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Prospective Teachers' Awareness and Perception on Integrating Education for Sustainable Development: Basis for a Training Program

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The world is in desperate need of mending after all of the anthropogenic destruction that humans have caused. The Philippine government has prioritized and pursued education for sustainable development (ESD) to address the country's pressing environmental, social, and economic challenges. However, the integration of ESD into the curriculum is still deficient due to the fragmented nature of the current integration. While concerned agencies are in collaboration towards crafting curricula that will make environmental education a required elective subject in college, baseline data is needed to make actions, especially concerning ESD, data-driven and hence more targeted. Using descriptive research design, this study assessed the ESD awareness and perceptions of 181 randomly selected pre-service teachers (PSTs) in a state university in Central Luzon, Philippines. The study found that 90.1% of the respondents were aware of the importance of ESD. Furthermore, the respondents generally agreed with the integration of ESD in education and showed an average level of ESD knowledge and a positive attitude and behavior towards ESD concepts. No significant difference was observed in respondents' ESD knowledge when they were clustered as to sex. However, male and female pre-service teachers had significantly different ESD attitudes. On the other hand, no significant difference was found between the male and female respondents in their ESD behavior. Finally, ESD knowledge was found to be significantly related to both ESD attitude and ESD behavior. Key findings were considered in developing an ESD training program specifically designed for pre-service teachers.

Keywords: ESD knowledge, ESD attitudes, ESD behavior, Education for Sustainable Development, Pre-Service Teachers, ESD Awareness, ESD Perception

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INTRODUCTION

The world is badly in need of mending from all of the anthropogenic destruction that humans have caused. Conferences organized by the United Nations (UN) for a thriving society continued to place a strong emphasis on the dangers human activity poses to the future of the planet. The solution that is required must be different from all of the band-aid fixes that have previously been employed to address the problems that exist in our

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environment and society. Humans and nature must coexist in a harmonious relationship, but it still seems far from reality. As a result, the sustainability pledge has drawn attention to the UN Education Strategy for Sustainable Development (Shulla et al., 2020).

Sustainable development aims to meet present needs without compromising future generations' ability to meet their own, ensuring social equity, economic growth, and environmental protection through education. The UN has initiated several projects, recognizing education as a crucial tool for raising awareness and changing behaviors (Leicht et al., 2018). Education for sustainable development (ESD) fosters critical thinking and decision-making skills essential for creating sustainable communities (Egana del Sol, 2020). Globally, countries are integrating ESD into their education systems to promote awareness, skills, values, and attitudes necessary for sustainable development. However, challenges such as limited resources and policy gaps persist, necessitating stronger international collaboration.

Education is a primary focus of sustainable development. The Global Action Plan (GAP) advises prioritizing policy improvement, transforming learning environments, developing educators' competencies, empowering youth, and seeking alternatives (UNESCO, 2020: 24-34). These strategies support ESD goals locally and globally (Shulla et al., 2020).

Countries like the Philippines have prioritized ESD as a pedagogical strategy to address sustainable development challenges (Valencia, 2018). Including ESD in the Philippine education system is crucial for several reasons. Firstly, it equips students with knowledge and skills to tackle the country's environmental, social, and economic issues, fostering responsible citizenship and ethical decision-making. Secondly, it promotes sustainable practices and resource conservation, addressing deforestation, pollution, and climate change. Thirdly, it contributes to economic growth by preparing a skilled workforce for green industries and sustainable entrepreneurship. Lastly, it cultivates environmental stewardship and empowers individuals to become change agents, leading to a more sustainable Philippines.

The Philippine government has promoted ESD across various sectors, including education. Republic Act No. 9512, the National Environmental Awareness and Education Act of 2008, mandates integrating environmental education into curricula at all levels, including daycare, preschool, non-formal, technical, vocational, professional, indigenous learning, and out-of-school youth programs. The National Service Training Program (NSTP) is used to promote ESD at the tertiary level.

Despite efforts to integrate ESD, the Philippines still faces challenges due to fragmented ESD integration in the K-12 curriculum. Unlike countries like China, the UK, and the USA, where ESD is more integrated into mainstream education, the Philippines lacks a separate ESD program in senior high and tertiary schools. For instance, China has integrated ESD into mainstream education with pioneers like Tongji University, while the UK and USA have effective ESD practices and programs at various educational levels (UNESCO, 2020).

The National Environmental Education Action Plan (NEEAP) aims to address this issue by creating curricula that make environmental education a required elective in tertiary education. ESD should not be restricted to certain majors; all students should be educated on environmental education and current SDGs. This study investigates whether there are differences in students' ESD knowledge, attitudes, and behavior across various college programs, given the fragmented nature of ESD integration in the Philippine education system.

