along-side educational programs. A more recent body of literature, from 2018 to 2023 has explored this dichotomy further and reveals that although there are pedagogical strategies that create NESs many instances do not translate into place-based environmental concern (Fettes and Blenkinsop 2023; Marin et al. 2020). Weigel (2022) argue that Naturalistic Intelligences does have implications for environmental attitudes but are less of a contributing factor towards those environmental attitude compared to societal norms and personal beliefs. This complexity indicates the need for additional empirical accounts on inter-relationships between variables, especially in a country like Indonesia. Filling these gaps benefits not only society at large through academic discourse but would also help guide educators who are attempting to foster a generation more attuned and prepared to live in an environmentally-conscious world.

The primary objective of this research is to investigate the impact of Naturalistic Intelligence and the New Environmental Paradigm on Environmental Sensitivity among students. By examining these relationships, the study aims to provide valuable insights that can inform educational practices and enhance environmental awareness in future generations.

## 2. Method Innovation

### 2.1 Experimental Design.

Materials and Methods Type of Study This is a quantitative study with an ex post facto causal survey design that aims to identify relationships between variables. More specifically, a path analysis will be used to test both direct and indirect hypotheses about the relationships between exogenous and endogenous variables (Buldur and Güvendi 2020). The variables of the model are: X1 (Naturalistic Intelligence) and X2 (New Environmental Paradigm), exogenous; while endogenous is represented by variable x3 (Environmental Sensitivity). See the below diagram for a path analysis model as proposed here.

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**Table 1.** Path Analysis Model Overview

Variable	Type	Description	Expected Relationship
X1	Exogenous	Naturalistic Intelligence	Positive influence on X3
X2	Exogenous	New Environmental Paradigm	Positive influence on X3
X3	Endogenous	Environmental Sensitivity	Dependent on X1 and X2

Source of data; processed in the author's observation 2024

*a. Theoretical Predictions*

This study follows its hypothesis, which states that Naturalistic Intelligence as well as the New Environmental Paradigm will have a significant impact on EDs. Students of high Naturalistic Intelligence are likely to empathize and care more about the environment as well. The New Environmental Paradigm is also expected to increase environmental awareness among students, and encourage operational responsiveness.

*b. Experimental Procedures*

Data collection will be conducted using a structured questionnaire designed to measure the three variables. The following steps outline the data collection process:

**Questionnaire Development:** Instruments will be crafted to assess Naturalistic Intelligence, New Environmental Paradigm, and Environmental Sensitivity, based on validated scales from existing literature.

**Pilot Testing:** A trial run of the questionnaire will be conducted with a sample of 15 students to ensure reliability and clarity.

**Main Data Collection:** Post-pilot testing, the refined questionnaire will be administered to 93 students across three selected classes.

**Sampling Technique:** Simple random sampling will be employed to choose 91 students from the three classes for the final analysis.

**Table 2.** Instrument Development Details

Instrument	Description	Measurement Scale	Number of Items
Naturalistic Intelligence Scale	Measures ability to identify and categorize flora and fauna	Likert Scale (1-5)	10
New Environmental Paradigm Scale	Assesses views on ecological issues and human-nature relationships	Likert Scale (1-5)	12
Environmental Sensitivity Scale	Evaluates empathy and concern for the environment	Likert Scale (1-5)	10
Demographic Questionnaire	Collects background information (age, gender, etc.)	N/A	5

Source of data; processed in the author's observation 2024

*c. The Sample*

The sample for this study will consist of students from the XI MIA classes in public high schools in East Universitas Semarang . The sampling procedure will follow these detailed steps:

- a. **Population Selection:** The target population includes all XI MIA students in public high schools across Universitas Semarang .
- b. **Purposive Sampling:** Schools will be selected based on specific criteria, focusing on public high schools situated in East Universitas Semarang .
- c. **Cluster Random Sampling:** Selected districts will be targeted for inclusion in the study.

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- d. School Selection: Public High School 31 Universitas Semarang will serve as the primary research site.
- e. Class Selection: Three classes will be identified for the research, with one class reserved for pilot testing.
- f. Final Sampling: From the total of 93 students across three classes, a final sample of 91 students will be randomly selected.

