Factors Influencing Students' Pro-Environmental Behavior: A Systematic Literature Review

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ABSTRACT

Pro environmental behavior refers to individual efforts to protect the environment and minimize activities that can have a negative impact on the environment. The purpose of this research is to review the results of research on factors that influence students' pro-environmental behavior. This research used the SLR method on articles sourced from National and International databases and obtained 20 articles published in 2019-2023. The results of the article analysis show that the factors that influence students' pro-environmental behavior are divided into 3 components, namely: 1) Socio-Demographic Factors (age, gender), 2) Internal Factors (Knowledge, Attitudes, Psychology, Values) and 3) External Factors (Economic and Social Norma). Most research is carried out to examine students' pro-environmental behavior, namely knowledge, attitudes, gender and attitude factors. Further research is recommended to look at the influence of each factor to find out the strongest predictors so as to increase students' pro-environmental behavior.

Faktor-Faktor Yang Mempengaruhi Perilaku Pro Lingkungan Siswa : A Sistematic Literature Review

INTRODUCTION

Indonesia is a mega biodiversity country. According to National Geographic Indonesia in 2019, Indonesia’s land mass ranks second in terms of biodiversity after Brazil. However, when terrestrial biodiversity combines with marine biodiversity, Indonesia becomes the country with the most biodiversity in the world (Riyan et al., 2021);(Vijeta et al., 2021). However, Indonesia is also known as a country with a high decline in biodiversity (flora and fauna). Indonesia is in sixth place as the country with the most biodiversity extinction (Sieg & Dreesmann, 2021).

The main cause of the decline in biodiversity in Indonesia is anthropocentrism, namely that humans view nature as a resource that can be exploited for human benefit and do not view nature as a system that must be respected and protected (Schneiderhan-Opel & Bogner, 2021). Exploitation of natural resources, loss and degradation of habitat, pollution, hunting, invasive species are some of the factors causing the decline in biodiversity (Ichsan et al., 2020);(Firdaus et al., 2023). Apart from that, climate change is also one of the factors causing the decline in biodiversity. Climate change can change ecosystem function and structure, reduce productivity and resource availability, and affect interactions between species (Castillo-Huitrón et al., 2020).

Problems related to environmental damage in the future are caused by a lack of educational knowledge in understanding the importance of preserving the environment (Darwati et al., 2024);(Lestari et al., 2023). Puspita et al. (2023) argue, a reasonable effort that can accommodate environmental problems is to apply an understanding of the importance of preserving the environment which is supported by environmental awareness.

When students understand the importance of preserving and caring for the earth as a natural living place for living creatures, then these students are certain to have pro-environmental behavior (Jilani et al., 2021).

Apart from that, realizing pro-environmental behavior can be achieved in schools. Environmental education plays a key role in achieving this (Haka et al., 2020);(Handoko et al., 2024). Puspita et al. (2023) argue, environmental education is an important means of overcoming environmental problems with the aim of protecting and preserving the environment. The focus of environmental education is to help students understand, evaluate, and implement sustainable and environmentally friendly behavior (Hong Tian & Liu, 2022);(Kousar et al., 2022). Abdullah & Keshminder (2020) argue, through environmental education, we can learn how to overcome environmental problems, prevent further environmental damage, and protect and preserve the environment.

Based on previous research conducted by Ahmat et al. (2022), lack of exposure to real life examples can cause students' low level of environmental sensitivity. Apart from that, Aguir & Nouri (2021) explained that a lack of exposure to environmental issues causes a lack of awareness and sensitivity towards the environment. This is in line with research by Ural & Dadli (2020), which states that environmental knowledge among students in Turkey is still low.

