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Exploring the Impact of Sustainability Development Education to Environmental Literacy of BPE Students

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ABSTRACT

This descriptive-correlational study aims to ascertained the level of sustainability development education and environmental literacy among BPE students and scrutinized the relationship between these variables. Environmental knowledge is crucial to providing sufficient awareness to address these ecological issues that are currently expanding throughout this generation. Due to the rise of environmental problems, it is imperative for future PE teachers to examined their ways of handling eco-friendly practices. Quantitative research was implemented, using a modified survey instrument to gather data collection from a sample of 328 BPE students at the University of Mindanao – Main Campus. The mean and standard deviation, two samples of descriptive statistics, were utilized to assess the degrees of sustainability development education and environmental literacy. Additionally, the Spearman rho correlational investigation was conducted to identify the important connection between these variables. The results revealed that the level of sustainability development education and the level of environmental literacy are very high level. However, the findings found a weak relationship between sustainability development education and environmental literacy, revealing factual data that demonstrated a subtle correlation between these factors. The findings show that there is an integral need to incorporate environmental themes and educational interventions to change the attitude and behaviors regarding sustainability. The results have significance for improving curriculum design, environmental programs, and meaningful discussions, highlighting the importance of integrating sustainable practices and ecological awareness.

INTRODUCTION

Living in an era characterized by fast deterioration of the environment and elevating ecological crises, the pressing point of environmental literacy has never been prioritized. As humanity struggles with multifaceted problems of climate change, resource depletion, and biodiversity loss, the lack of comprehensive knowledge and awareness of ecological issues stands as one of the most significant barriers to finding sustainable alternatives. Mining, climate change, plastic pollution, and improper solid waste management in the Philippines have made the Philippines the third worst plastic pollutant country in the world's oceans (Castillo, 2018; Tacio, 2018). Expanding environmental issues result from individuals' ignorance, attitudes, behaviors, and lack of consciousness (Zang *et al.*, 2021). For example, Fang *et al.* (2018) affirm that students' environmental behavior has to do with the understanding they possess. In other words, believing that living the "easiest life" is necessary to absolve oneself of responsibility could harm the environment. Considering these severe outcomes of significant ecological problems, taking immediate action to elevate individuals into environmentally literate is imperative. Nevertheless, adequate and proper education is vital in enhancing environmental awareness and literacy.

Several studies imply that environmental literacy promotes beneficial outcomes that lessen the tragic impact of ecological loss. Thus, it aims to equip every individual with accurate scientific knowledge, abilities for critical thinking, strategic and creative problem-solving skills, and the capacity for sound decision-making. Consequently, it empowers individuals to grasp the impact of their actions on the environment and cultivates the knowledge and competencies needed to tackle intricate ecological challenges (Greenfield, 2022). They promote environmental literacy, which results in pro-environmental awareness and an individual's attitude. For example, Veisi *et al.* (2018) found that through education, environmental literacy promotes a positive attitude and demonstrates a heightened awareness of environmental issues among students at Shahid Beheshti University in Iran. Similarly, Tadena and Salic-Hairulla (2021) in Mindanao found that students' appreciation for their relationship with the environment increases when they receive an adequate environmental education. Ultimately, education related to the environment is one of the primary sources of information contributing to one's environmental awareness and attitudes (Sasa *et al.*, 2022). Sustainability development education (SDE) is linked to an individual's better environmental literacy. For example, in the Philippines, Borres (2021) implemented an environmental education program in an underprivileged urban community designed to raise environmental awareness and consciousness. According to the result, the

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environmental education program successfully fulfilled its objective by equipping the participants with the essential knowledge to enhance their comprehension of environmental concepts. Hence, it is crucial to promote sustainability environmental education to instill awareness in people of all backgrounds, urging them to protect, conserve, and restore environmental quality (Poonam & Rachna, 2020). To fully understand the various aspects of sustainability development education, this study will examine how well it promotes environmental literacy and how well it can influence how people interact with their environment.