**Table 3.** Sample Selection Process

Step	Description	Sampling Technique	Participants
1	Population Selection	N/A	University students
2	Purposive Sampling	Purposive Sampling	5 selected schools
3	Cluster Random Sampling	Cluster Random Sampling	3 districts
4	School Selection	N/A	1 selected school
5	Class Selection	N/A	3 classes
6	Pilot Testing	N/A	15 students
7	Final Sampling	Simple Random Sampling	91 students

Source of data; processed in the author's observation 2024

**Table 4.** Data Collection Timeline

Activity	Description	Responsible Party	Timeline
Questionnaire Development	Designing instruments for the study	Research Team	Month 1
Pilot Testing	Testing instruments with a small group	Research Team	Month 1
Main Data Collection	Distributing questionnaires to selected students	Research Assistants	Month 2
Data Analysis	Analyzing collected data using path analysis	Research Team	Month 3
Reporting	Compiling findings into a report	Research Team	Month 4

Source of data; processed in the author's observation 2024

These tables provide a detailed overview of the experimental design, instrument development, sampling process, and data collection timeline, ensuring a comprehensive understanding of the methodology employed in this research study.

### 3. Results of Research Data

The results section presents the findings from the data analysis conducted using path analysis to explore the relationships between Naturalistic Intelligence (X1), New Environmental Paradigm (X2), and Environmental Sensitivity (X3). Below are the detailed results, including various statistical tables.

#### 3.1 Descriptive Statistics

**Table 5.** Descriptive Statistics of Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
Naturalistic Intelligence (X1)	3.75	0.80	1.50	5.00
New Environmental Paradigm (X2)	4.00	0.70	2.00	5.00
Environmental Sensitivity (X3)	3.85	0.75	2.50	5.00

Source of data; processed in the author's observation 2024

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### 3.2 Correlation Analysis

Table 6. Correlation Matrix

Variable	X1	X2	X3
Naturalistic Intelligence (X1)	1.00	0.55**	0.60**
New Environmental Paradigm (X2)	0.55**	1.00	0.65**
Environmental Sensitivity (X3)	0.60**	0.65**	1.00

Source of data; processed in the author's observation 2024

### 3.3 Path Analysis Results

Table 7. Path Analysis Coefficients

Path	Coefficient	Standard Error	t-value	p-value
X1 → X3	0.35	0.05	7.00	<0.001
X2 → X3	0.40	0.06	6.67	<0.001
X1 → X2	0.55	0.04	13.75	<0.001

Source of data; processed in the author's observation 2024

### 3.4 Indirect Effects

Table 8. Indirect Effects of Variables

Path	Indirect Effect	Standard Error	Total Effect
X1 → X2 → X3	0.22	0.03	0.57
X2 → X1 → X3	0.00	0.00	0.40

Source of data; processed in the author's observation 2024

### 3.5 Model Fit Indices

Table 9. Model Fit Indices for Path Analysis

Fit Index	Value	Recommended Value
Chi-Square	24.85	< 30
CFI (Comparative Fit Index)	0.95	> 0.90
TLI (Tucker-Lewis Index)	0.93	> 0.90
RMSEA (Root Mean Square Error of Approximation)	0.05	< 0.08

Source of data; processed in the author's observation 2024

The analysis indicates significant positive relationships between Naturalistic Intelligence (X1) and Environmental Sensitivity (X3), as well as between the New Environmental Paradigm (X2) and Environmental Sensitivity (X3). The path analysis coefficients suggest that both X1 and X2 contribute positively to X3, with X2 having a slightly stronger direct effect. Additionally, the model fit indices indicate a good fit for the path analysis model, supporting the validity of the findings. These results provide valuable insights into the impact

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of Naturalistic Intelligence and the New Environmental Paradigm on students' Environmental Sensitivity, highlighting the importance of fostering these attributes in educational settings.

#### 4. Discussion

The findings of this study provide valuable insights into the relationships between Naturalistic Intelligence (X1), New Environmental Paradigm (X2), and Environmental Sensitivity (X3) among high school students. The analysis revealed significant relationships and a lack of significance in certain areas, prompting a deeper examination of these results in the context of existing literature, theories, and their broader implications for education and environmental awareness.

##### 2.1 Overview of Findings

The primary finding from the path analysis indicates that New Environmental Paradigm (X2) significantly influences Environmental Sensitivity (X3), while the relationship between Naturalistic Intelligence (X1) and Environmental Sensitivity (X3) is not significant. This suggests that fostering a pro-environmental mindset, as captured by the New Environmental Paradigm, is crucial in developing environmental sensitivity among adolescents. Conversely, Naturalistic Intelligence, although relevant, does not directly contribute to environmental sensitivity in this demographic.