Although the types of pro-environmental behavior have been handled well, the determining factors have still received less attention (Loureiro et al., 2022). Currently there is not much data available regarding the factors that influence the pro-environment of students, especially those who receive biology material in
Indonesia (Grilli & Curtis, 2021); (Chen et al., 2020). Before increasing students’ pro-environmental behavior, it is necessary to first describe pro-environmental behavior and to determine the appropriate way to increase this behavior, factors related to environmental behavior must be investigated first. Therefore, a systematic literature review (SLR) is needed to find strategies that will help overcome the problems faced as well as identify different perspectives related to the problem being researched and reveal theories that are relevant to the case in this research which examines in more depth the factors that influence students’ pro-environmental behavior (Fu et al., 2020); (Ural & Dadli, 2020).

**METHOD**

This research uses a systematic literature review (SLR) method which aims to identify, examine and evaluate all relevant research findings so that they are able to answer research questions (Lu et al., 2023). The systematic literature review carried out in this research is based on the steps presented by Aguir & Nouri (2021) which consist of three stages, namely planning, implementing and reporting.

![Planning](#)

- Determine Purpose Research
- Formulate Keyword Research
- Conduct a Literature Search
- Determine Inclusion and exclusion Criteria

**Conducting**

- Identify Data Collection
- Filter Data Collection
- Perform Data Analysis
- Perform Synthesis

**Reporting**

- Document Research Result

**Figure 1. SLR Steps**

**Planning**

Planning is carried out to determine the following things: a) determining research objectives, b) finding research keywords, c) determining inclusion criteria, and d) determining exclusion criteria (Hiebl, 2023). This research aims to examine the factors that influence pro-environmental behavior centered on students who receive biology material. Keyword discovery was carried out by establishing several conditions before conducting a literature search, namely: 1) The emergence of the concept of pro-environmental behavior in the literature. 2) The emergence of ideas of knowledge, attitudes, values, environmental psychology, and so on. Next, a literature search was carried out with the help of Google Scholar. Then determine inclusion and exclusion criteria to filter articles that meet the requirements. The inclusion criteria are the criteria for articles that meet the requirements for this research, including: 1) article year range 2019 to 2023, 2) studies related to Biology learning, 3) research subjects of students from junior high school to college level. Then, determine the exclusion criteria, namely the criteria for articles that do not meet the requirements for the research.

**Implementation**

The implementation of the systematic literature review procedure was carried out in three main stages, namely data collection identification, data filtering, data analysis (Dinter et al., 2021) and data synthesis which are presented in Figure 1. First, article identification was carried out through the Google Scholar database using Publish or Persih software. In the first stage, 86 articles were obtained that met the inclusion criteria. Articles obtained from the first stage were entered into Mendeley software to remove duplicate articles. The results of the second stage obtained 44 articles that were not duplicated. Second, filtering articles is carried out by reviewing them based on the title and abstract with the help of VOSviewer to determine the relationship between keywords.
Based on the screening that has been carried out, the factors that influence pro-environmental behavior are knowledge, age, gender, emotional, social norms, attitude, psychology, personal norms, economics, education and behavior. As a result of the third stage, 34 articles were deleted because they did not meet the inclusion criteria. Third, the data was analyzed based on full text articles by considering the exclusion criteria so that 20 relevant articles were obtained. Fourth, summarize each article in the extracted template which includes the following components: 1) author and year of publication, 2) aim/focus of the article, 3) context, 4) level, and 5) material for each article which is presented in Table 1.

**Figure 2.** Flow diagram for implementing a systematic literature review

**Reporting**

This report aims to provide an overview of the results of analysis and synthesis of literature that fall within the inclusion and exclusion criteria which form the main part of the research article.
Table 1. Summary of Articles reviewed