The Experiential Learning Theory (ELT) by Dewey (1986), which is the main theoretical framework for the research, posits that ELT offers an interactive and captivating method for developing environmental awareness, promoting active involvement, nurturing significant bonds with nature, and enabling individuals to take on informed and accountable roles as guardians of the environment (De Leon, 2020). However, our findings indicate a statistically significant yet modest relationship between sustainability development education and environmental literacy. Therefore, it is crucial to recognize the multifaceted nature of environmental literacy. Factors beyond formal education, such as personal beliefs and socio-economic status, influence individuals' comprehension of environmental issues. These findings underscore the complexity of environmental literacy and emphasize the need for holistic approaches to sustainability education. Our research highlights the importance of refining educational practices to address this complexity and further investigating the nuanced interactions between experiential learning and environmental literacy.

Ecological Systems Theory (EST), developed by Urie Bronfenbrenner (1977), posits that individuals are embedded within multiple systems of influence, ranging from immediate settings (microsystems) to broader societal contexts (macrosystems). It underscores the intricate interplay between individuals and their surroundings, emphasizing the significance of comprehending how diverse systems impact human growth and development (Budzyna & Buckley, 2023). This study offers a thorough structure for examining the intricate interconnections between individuals and their environment across various systems. Overall, EST provides a holistic framework for understanding environmental issues and their impact on individuals, communities, and ecosystems, making it valuable for promoting environmental literacy.

Moreover, John Dewey's Constructivism theory states that individuals who participate in real-world tasks would exhibit elevated levels of expertise using creativity and cooperation. A study from Fauzi *et al.* (2023) emphasizes constructivist learning that focuses primarily on students, engaging them in direct observations of actual phenomena and real-world situations. It involves incorporating real-life situations into the classroom, fostering students' ability to link their existing knowledge to its practical application in their daily lives. Hence, the constructivist learning method influences students' environmental consciousness, motivating them to preserve and nurture their environment (Sihotang & Tauran, 2020).

Sustainable development education contributes to fostering a more sustainable and equitable world. A recent study underscores the importance of enhancing Education for Sustainable Development through various educational channels, focusing on cultivating a positive mindset and greater awareness among adolescents about sustainability's social, economic, and environmental dimensions (Yuan *et al.*, 2022). Promoting social sustainability ensures that everyone has equitable access to high-quality education and opportunities for individual and community growth, regardless of background, gender, ethnicity, financial status, or ability; students hope to promote fairness and diversity (Glavic, 2020). Economic sustainability, on the other hand, pertains to strategies that bolster a country's sustained economic advancement while safeguarding environmental, social, and cultural aspects (Bish, 2020). Promoting economic sustainability in a classroom could emphasize employability skills. However, this notion could be impeded by the potential threat of declining exam performance (Robson *et al.*, 2020). Environmental sustainability encompasses water and air quality and reducing environmental pressures like greenhouse gas emissions. The connection between human well-being and the environment is evident, emphasizing that protecting and rehabilitating the environment also benefits people (Vandyck *et al.*, 2018; Xavier *et al.*, 2019). However, Alamooru (2022) found out that individuals with a flood of negative information regarding the environment need more guidance on resolving it despite learning it extensively. As a result, many adults express a sense of powerlessness and ineffectiveness when confronted with the ecological crisis. Thus, sustainability development education aims to integrate these three dimensions to empower individuals and communities to make informed decisions that enhance environmental awareness and the well-being of current and future generations.

Moreover, environmental literacy gains various recommendations and implementations that align with the concerns of ecological issues. Some researchers highlight students' environmental literacy as the source of formulating environmental education strategies and educational policies (Aminrad *et al.*, 2013; Wiratni, 2023; Velempini, 2017). For example, "Adiwiyata Program," a launched program in Indonesia, aims to produce learners with environmental-friendly behavior that accords with the school's ideal knowledge and standards and, most importantly, to achieve the principles of sustainable development (Hermawan *et al.*, 2022). In the study of Akçay and Şengül (2023), it was believed that establishing environmental education in early childhood can create an effective environmentally literate in terms of their behaviors. As a result, expanding attitude, behavior, and responsibility requires an educational structure with skilled instructors that enables education to increase

awareness about climate change and make individuals environmentally literate (Shahzadi *et al.*, 2022). By adapting the context of environmental literacy, individuals can develop their environmental skills that can be utilized in various ways to effectively attain its mission: to prevent the miserable outcome of ecological issues.