Pre-service teacher education plays a crucial role in integrating ESD effectively. Teacher Education Institutions (TEIs) are essential in shaping future educators who can incorporate sustainability principles into their teaching. By prioritizing ESD in TEIs, aspiring teachers can develop the necessary knowledge, skills, and attitudes to promote sustainable behaviors and address environmental and social challenges, ensuring future generations of teachers can inspire students to become environmentally conscious and socially responsible global citizens (UNESCO, 2020).

Numerous studies have focused on integrating ESD, particularly in the context of pre-service teacher education

(Saqib et al., 2020). Research on demographic variables such as sex has shown no significant gender-related differences in environmental knowledge among pre-service teachers (Mojilis, 2019; Shivakumara et al., 2015). However, debates continue on how gender affects sustainability perceptions (Álvarez-García et al., 2019; Gilal et al., 2019). Some studies suggest no discernible influence of gender on sustainability attitudes (Álvarez-García et al., 2019; Syed Azhar et al., 2022). This study investigates the awareness and perceptions of fourth-year pre-service teachers at the Bataan Peninsula State University-Dinalupihan Campus regarding ESD integration. It aims to determine if they have adequate awareness and positive perceptions of ESD in education.

LITERATURE REVIEW

The following discussion outlines the related literature gathered through library visits, reading of books and periodicals, reviewing of journals, and online database and webpage research. The succeeding discussions situate the current study in the existing literature on ESD knowledge, attitude, and behavior.

ESD Knowledge. According to UNESCO (2023), Education for Sustainable Development (ESD) empowers students to tackle global issues like climate change, biodiversity loss, unsustainable resource use, and inequality by providing essential knowledge, skills, values, and agency. ESD encourages wise choices and collective action to improve society and protect the environment. It encompasses lifelong learning, enhancing cognitive, socio-emotional, and behavioral aspects of learning.

Understanding ESD allows individuals to assess their lifestyles and align them with ESD objectives. If not aligned, they can integrate ESD principles into their daily lives. UNESCO (2020), highlights ESD as one of their initiatives promoting planet, prosperity, and peace, focusing on policy, learning environments, educator training, youth, and communities to achieve global sustainability. Goals include developing sustainable university plans, ESD-related research and training, partnerships, and community-based initiatives. ESD ensures sustainability themes are embedded in curricula, aligning with one of the UN's 17 sustainable development goals.

Monkhouse and Dibb (2011), emphasizes the importance of understanding sustainable development as meeting current needs without compromising future generations. Teacher education must comprehensively address ESD to equip pre-service teachers with action-oriented teaching methods. Awareness of ESD is low, and many fail to recognize that sustainable development extends beyond environmental concerns to broader societal issues like social justice and economic growth (Government Strategy and Action Plans, n.d.). Achieving sustainable development requires balancing social inclusion, economic growth, and environmental protection, necessitating collaboration across society (Shabana & Saltanat Kazi, 2016).

Colleges and universities play a crucial role in preparing students to address sustainability challenges. Sustainability should be integrated into course material and teaching methods, emphasizing the need for knowledge about ESD and its importance in addressing current demands without jeopardizing future generations' abilities to meet their own needs.

ESD Behavior. Human behavior is crucial in the process of achieving sustainable development goals. The SDGs and many of the difficulties facing society today are rooted in human behavior. To understand human behavior, what motivates it, and what can be done to modify it, we need to utilize behavioral insights (edX, n.d.). It is important to describe people's behavior towards the integration of sustainable development because it's a vital consideration for sustainable development to happen.

This is where sustainable behavior comes in. Sustainable conduct entails conscious activities that are aimed at ensuring the welfare of all living things, including current and future generations. It consists of people's sense of

obligation, customs, values, and beliefs. In order to address environmental challenges, behavioral changes in people will be required. People will need to change their behavior in many ways to ensure a sustainable future , such as reducing their energy and water consumption and protecting species and ecosystems.

According to Shutaleva et al. (2021), young people are aware of sustainable environmental practices, yet they frequently do not implement them consistently. Friends and acquaintances support and discuss sustainable behavior. The mass media and social networks are the main variables affecting how sustainable behaviors are formed.

A solution for this must be formulated as soon as possible because, to achieve the Sustainable Development Goals (SDGs), governments, organizations, and people will need to modify their behavior. This will be a difficult undertaking over time. But people can create goods and services that assist the SDGs' advancement by taking human behavior into account and identifying the obstacles to behavioral difficulties (SOCAP Global, 2022).