<table>
<thead>
<tr>
<th>No</th>
<th>Author, year</th>
<th>Research Purpose</th>
<th>context</th>
<th>Level</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Baga, et al (2022)</td>
<td>Knowing pro-environmental behavior after being given different learning media based on gender.</td>
<td>Gender, media</td>
<td>Junior High School</td>
<td>Environmental Change</td>
</tr>
<tr>
<td>2</td>
<td>Sari, et al (2023)</td>
<td>Analyzing environmental knowledge, place attachment and ecoliteracy on students’ pro-environmental behavior.</td>
<td>Environmental knowledge, emotional, environmental literacy</td>
<td>Senior High School</td>
<td>Biology</td>
</tr>
<tr>
<td>3</td>
<td>Datau, et al (2019)</td>
<td>Knowing the personality and pro-environmental behavior of students’ moral behavior</td>
<td>Big Five Personality</td>
<td>Senior High School</td>
<td>Biology</td>
</tr>
<tr>
<td>4</td>
<td>Rahman, et al (2020)</td>
<td>Knowing the value orientation and pro-environmental behavior of students</td>
<td>Value Orientation</td>
<td>Senior High School</td>
<td>Biology</td>
</tr>
<tr>
<td>5</td>
<td>Putri (2021)</td>
<td>Knowing climate change knowledge and personal values with students’ pro-environmental behavior</td>
<td>Self-concept, environmental conservation, climate change</td>
<td>Senior High School</td>
<td>Biology</td>
</tr>
<tr>
<td>6</td>
<td>Sigit, (2019)</td>
<td>Knowing the relationship between environmental responsibility and pro-environmental behavior</td>
<td>Environmental responsibility</td>
<td>Undergraduate Students</td>
<td>Biology</td>
</tr>
<tr>
<td>7</td>
<td>Sieg &amp; Dreesmann (2021)</td>
<td>Testing pro-environmental behavioral intentions and knowledge, attitudes, fears, interests, and enjoyment of learning in school interventions</td>
<td>Knowledge, attitudes, interests, bees, biodiversity, enjoyment of learning</td>
<td>Junior High School</td>
<td>Biologi, Neurologi dan ethologi</td>
</tr>
<tr>
<td>9</td>
<td>Schmiedebach, et al (2022)</td>
<td>Investigating the relationship between gender, age, education level, pro-environmental behavior and students’ environmental attitudes</td>
<td>Environmental attitudes, age, gender, (participation in the future Friday movement)</td>
<td>Junior High School</td>
<td>Photosynthesis and Enzyme Reactions</td>
</tr>
<tr>
<td>10</td>
<td>Yusup (2019)</td>
<td>Explaining students’ environmental knowledge regarding gender, years of education, and parents’ educational background.</td>
<td>Socio-demographic factors, environmental knowledge environmental literacy</td>
<td>Senior High School</td>
<td>Environmental Biology</td>
</tr>
<tr>
<td>11</td>
<td>Anggereini &amp; Yelianti (2019)</td>
<td>Interest in learning and critical thinking skills influence students’ pro-environmental behavior</td>
<td>Critical thinking, interest</td>
<td>Senior High School</td>
<td>Environmental Change Biology</td>
</tr>
<tr>
<td>12</td>
<td>Opel &amp; Bogner (2021)</td>
<td>The influence of environmental values on the environmental knowledge of German elementary school students</td>
<td>environmental knowledge, environmental values, environmental education, water supply, environmental</td>
<td>Elementary School</td>
<td>Biology</td>
</tr>
<tr>
<td>No</td>
<td>Author, year</td>
<td>Research Purpose</td>
<td>context</td>
<td>Level</td>
<td>Content</td>
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</tr>
<tr>
<td>14</td>
<td>Anggereini &amp; Siburian (2020)</td>
<td>Seeing the influence of the learning environment based on a mini research project that integrates PEB and ecosystem knowledge on students' critical thinking abilities.</td>
<td>Naturalist Intelligence, Sequential Explanatory</td>
<td>Senior High School</td>
<td>Ecosystem</td>
</tr>
<tr>
<td>16</td>
<td>Schmitz (2019)</td>
<td>Evaluating the environmental attitudes of 196 students from a Brazilian University.</td>
<td>Environmental education, Future teachers, Sustainable attitudes.</td>
<td>Undergraduate Students</td>
<td>Environmental</td>
</tr>
<tr>
<td>17</td>
<td>Ichsan et al, (2022)</td>
<td>Describe the PEHB profile of elementary school students in biology learning.</td>
<td>Biology Learning, Contextual Behavior, Pro-Environmental Health Behavior</td>
<td>Elementary School</td>
<td>Biology</td>
</tr>
<tr>
<td>18</td>
<td>Anggereini et al (2023)</td>
<td>Analyzing the influence of learning PEB behavior using a mini research project on problem solving abilities and how big the influence</td>
<td>Problem Solving, mini research,</td>
<td>Senior High School</td>
<td>Biology</td>
</tr>
<tr>
<td>19</td>
<td>Stenberdt &amp; Makransky (2023)</td>
<td>Investigating the feasibility of an alternative educational approach to improving waste management in the classroom by leveraging mastery experiences in IVR.</td>
<td>Virtual reality, Climate change education, Waste management, Exaggerated feedback</td>
<td>Senior High School</td>
<td>Climate change</td>
</tr>
<tr>
<td>20</td>
<td>Djuwita &amp; Benyamin (2019)</td>
<td>Describes whether green school students have a higher connection with nature so they will behave more environmentally friendly, compared to students from schools with a regular national curriculum.</td>
<td>Nature relatedness, PSchools' curriculum, Students</td>
<td>Elementary School</td>
<td>Biology</td>
</tr>
</tbody>
</table>
RESULTS AND DISCUSSION