Previous research confirmed a connection between sustainability development education and its impact on an individual's environmental literacy. One study found that environmentally literate university students are nurtured to foster environmental education. Subsequently, another study discovered that by using sustainability education, individuals with environmental awareness acquire information that fosters pro-environmental behaviors within their communities and cultures. These studies show a substantial impact of sustainability education on developing an individual's environmental literacy and awareness. However, there is a need for expanded teaching approaches to raise awareness about the environment among the students. Furthermore, the Physical Education field can begin to incorporate issues related to sustainability development education into our daily life experiences and decision-making processes (Erhabor & Don, 2016; Fang, *et al.*, 2022; Lundvall & Froberg, 2023).

In contrast to previous research in across various academic disciplines, this study stands out by focusing on Bachelor of Physical Education (BPE) students. The primary aim is to assess these students' environmental awareness and grasp of environmental issues as shaped by their experiences with sustainable education. Furthermore, unlike other studies that primarily emphasize comments and reflections on sustainable development goals (Baena-Morales & González-Víllora, 2023; Mambu, 2023; Henfrey *et al.*, 2023; Dang & Serajuddin, 2020), this research places greater emphasis on evaluating the influence of sustainable education on students' environmental literacy. In the study of Lundvall and Fröberg (2023), it was suggested that there is a pressing need to adopt educational components of sustainable development in physical education that present both difficulties and recognize a critical learning viewpoint. Moreover, providing environmental education with an emphasis on active engagement would likely contribute significantly to the advancement of environmental literacy (Akçay & Şengül, 2023). Additionally, interaction with nature could potentially enhance the environmental literacy of future PE teachers as advocates for sustainable development (Pasek *et al.*, 2022).

Moreover, the result of this study creates a beneficial pursuit for several groups and individuals that aim to centralize sustainability and environmental ideations. Curricularists can utilize the study's findings by developing a curriculum that focuses on the environmental literacy of a particular program. Thus, environmental groups and organizations can find valuable notions in this research by uplifting individuals to advocate for environmental sustainability. Most significantly, the institution would create various sustainability programs through expanding the research conductions. Lastly, BPE students, the future leaders, gain the utmost environmental understanding and prior commitment to sustainability development. This research would give them a positive perspective on society's general environmental knowledge and actions.

Hence, this study aims to determine the relationship between sustainability development education and the environmental literacy of BPE students. The results measured the level of sustainability development education regarding social, economic, and environmental. The level of environmental literacy, on the other hand, also aims to determine attitudes, behaviors, and responsibilities among future BPE teachers. Lastly, to ascertain the significant relationship of sustainability development education to environmental literacy. Hence, exploring the more profound knowledge of the interrelation between sustainability development education and environmental literacy plays a vital role in promoting sustainable established programs and practices. This study also hypothesized that there is no significant relationship between these variables.

MATERIALS AND METHODS

Research Respondents

The present study involved a sample group of 328 physical education students enrolled in the Bachelor of Physical Education (BPE) program at the University of Mindanao-Main during the Academic Year 2023-2024. The respondents were from first- to fourth-year levels. Due to constraints on data collection resources and the study's specific focus on an easily reachable group, a universal sampling method was employed. As noted by Avron *et al.* (2019), the universal sampling technique was utilized to attain the optimal complexity of any signal.

The inclusion criteria suggested that they must be studying at the University of Mindanao (Main), bonafide BPE students aged 18 and above, of any gender, and willing to participate. All other College of Teacher Education programs were excluded from participating in this study. During the recruitment procedure, respondents were informed that their participation in the study was completely voluntary. However, if they wish to withdraw their participation during the study's execution, they are free of any obligations or responsibilities.

