



CORRELATION BETWEEN PRO-ENVIRONMENTAL BEHAVIOR AND ENVIRONMENTAL VALUES OF FEMALE PRE-SERVICE SCIENCE TEACHERS IN INDONESIA

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DOI: 10.15294/jpii.v12i2.42261

Accepted: January 24th, 2023. Approved: June 27th, 2023. Published: June 30th, 2023

ABSTRACT

In contrast with the global trend of male domination in science and technology, Indonesia's pre-service science teacher program is widely attracted to female students. This study aims to investigate the correlations between pre-service science teachers' pro-environmental behaviors (PEB) and values toward the environment through one-time cross-sectional survey studies. Information was collected from a sample of the predetermined population at one point, followed by correlational studies designed to explore the correlations between the variables under study. The questionnaire consists of three aspects of PEB (preservation, utilization, and appreciation) and four aspects of value (biospheric, altruistic, egoistic, and hedonic). A total of 273 female pre-service science teachers enrolling in four public universities in Indonesia participated through an online questionnaire. The purposive sampling method was chosen to constitute the sample of this study. In order to analyze the data collected, descriptive statistics and correlation tests were utilized. According to the results, it can be concluded that pre-service science teachers held good environmental behaviors and values. The aspects of preservation and appreciation have a positive correlation, while utilization is negative. The four aspects of value are all at high levels, as is their correlation. This result indicates that female pre-service science teachers have positive behavior and value toward the environment. Moreover, the pre-service science teacher program should encourage understanding and behavior toward the environment to prepare future science lessons more aligned with the environment.

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Keywords: behavior; female; pre-service science teacher; pro-environmental behavior; value

INTRODUCTION

Sustainability of the environment has become a significant focus around the globe. The urgency of sustainability is also stated clearly through the 17 Sustainable Development Goals (SDGs) by United Nations (United Nations, 2017). The physical components of the earth, such as land, air, and water, support and influence life in the biosphere, which is equated with nature (Rani & Prakash, 2015). However, the significant increase in human population affected the

global challenge in environmental issues, such as the quality of air (Sulaeman et al., 2020; Samways, 2022) and water quality has decreased on converted agricultural land as a result of previous agricultural practices (Subagiyo et al., 2019; Prabowo et al., 2021), and deforestation (Cooke, 2006). On the other hand, although public awareness and positive behavior toward these issues are crucial, it is also challenging. Therefore, an education fostering positive attitudes toward the environment is necessary (Nuryadin et al., 2023).

In general, formal and informal education aims to transform individuals into better individuals regarding their knowledge, attitudes,

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and behaviors (Borges, 2019; Putra et al., 2021; Zulkarnaen et al., 2022). Specifically, in the topic of environment, education needs to bridge knowledge and positive behavior toward it. To shape human behavior, self-identity is a behavioral mediator highly predictive of an individual's behavior (McGuire, 2015). Therefore, environmental education should create positive environmental culture (Chwialkowska et al., 2020) by offering opportunities for problem-solving, participation, and decision-making while taking into account ecological, political, economic, social, cultural, and ethical issues (Tsekos, 2012; Fang et al., 2023). The need for research in environmental education is crucial and simultaneously conducted from many aspects (Dinurrohmah et al., 2022a). It must drive the collaboration of many resources in supporting environmental education, including the curriculum, environment, and society (Fu et al., 2018; Djuwita & Benyamin, 2019).

To support the global movement toward SDGs and implementation of environmental education, teachers play strategic roles in shaping future generations (Martišauskienė, 2016; Hatlevik & Hatlevik, 2018; Casanova et al., 2023). In specific topics toward the environment, science teachers play this strategic role through their science lessons. Science lessons could be conducted by considering students' environmental issues and encouraging pro-environmental school programs (Putra et al., 2021; Sholahuddin et al., 2021).