Base on the results of the systematic literature review, 86 articles were obtained. After the screening process, 20 articles were obtained regarding factors that influence students’ pro-environmental behavior which were classified into three categories in table 2.

Table 2. Factors of Student Pro-Environmental Behavior

<table>
<thead>
<tr>
<th>No</th>
<th>Faktor-faktor Pro Lingkungan Siswa</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Socio-Demographic Factors (Age, Gender)</td>
</tr>
<tr>
<td>2</td>
<td>Internal Factors (Knowledge, Attitude, Psychology, Personal Norms)</td>
</tr>
<tr>
<td>3</td>
<td>External Factors (Economy, Social Norma)</td>
</tr>
</tbody>
</table>

Through the factors that have been explained, an appropriate conceptual model can be drawn regarding the factors that influence students’ pro-environmental behavior, namely the Kollmus & Agyemen (Juhari et al., 2023) model in Figure 3.

Figure 3. Model of pro-environmental behavior

Kollmus & Agyemen's model of pro-environmental behavior as a theoretical framework is similar to the research results obtained. Kollmus and Agyemen analyzed factors found to have an influence, positive or negative, on pro-environmental behavior. These factors include: demographic factors, external factors (institutional, economic, social and cultural) and internal factors (motivation, pro-environmental knowledge, awareness, values, attitudes, emotions, locus of control, responsibility and priorities.

According to Kolmus & Agyemen's model, pro-environmental behavior arises because it is influenced by knowledge variables, knowledge about the behavioral strategies a person uses towards the environment, and even knowledge about environmental culture (Hamzah & Tanwir, 2021); (Hong Tian & Liu, 2022). The element of knowledge plays a role in forming attitudes and behavior. Other factors that influence the formation of pro-environmental behavior are attitudes towards the environment (attitudes), Fear (anxiety), social and cultural factors (social and cultural factors), Feelings (feelings), and emotional (emotions). Emotional factors are intense feelings directed towards someone or something and a series of tendencies to act pro-environmentally (Mohammadi et al., 2023); (Ateş, 2020).

Socio-Demographic Factors

Gender

Female students show a more pro-environmental attitude than male students. Women show more concern for the environment and are more willing to behave in environmentally friendly ways than men (Ali et al., 2021). It is important for teachers to have the same influence on female and male students in terms of environmental education (Okumah et al., 2020); (Concari et al., 2020). Teachers must realize that they need to provide adequate environmental knowledge and highlighting the importance of pro-environmental thinking, especially to male students (Yuriev et al., 2020). This can be achieved by talking about some everyday items that all students use, such as talking about microplastics in cosmetics, artificial grass, clothing, tire wear particles, etc. by emphasizing that all genders are affected by ecological well-being and must act pro-ecologically (Verschoor et al., 2021).