Research Instruments

The Physical Education Scale for Sustainable Development in Future Teachers (PESD-FT) (Baena-Morales *et al.*, 2022) measured sustainability development education in terms of social, economic, and environmental. There were six items in each of the indicators. The Environmental Literacy Questionnaire (Koul, 2019) measures environmental literacy in terms of attitude (11 items), behavior (13 items), and responsibility (4 items).

The levels of sustainability development education and environmental literacy were interpreted through a Likert

scale method adopted by Gümrükçüoğlu *et al.* (2017). Within this framework, a score of 4.20-5.00 suggests consistent sustainability development education at a very high level. Then, a score of 3.40-4.19 suggests frequent sustainability development education at a high level. In the middle range, a score of 2.60-3.39 indicates fair sustainability development education at a neutral level. A score of 1.80-2.59 indicates rare sustainability development education at a low level. Lastly, a score of 1.00-1.79 indicates a complete lack of sustainability development education at a very low level.

The adapted-modified questionnaire was validated by the panel of experts, which got a mean score of 4.64. The researchers made minor modifications and consulted the validators for their approval of the appropriateness and validity of the instrument. In addition, the researchers also redesigned the general layout of the instrument, adding a 5-point Likert scale descriptive equivalence for different responses, which provides more concrete responses. As one instrument, the 46-item survey questionnaire underwent a pilot testing phase, in which the Cronbach Alpha's for the 18 SDE and 28 EL were $\alpha = .954$ and $\alpha = .908$, respectively, revealed to be highly reliable. By developing an instrument that was valid and reliable, the researchers verified that the information collected was precise and accurate, enhancing the legitimacy and integrity of the research.

Research Design/Procedure

This quantitative study employed a descriptive-correlational design to attest to the veracity of research objectives that determine the significant relationship between sustainability development education and environmental literacy. This design has been widely used in environmental psychology research by Steg and Van de Breg (2019), which indicates that the direction and degree of a relationship between these two variables is the primary basis for the correlation coefficient.

Henceforth, the correlation was concluded through Spearman rho statistical measurement and 0.05 level of hypothesis testing. Mean and Standard Deviation, on the other hand, also determined the level of sustainability development education and environmental literacy and their respective measures. Eventually, these methods effectively produce appropriateness to the research objectives.

To verify this research conduct, the researchers asked permission from the Dean of the College of Teacher Education (CTE) and the Program Head of the Bachelor of Physical Education (BPE) of the University of Mindanao (Main). Upon approval, the researchers managed the data gathering within the school site. Through the in-person survey, the researchers completely retrieved all the responses from the selected respondents. In the data collection, the researchers sought to thoroughly organize and encode the collected data per procedures. Afterward, the raw data was submitted to the statistician. The statistician was responsible for computing the statistical data for each variable using the provided measurements and the correlation coefficient between the variables. The data were treated confidential in response to the Data Privacy Act of 2012.

After computing the needed statistical analysis, the mean, standard deviation, and Spearman rho coefficient were used as statistical tools. The researchers examined the finalized result to identify any essential findings in the data. The findings were then interpreted and included in the results and discussion, wherein the researchers formulated the conclusions based on the results regarding the research objectives. Finally, the researchers further examined the practical inferences of the study's findings, which show how these results can benefit and guide enhanced practices and programs in significant domains.

RESULTS AND DISCUSSION

Level of Sustainability Development Education of BPE Students

Table 1 represents the level of sustainability development education of BPE students. With the given mean and standard deviation, the results indicate that the overall mean score of SDE was strongly agree (*M = 4.53, SD = 0.33*), indicating that the statements were constantly being performed. All of the indicators suggested attaining the range of strongly agree, wherein students inclined to sustainability development education have the knowledge, skills, values, and attitudes necessary to make informed decisions and take actions towards sustainable development.