The pre-service science teacher program is a four-year program that prepares university students to become science teachers (Kaldi & Xafakos, 2017; Uçar & Canpolat, 2019). A science teacher preparation program is vital in the early stage of developing science teacher competency (Lin, 2019; Sulaeman et al., 2022). Science educators face various challenges concerning the interrelationship between science and environmental education (Berber, 2021). Traditionally, environmental education has been taught in the context of science education under the Indonesian curriculum.

Although the pre-service teacher shows interest in the environmental issue, the complexity of PEB aspects (Freed, 2019) resulted in the struggle with the development of a more comprehensive environmental education curriculum that focuses on the integration of theory and action (Gwekwerere, 2014; Ardoin et al., 2020; Kalla et al., 2022). Therefore, their behavior toward the environment and the values that drive the behavior must be explored (Balundè et al.,

2019; Ambarfebrianti & Novianty, 2021). Specifically, in the Indonesian context, female students are dominated by pre-service teacher programs, and these phenomena also occur in pre-service science teacher programs. Although there are a majority of female pre-service teachers in the program, people tend to see their ability to teach negatively and believe that women would perform worse than men in these areas, which might have substantial implications for women (Bearlin, 1990; Altakhaineh et al., 2020).

Pro-environmental behavior (PEB) indicates the individuals' characteristics as a form of awareness in protecting the environment (Steg et al., 2018; Lange & Dewitte, 2019). Subsequently, this kind of behavior can be marked objective coordinated in environmentalism, which individuals take on with an express objective of helping the environment (Steg et al., 2018). However, researchers conducting their study on this topic have different terms in describing environmental behavior based on the context (e.g., business, tourism, hospitality, economics, education), but they still in the same meaning (Fadzil et al., 2021). There are also types of environmentally relevant behavior (Bamberg & Rees, 2015) related to environmental protection and sustainability, indicating the need for conducting a study on this topic, especially for education needs.

Although PEB exploration is commonly conducted at the university level (Díaz et al., 2020), the causes of PEB need to be understood deeper. The values aspect as the root of PEB (Stern, 1999) potentially drives a significant impact on PEB. Thus, identifying the category and the correlation of values which consisted of biospheric, altruistic, egoistic, and hedonic values, is needed. However, the study that explores PEB and its corresponding value in pre-service science teachers is rarely found. Therefore, our study aims to explore deeper the PEB level of female pre-service science teachers and their values toward it.

Apart from the novelty and urgency of this research, the limitations also need to be considered. First, this research only involved pre-service teachers' transformation to in-service teacher need further observation. Second, the research is limited to the territory of Indonesia by only involving Indonesian students.

METHODS

This research was designed by combining two methodologies: a one-time cross-sectional survey and a correlational study. A one-time

cross-sectional survey was used for this research. Correlational studies are used to look into the correlations between the research variables once data for the study is gathered at one point in time from a sample of the specified population. (Fraenkel et al., 2012). Pre-service science teachers' values and behavior are compared concerning PEB. In order to determine the level of pre-service science teachers' PEB, environmental identity, and eco-centric and anthropocentric attitudes, descriptive analysis, including mean and standard deviation, was calculated.

The study's target population was all pre-service science teachers enrolled in a four-year teacher education program at Indonesian public universities. For the inclusive criteria, respondents had to be active students majoring in any field related to the Science Education department. In addition, exclusive criteria were also applied, including students who dropped out, students with incomplete demographic data, and students not filling out informed consent as respondents.

As many as 5.000 students were recruited as the target research population (Sulaeman et al., 2022). Consistent with Krejcie and Morgan's Table (Krejcie & Morgan, 1970), on the degree confidence of 95% and margin of 5%, the minimum sample size to achieve was supposed to be a minimum of 1 of 70 respondents. The sampling procedure requires 357 samples, but 237 female pre-service science teachers consented to participate as a sample of the study.