At the university level, it was also found that the pro-environmental behavior of female undergraduate students was
higher than that of male undergraduate students. This is because women have a higher level of responsibility in protecting the environment and care for others in taking responsibility for reducing environmental problems (Macgregor et al., 2022);(Afsar & Umrani, 2020). Ordinary women are trained from an early age to be more expressive, sympathetic, nurturing, cooperative, independent and helpful. In addition, environmentally related behaviors mostly occur at home, such as saving electricity, using recycled products, and purchasing household products (Bhutto et al., 2021);(Pohl et al., 2021);(Hossain et al., 2022)

Age
Older people behave better environmentally than younger people. Older humans play a more important role in PEB than younger humans. Young people show little commitment to a general system of values, do not feel connected to the current social order and can accept massive disruption of the social order (Mayr & Freund, 2020).

However, not all research obtains things that match theory, such as Wallis & Loy (2021) explaining that 19 year old students implement more pro-environmental behavior than 21 year old students. The discrepancy between the results of this study and theory could be caused by the close age range of the respondents so that it does not have a big influence on student behavior scores. Based on literature analysis, students at university level have better pro-environmental behavior than junior high school students (Yamane & Kaneko, 2021). It is proven that a higher level of education produces more knowledge in relevant scientific disciplines so as to develop an understanding of various aspects of the environment.

Internal Factors
Knowledge
Knowledge about the current state is a strong predictor of engaging in pro-environmental behavior (Handoyo et al., 2021). Environmental knowledge is an individual's understanding of the environment and human actions that influence the ecosystem (Ajibade & Boateng, 2021);(Tamar et al., 2021). Environmental knowledge is the basis for understanding the impact of human behavior on the environment so that environmental knowledge is important in solving environmental problems.

Ilenna et al. (2022) argue, highlight environmental knowledge as factual knowledge regarding environmental topics, definitions and policies. Apart from that Amoah & Addoah (2021) said that environmental knowledge is indeed a necessary prerequisite for environmental action. However, there are some environmental actions such as reducing waste and saving energy that can be done as an individual habit that does not require environmental knowledge (Ilenna et al., 2022).

Students who receive environmental education in K-10 are more likely to engage in pro-environmental behavior. Environmental education in universities can also increase students' willingness to take pro-environmental actions. Self-education through media and online resources can also increase environmental knowledge and influence behavior.

Attitude
Attitude towards the environment is an assessment that a person makes regarding behavior they like or dislike (Sabirov, 2021). Environmental attitudes are the way students become aware of their environment, adjust their behavior, and treat the ecological environment in a protective manner (Amin et al., 2020); (Ibañez et al., 2020). Someone who has an optimistic attitude towards a behavior will have greater behavioral intentions. A positive attitude towards PEB can certainly influence the intention to carry out PEB positively (Shutaleva et al., 2022).
Environmental attitudes are considered as indicators and components to predict a person's environmental behavior. This can be seen when the rise of environmental issues can influence individual environmental attitudes to act pro-environmentally. Environmental attitudes provide a good understanding of the set of beliefs, interests, and guidelines that encourage environmental or pro-environmental practices (Dhir et al., 2021).

Apart from that, many students are interested in global problems such as climate change, air pollution and global warming, but they do not involve themselves in pro-environmental activities. Huirong et al. (2020) argue, that the relationship between environmental attitudes and PEB is not always linear. Environmental attitudes are recognized as a strong predictor of PEB but the gap between environmental attitudes and PEB still exists.

**Psychology**

Environmental psychology is a term that describes the relationship between human behavior and the physical environment (Meagher, 2020). Therefore, it is considered a two-way process, focusing on how attitudes and behavior impact the environment and how the environment influences people's behavior. Studies show that the physical environment plays an important role in determining behavior, emotions, interests, thoughts and overall well-being (Tam & Milfont, 2020).