In this light, the social indicator posits the highest mean score of 4.56 (*SD = 0.39*), in which respondents believed that they could make physical education lessons accessible to everyone regardless of gender, race, or personal situation. Therefore, students seek to foster fairness and diversity by guaranteeing that everyone, irrespective of their background, gender, ethnicity, socio-economic status, or abilities, has equitable access to high-quality education and chances for individual and communal growth (Glavic, 2020). The economic and environmental

Table 1: Level of Sustainability Development Education of BPE Students

Indicators	Mean	SD
Social	4.56	0.39
Economic	4.52	0.39
Environmental	4.52	0.37
Overall	**4.53**	**0.33**

indicators, on the other hand, share the lowest mean score of 4.52 (*SD = 0.39 and 0.37*), respectively. Despite having a very high level of equivalence, the respondents highlight the need to improve their knowledge and employability skills to promote a sustainable lifestyle during physical education lessons. This was due to the belief that prioritizing employability skills may hindered by the potential risk of exam performance suffering (Robson *et al.*, 2020). Moreover, the lack of improvement in their knowledge could be attributed to their lack of adequate guidance with bombarded negative environmental information, leading to feeling powerless to promote a sustainable lifestyle (Alamooru, 2022).

Furthermore, the study's result demonstrates a very high level of consistency in social, economic, and environmental factors. Regarding the overall result, BPE students are committed to utilizing sustainable interventions and developing knowledge that creates immediate actions toward climate change during their physical education classes. Thus, to raise awareness and encourage people from every aspect of life to preserve, maintain, and improve the quality of the environment, it is imperative to advance sustainability development education. However, the significance of improving sustainable development education through a variety of educational settings, with an emphasis on fostering a positive outlook and raising adolescents' knowledge of the social, economic, and environmental aspects of sustainability (Poonam & Rachna, 2020; Yuan *et al.*, 2022).

Level of Environmental Literacy of BPE Students

Table 2 represents the level of environmental literacy of BPE students. With the given mean and standard deviation, the results indicate that the overall mean score of environmental literacy was strongly agree (*M = 4.44, SD = 0.30*), indicating that the statements are constantly being performed. All of the indicators suggested attaining the range of strongly agree. Among the indicators, responsibility attains the highest mean score (*M = 4.56, SD = 0.30*); while behavior suggested to have a lowest mean score (*M = 4.40*, *SD = 0.34*). In contrast, students who were inclined toward environmental literacy were able to promote pro-environmental awareness, attitudes, and behavior toward environmental issues.

Table 2: Level of Environmental Literacy of BPE Students

Indicators	**Mean**	**SD**
Attitude	4.43	0.34
Behavior	4.40	0.34
Responsibility	4.56	0.43
Overall	4.44	0.30

The findings show that the responsibility indicator claims to have the highest means score of 4.56 (*SD = 0.30*), and respondents believed they could solve any environmental problems they caused. As a result, they could provide better environmental protection awareness and enable them to understand how their actions affect the environment (Greenfield, 2022). Conversely, the behavior indicator had a low mean score of 4.40 (*SD = 0.34*) among the three indicators. Despite the very high descriptive level, this can be attributed to respondents' lack of willingness to bring their water containers, failure to carry reusable utensils, and a general reluctance to conserve energy. Therefore, thinking that the "easiest life" is essential to relieving themselves of their responsibilities might harm the environment (Fang *et al.*, 2018).

Henceforth, the findings conclude that the BPE students have very high levels of consistency of environmental literacy in terms of attitude, behavior, and responsibility. According to the result, BPE students pledge to address ecological problems and raise awareness about environmental protection. Therefore, encouraging environmental literacy leads to developing pro-environmental awareness and attitudes in individuals. Moreover, it enables individuals to understand the consequences of their actions on the environment and fosters the knowledge and skills necessary to address complex ecological issues (Greenfield, 2022; Veisi *et al.*, 2018).

Correlation Matrix between Sustainability Development Education and Environmental Literacy

Table 3 shows the correlation matrix between sustainability development education and environmental literacy. Thus, the Spearman rho coefficient analysis suggested a weak relationship between the two variables, *ϱ (328) = .397, p = .000*. As it accords to the coefficient guidelines, the value reveals a weak correlation between sustainability development education and environmental literacy. The p-value of .000 entails that rejecting the null hypothesis is possible at the 0.05 significance level. Nevertheless, a subtle relationship exists between sustainability development education and environmental literacy.