The instruments were chosen based on a review of the relevant literature and subdivided into three sections, consisting of the demographic items (section 1), the values items (section 2), and the PEB items (section 3). The demographic items consisted of the question for the period in changed domicile, the values (altruistic, biospheric, egoistic, and hedonic) items modified from the E-PVQ scale (Bouman et al., 2018), and PEB (preservation, utilization) items added. Appreciation aspects used the 2-MEV scale (Bogner, 2018). The e-PVQ scale was translated and modified into the Indonesian environmental problem context and changed into a 5-point Likert scale. The 2-MEV scale, which added the appreciation aspect, was translated into the Indonesian context.

The data were obtained through an online survey using a research instrument in the form of a questionnaire with a Likert scale based on Table 1. Differences value aspect in the Likert scale based on the notion that values are typically organized on a circular complex (Schwartz, 1994), commonly measured using a 7-point Likert scale

(Bouman et al., 2018). Therefore, the values statement needs to be distinct enough without confusing the respondent.

Table 1. Likert Scale of the Instrument

Score	PEB	Value
1	Totally disagree	Totally disagree
2	Disagree	Disagree
3	Neutral	Partially disagree
4	Agree	Neutral
5	Totally agree	Partially agree
6	-	Agree
7	-	Totally agree

This study used descriptive quantitative analysis to quantify the data in statistical and descriptive analysis (Mkumbachi et al., 2020). Data were analyzed using Microsoft Excel and IBM SPSS package 26 software to analyze descriptively and statistically. Data analysis involves calculating mean, valid percentage, and standard deviation to give an overview of PEB and values. The correlation between values and PEB and its aspects was investigated using Pearson's product-moment correlation analysis (Zinzendoff Okwonu et al., 2020). In order to get to know the representative aspects both in PEB and values, a deeper understanding of the correlation between PEB and its aspects (preservation, utilization, and appreciation), values and its aspects (biospheric, altruistic, egoistic, and hedonic), the correlation analysis between them was conducted.

RESULTS AND DISCUSSION

The pro-environmental behavior of female pre-service science teachers is higher than expected. A previous study found positive behavior toward the environment (Yumuşak et al., 2016), which female student has a higher level than male (Kızılay & Önal, 2019). Based on the quantitative analysis, the average PEB score reached 3.97 points, categorized as high, with a standard deviation of 0.48. Figure 1 shows the percentage of each category of pro-environmental behavior (PEB). The figure signifies that 74.26% of female pre-service science teachers had PEB scores in the high category, while 25.32% had scores in the medium. Only one respondent (0.42%) was in a low category.

The score shows that most participants strongly agree with the statement. It was expected that female pre-service science teachers would score higher on average since some previous stu-

dies reported females to have a greater degree of PEB than males (Kennedy & Kmec, 2018; Vicente-Molina et al., 2018; Kızılay & Önal, 2019). Environmentalism is about protecting and caring for the planet and those harmed by environmen-

tal problems, which aligns with traditional feminine roles since caretaking is integral to women's traditional stereotypes and roles (Sharma et al., 2016; Swim et al., 2020).

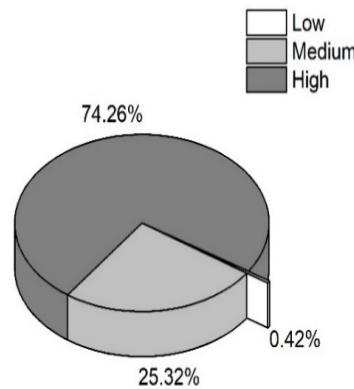


Figure 1. Overview of Female Pre-Service Science Teacher PEB

However, there are still participants in the low and medium category. Different categories were identified, since the individual action, especially for females, is related to the society in which they grew up and interacted (Boubonari et al., 2013). Thus, both medium and low category is caused by the formed aspect of PEB, such as cultural value (Chwialkowska et al., 2020; Bouman et al., 2021; Dinurrohmah et al., 2022b), which could be stimulated by the activities in campus. In the medium category, participants agree with the statements; therefore, they still have the potential to implement positive behavior toward the environment.