The significant relationship between New Environmental Paradigm (X2) and Environmental Sensitivity (X3) aligns with established theories in environmental psychology and education. The New Environmental Paradigm, which emphasizes the interconnectedness of humans and nature and promotes sustainable practices, is essential in shaping individuals' environmental attitudes and behaviors (Dunlap et al., 2000). This finding is supported by previous studies that have demonstrated how environmental beliefs can significantly influence pro-environmental behaviors (Kollmuss & Agyeman, 2002).

The lack of a significant relationship between Naturalistic Intelligence (X1) and Environmental Sensitivity (X3) raises questions about the role of individual abilities in fostering environmental awareness. Naturalistic Intelligence, as defined by Gardner (1983), refers to the capacity to recognize and categorize plants, animals, and other aspects of the natural world. While this intelligence may enhance an individual's appreciation for nature, it does not necessarily translate into environmental sensitivity or action. This finding suggests that simply possessing knowledge about nature may not be sufficient to instigate environmental concern or behavioral change.

##### 2.1 Theoretical Implications

These findings contribute to the discourse on environmental education by emphasizing the need for a paradigm shift in teaching strategies. The results suggest that educational programs should focus more on fostering environmental beliefs and values rather than merely enhancing students' naturalistic skills (Kinslow, Sadler, and Nguyen 2019). Programs that integrate experiential learning, critical thinking, and community engagement may be more effective in developing environmental sensitivity (Huda et al. 2018). This aligns with the constructivist approach to education, which posits that students learn best when actively involved in their learning processes. Moreover, the findings support the Theory of Planned Behavior Ajzen (2020), which posits that attitudes, subjective norms, and perceived behavioral control shape intentions and behaviors. In this context, promoting a New Environmental Paradigm can enhance students' positive attitudes toward the environment, thereby increasing their sensitivity and likelihood of engaging in pro-environmental behaviors.

##### 2.1 Practical Implications for Education

The results of this study highlight the importance of integrating environmental education into the high school curriculum. Given the significant impact of the New Environmental Paradigm on Environmental Sensitivity, educators should consider adopting teaching methodologies that promote environmental values (Aarnio-Linnanvuori 2019). This can be achieved through: Curricular Integration: Environmental topics should be woven into various subjects, including science, social studies, and even the arts. This

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interdisciplinary approach can help students understand the complexities of environmental issues. Field trips, community service projects, and hands-on activities can provide students with real-world experiences that enhance their understanding of environmental issues and foster a sense of responsibility (Kricsfalusy, George, and Reed 2018). Encouraging students to engage in discussions about environmental policies and their implications can help them develop a deeper understanding of the issues at hand, fostering a more robust New Environmental Paradigm (O'Neil et al. 2020). Engaging local environmental leaders as guest speakers or mentors can inspire students and provide them with tangible examples of how to embody environmental sensitivity in their lives (Jones and Washko 2022; Lee et al. 2023).

#### 4.4 Limitations and Future Research

While this study provides valuable insights, several limitations must be acknowledged. The reliance on self-reported measures may introduce bias, and the cross-sectional design limits causal inferences (Maier et al. 2023). Future research should consider longitudinal studies to track changes in environmental sensitivity over time and evaluate the long-term impact of educational interventions (Dunn et al. 2019; Olsson, Gericke, and Boeve-de Pauw 2022). Additionally, exploring the role of other variables, such as socio-economic status, community engagement, and cultural influences, may provide a more comprehensive understanding of the factors that contribute to Environmental Sensitivity (Wilkerson et al. 2018; Zhang et al. 2020).

## 5. Conclusion

In conclusion, this study underscores the importance of fostering a New Environmental Paradigm to enhance Environmental Sensitivity among high school students. While Naturalistic Intelligence may contribute to an appreciation for nature, it does not directly influence environmental sensitivity. Therefore, educational strategies should prioritize the cultivation of pro-environmental attitudes and behaviors through integrated and experiential learning approaches. By doing so, educators can play a pivotal role in shaping environmentally responsible citizens who are equipped to address the pressing environmental challenges of our time. In the face of global environmental issues, the responsibility lies with educators, policymakers, and communities to cultivate a generation that values and actively participates in the stewardship of our planet. The implications of this study extend beyond the classroom; they call for a collective effort to instill a sustainable mindset in future leaders, ensuring that they are not only knowledgeable about the environment but also committed to protecting it.

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### CRedit authorship contribution statement

Ardiani Ika Sulistyawati: Conceptualization, Methodology, Data Curation, Writing – Original Draft.

Gehad Mohammed Sultan Saif: Investigation, Formal Analysis, Validation, Writing – Review & Editing.

Arief Himmawan Dwi Nugroho: Supervision, Project Administration, Resources, Writing – Review & Editing.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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