Henceforth, the results have highlighted the correlations that demand further research. Correlations between sustainability development education and environmental literacy reveal that for the social, *ϱ(328) =.319, p =.000*; for economic *ϱ(328) =.357, p =.000*; and for environmental, *ϱ(328) =.365, p =.000*. These findings highlight that environmental, *ϱ(328) =.365* has the strongest correlation with environmental literacy of the BPE students, followed by economic, *ϱ(328) =.357*, which has a weak correlation.

Table 3: Correlation Matrix between Sustainability Development Education and Environmental Literacy

Sustainability Development Education	Environmental Literacy			
	Attitude	**Behavior**	**Responsibility**	**Overall**
Social	.299**	.286**	.280**	.319**
Economic	.353**	.321**	.285**	.357**
Environmental	.359**	.328**	.280**	.365**
Overall	**.387****	**.356****	**.315****	**.397****

***. Correlation is significant at the 0.01 level (2 tailed).*

While social $\varrho(328) = .319$ predicts to have an extremely weak correlation. Upon the combination of results for significance, each indicator had $p = .000$, suggestive of correlations at the $p < 0.05$ significance level.

The study's findings revealed a significant relationship but weak correlation between sustainability development education and environmental literacy. The researchers believed that it was due to the factors the researchers have no control over, such as biased responses, participants' availability, and how questions are interpreted and responded to. Moreover, researchers also believed it could be attributed to factors not in the questionnaire. This involves conducting qualitative research to explore students' attitudes, beliefs, and experiences related to sustainability education and explore ecological perspectives shaping students' environmental literacy.

The Experiential Learning Theory by Dewey (1986), which is the main theoretical framework for the research, posits that ELT offers an interactive and captivating method for developing environmental awareness, promoting active involvement, nurturing significant bonds with nature, and enabling individuals to take on informed and accountable roles as guardians of the environment (De Leon. 2020). However, our findings indicate a statistically significant yet modest relationship between sustainability development education and environmental literacy. Therefore, it is crucial to recognize the multifaceted nature of environmental literacy. Factors beyond formal education, such as personal beliefs and socio-economic status, influence individuals' comprehension of environmental issues. These findings underscore the complexity of environmental literacy and emphasize the need for holistic approaches to sustainability education. Our research highlights the importance of refining educational practices to address this complexity and further investigating the nuanced interactions between experiential learning and environmental literacy.

In summary, the study's results emphasized the critical role of educators and policymakers in fostering a more environmentally literate society. The findings further highlighted that more is needed in educational interventions that shape individuals' attitudes and behaviors toward sustainability. The role of environmental education, on the other hand, accords with the alignment of previous studies that posit becoming environmentally literate, which the findings represent the exigency of including environmental themes in the curriculum for a complex understanding of the fundamental processes in environmental literacy and sustainability development education.

CONCLUSION

The present study commits to determining the interrelation between sustainability development education and the environmental literacy of BPE students. The findings confirmed a very high level of sustainability development education in terms of social, economic, and environmental factors. Similarly, to the environmental literacy, the attitude, behavior, and responsibility indicators also shows very high level, which mostly the BPE students expressed their strong agreement. However, the study confirmed a weak correlation between the two variables, suggesting to enhance the effective implementation of sustainability development education to engage environmentally literate individuals at subtle levels.

The researchers also highlight the recommendations that could enhance the overall study. It is essential to integrate employability skills into the physical education curriculum, particularly in the real-world application like leadership and teamwork. Thus, calling an investigation of sustainability development education within the BPE curriculum is important by assessing how it was currently taught and identifying any existing barriers. Advocating for energy conservation policies and eco-friendly practices is suggested to include in the educational competencies that provides readiness and understanding to the BPE students. Lastly, future researchers could explore the long-term effects of environmental literacy, considering various influencing factors, to provide deeper insightful discussion to its impact.

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