To investigate deeper, an analysis of each aspect of PEB was conducted in three aspects of PEB, which are preservation, utilization, and

appreciation (Mónus, 2021). Figure 2 shows the average score of each aspect. The figure indicates that appreciation was the aspect with the highest score (4.28 out of 5), followed by preservation (4.01 out of 5). According to the study results, female pre-service science teachers exhibit vital positive behaviors toward nature, especially in appreciating nature (utilizing nature without harming it). As with the other aspects of PEB, human nature exploits nature for our needs (Martin et al., 2016; Kattumuri, 2018). However, the score of utilization aspect was lowest for the female pre-service teachers. Because an appreciating use of nature includes quite different perspectives on nature than an exploitative utilitarian choice, the utilization aspect may produce a rather unclear attitudinal preference (Bogner, 2018).

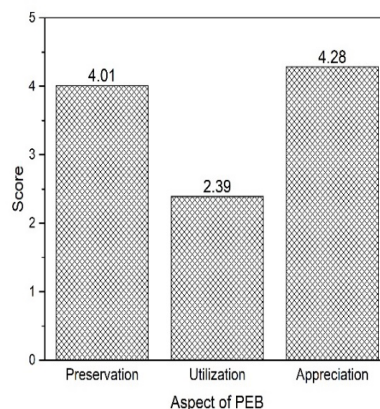


Figure 2. Students' Response to the Aspects of PEB

Regarding the correlation between PEB and values, the correlation analysis was conducted, and resulted in Figure 3.

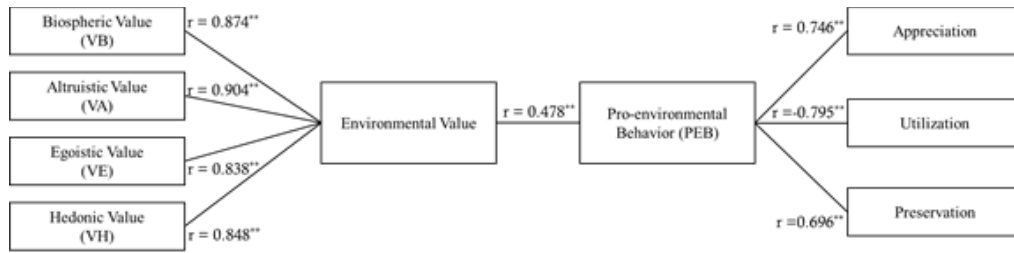


Figure 3. Overview Correlation Analysis of the Study

Figure 3 shows the correlation between PEB and its aspects. The statistical investigation found strong positive correlations between PEB and the aspect of appreciation (0.746) and preservation (0.696), respectively. This finding informed us that the two aspects of PEB represent the general PEB. It is also similar to previous researchers' findings in the same analysis, showing that the effect of appreciation and preservation of nature on PEB was significant (Sigit et al., 2019; Alcock et al., 2020). By visiting nature frequently, people can appreciate nature more and recognize their environmental responsibilities, which leads to more pro-environmental behavior from individuals. On the other hand, a strong negative correlation was found between PEB and utilization aspect (-0.795) (Kibbe et al., 2014). Nature utili-

zation habits seem to degrade PEB according to this result significantly.

Exploration of PEB requires understanding each person's value (Dinurrohmah et al., 2022b; Larson et al., 2015). Values are internalized cognitive structures that help people make decisions by demonstrating fundamental moral principles, a feeling of priorities, and a propensity to interpret the world meaningfully and see patterns (Oyserman, 2015). Values related to PEB in this research are biospheric (VB), altruistic (VA), egoistic (VE), and hedonic (VH). The average value is 6.23 in the High category, of which 96,62% are in the high category (Figure 4). From the four values, Figure 4 shows that biospheric, altruistic, and hedonic values are achieved highly, and the lowest value is egoistic.