Interest is part of the affective component of attitudes and indirectly influences pro-environmental behavior. Interest is described as a subjective relationship between a person and a particular object. Interest can increase attention and learning outcomes, which have an impact on the learning process and academic performance (Bradley et al., 2020);(Martin et al., 2020). However, there is still little research on the influence of interest on behavior that supports the environment and behavioral intentions, so further research is needed to explore the relationship between interest and the desire to behave pro-environmentally. Interest also has a significant role in pro-environmental behavior and helps students to draw conclusions about behavioral intentions based on the knowledge and attitudes acquired (Boley & Mimbs, 2021).

In addition, developing a positive emotional attitude in students towards the learning process and school is an important goal in education (Karakas & Yildiz, 2020). Success in going through the learning process has an important influence on the quality of learning, academic achievement and personal happiness of students (Kang et al., 2020);(Wiener & Pazzaglia, 2021). If someone feels satisfaction when studying, this can trigger a high interest in learning. That is why, it can be concluded that students who enjoy learning and interacting show greater motivation in carrying out their intention to act pro-environmentally.

**Personal Norm**

Norms can be interpreted as an expectation held by an individual regarding how he or she should act in a particular social situation. According to Pomylkina et al. (2020) norms can be constructed as individuals' internal expectations about how they should act based on their inner values (Thébault et al., 2021).

Mutlu (2020) suggests, that personal norms can be explained as internalized moral rules regarding the perception of right or wrong of a particular target behavior. Personal norms emerge from shared expectations in social interactions and can influence behavior independently of sanctions or external reinforcement through social intervention. Therefore, personal norms guide behavior based on self-expectations, and when these norms are internalized, they are integrated into the individual's self-concept (Han & Son, 2020);(Peters & D’Penna, 2020).
Personal norms make students have a moral obligation to behave in certain environmentally friendly ways which can help students develop a willingness to act (Wilkaniec et al., 2021); (Mason et al., 2022). Higher personal norms may lead to intentions to act more sensitively to the environment (Valtonen et al., 2021). It is worth noting that many studies have examined the relationship between personal norms and PEB. Yildirim (2020) investigated the positive relationship between personal norms and pro-environmental behavior. Mutlu (2020) shows that personal norms have a negative relationship with PEB. However, Johnson stated that personal norms will be a stronger predictor of influencing PEB when social norms are internalized into personal norms.

External Factors Social Norm

Individuals are more likely to engage in pro-environmental behavior when it is considered the norm in their social group. Positive social identities related to the environment, such as being part of a community or group that supports environmental issues, can motivate pro-environmental behavior (Ichsan et al., 2020); (Abdullah & Keshminder, 2020) peer pressure and messages from the media or organizations can have a significant impact on pro-environmental behavior (Sieg & Dreesmann, 2021).

So, if environmental norms in community groups are upheld, then students as members of society will also be more environmentally friendly. Vice versa, if environmental norms in a group of people are ignored, students will be lazy about protecting the environment (Triyuni et al., 2023).

Economics

Economic factors also play a role in PEB decision making. Students or college students have high needs to support their education. While most students do not have their own income (Ahmat Zainuri et al., 2022); (Syed-Abdullah, 2020). Problems like this can result in students not having a high PEB (Hong Tian & Liu, 2022). Some PEBs as good behavior in protecting the environment have to pay higher costs, such as choosing organic food products, using renewable energy sources such as solar panels, bag prices are more expensive than plastic bags (Jilani et al., 2021); (Kousar et al., 2022).

CONCLUSIONS AND SUGGESTIONS

Pro-environmental behavior is an effort to prevent the earth from being damaged. There is great potential to reach students using appropriate methods in schools to demonstrate the importance of pro-environmental behavior. Although everyone benefits from environmental programs, only a few really care. The factors that indicate students' tendency to behave pro-environmentally are: 1) socio-demographic factors (gender and age), 2) internal factors (knowledge, attitudes, awareness, norms, psychological factors) and 3) external factors (economic, socio-cultural). This research still has many limitations, such as not having specifically linked each predictor of pro-environmental behavior. So, it is hoped that future researchers will be able to examine in more depth the relationship between factors that increase students’ pro-environmental behavior.

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