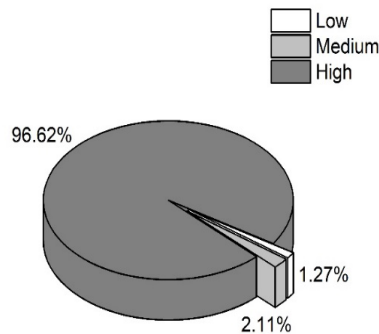


Figure 4. Overview of Female Pre-Service Science Teacher Values

The egoistic value is concerned with safeguarding and increasing their resources in money, possessions, status, and power preference, which is generally negatively related to environmental behavior (Steg et al., 2014; Werff & Steg, 2016; Bouman et al., 2021). Egoistic value was the lowest value aspect compared to other aspects. This lowest score is predicted since the previous study explained the negative correlation between egoistic value and environmental behavior (Liu et al.,

2018) and the positive correlation among three value aspects (altruistic, biospheric, egoistic) regarding the preference of each aspect (Werff & Steg, 2016). The same types of hedonic and egoistic values, as the self-enhancement values, might bring the conceptualization that both values would be in the same category. However, the difference in accessibility to influence humans could potentially drive the different levels in both values.

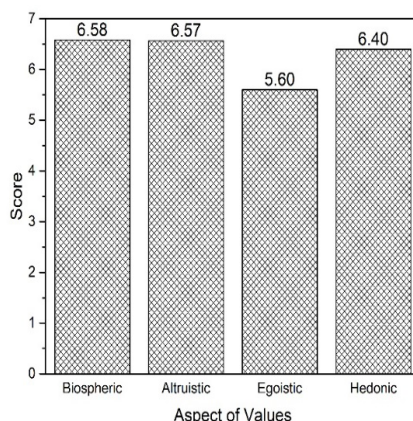


Figure 5. Student's Response to the Aspect of Values

The strong correlation between values and their aspects is shown in Figure 3. The strong correlation among the aspects supports the previous studies (Bouman et al., 2018; Ambarfebrianti & Novianty, 2021). However, it is contradictive with the finding that the dimension of self-transcendence (altruistic and biospheric) and self-enhancement (egoistic and hedonic) play opposite roles in environmental behavior (Cheng et al., 2018). Despite the less attention to hedonic value (Quoquab et al., 2020) in the previous study, the strong positive correlation indicates the need to consider each aspect to predict the overall orientation value and environmental behavior.

To understand the role of value in PEB, the result of correlation analysis between value and PEB represent in Figure 3, which is in line with the theory that explains the indirect correlation between them (Stern, 1999; Chung et al., 2019). This result also supports most of the previous research about value and PEB that shows the correlation between value and PEB (Gheith, 2013; Steg et al., 2018; Chung et al., 2019; Djuwita & Benyamin, 2019). Promoting or teaching PEB to individuals needs to consider the value aspect as the correlated aspect of PEB.

The high category of values (Figure 4) that are hypothesized could drive PEB is proven by the high category of PEB (Figure 1) and the significant result of statistical analysis (Figure 3). Since the strong correlation was shown, considering the value aspects is necessary to make society more environmentalist, especially in education. Under the environmental behavior theory, values influence PEB by influencing human awareness, responsibility, and the norm of nature (Stern, 1999). Regarding the strategic role of a teacher through the science lessons in specific topics of the environment, the teacher should develop and internalize environmental values to encourage strong PEB.

CONCLUSION

According to the study results, pre-service science teachers held good environmental behaviors and values. The aspects of preservation and appreciation have a positive correlation, while utilization is negative. Moreover, the four aspects of value are also high, and the correlation among value aspects is also high. This result indicates that female pre-service science teachers have positive behavior and value toward the environment. Therefore, pre-service science teacher programs should encourage values and the understanding of behavior toward the environment to prepare future science lessons to be more aligned with the environment.

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