ESD Attitude. People's attitudes towards the integration of ESD or SD, in general, are crucial for its successful implementation in our society. A generally positive attitude towards it must be achieved in order for the SDGs to be achieved. People commonly have good sentiments and are supportive when they hear something about sustainability, especially for the environment. In fact, in a 2020 McKinsey US consumer sentiment survey, more than 60% of respondents stated they would pay more for a product with sustainable packaging. This shows that customers care greatly about purchasing ecologically and ethically sustainable items. According to a recent Nielsen IQ poll, 78% of US consumers feel living sustainably is essential to them (Sustainable Development – Frey, n.d.). This sheds light on the realization of the SDGs. If people have a good attitude towards sustainability, we are one step closer to achieving the implementation of sustainable development.

According to Kalsoom (2019), a shift in one's attitudes toward environmental, social, or economic challenges is referred to as an "attitude change toward sustainable development" (SD). It is about fostering a sense of care and empathy for the land and its inhabitants, including humans and other living things. In other words, a shift in attitude toward SD is a feeling of guilt over oppression, climate change, environmental degradation, and social injustice. A strong desire to take individual or group pro-sustainability initiatives is also a necessary component.

Studies in the past have shown that boosting support for sustainable development and future behavior depends heavily on how sustainability is perceived. Numerous studies have recently used various constructs to investigate people's perceptions of sustainability. Environmental views, sociocultural perceptions, economic perceptions, and life satisfaction perceptions have all been identified as significant contributors to residents' beliefs about sustainability. Environmental perceptions are one of the main research issues in environmental management and refer to people's awareness of their immediate surroundings (Lin et al., 2021).

Teachers' Perspectives on Integration of ESD in Teaching

Pre-service teachers' positive perceptions of sustainable development (SD) are primarily derived from school textbooks and are not significantly influenced by their academic specializations (Ambusaidi & Al Washahi, 2016). Lower-grade teachers show a favorable attitude towards ESD but face barriers and have limited familiarity with its concepts, though they instinctively incorporate ESD values into their teaching (Cordina & Mifsud, 2016). Teachers generally have a limited understanding of ESD but integrate its environmental aspects into science teaching and its social aspects through cultural activities (Dube & Lubben, 2011). Physical Education Teachers mainly view ESD as a means of raising awareness, facing significant obstacles in incorporating it into their curricula (Baena-Morales et al., 2024). Completing sustainability programs improves students' understanding of SDGs and highlights the importance of integrating ESD into teaching practices (García-González et al., 2020). Teachers support incorporating ESD into the senior secondary curriculum as a standalone or multidisciplinary subject to promote

sustainable resource use (Anyolo et al., 2018).

Teaching Methods and Practices for Implementing ESD into the Curriculum

ESD is recognized globally, especially in higher education, as a driver of societal change, but universities struggle to integrate it effectively into teaching practices and staff training (Mulà et al., 2017). Teachers use "participatory approaches" to help students articulate viewpoints on sustainability and connect classroom learning to real-life (Scoullos, 2013). Science and social science teachers' approaches differ, with science teachers rooted in evidence-based traditions and social science teachers more aligned with ESD (Borg et al., 2012). The Commission on Higher Education in the Philippines has incorporated ESD into their strategic plan, focusing on environmental conservation and community outreach, but practical application theories are developing slowly (Balanay & Halog, 2016). While some universities offer specialized sustainability modules, comprehensive staff development programs are rare (Mulà et al., 2017). Effective integration of ESD into professional development requires greater understanding of its multi-dimensional challenges and institutional transformation (Borg et al., 2012). Learners' motivation is crucial, and raising awareness and engagement in sustainability practices enhances intrinsic motivation (Anyolo et al., 2018). Research trends indicate a need to align higher education with sustainable development more closely (Wu & Shen, 2016).

Barriers and Challenges to Effective Integration of ESD

Universities face challenges in integrating ESD into mainstream teaching, staff training, and institutional priorities (Mulà et al., 2017). Effective ESD integration is hindered by a lack of motivating instances and essential knowledge among teachers (Borg et al., 2012). Despite interest in sustainability projects, there is a lack of resources and financing (Brandli et al., 2015). Overcoming these obstacles requires involvement from all university stakeholders (Elliott & Wright, 2013). An integrative approach involving interdisciplinary work is needed to address unsustainable development (Leal Filho et al., 2015). Coordination in academic research on sustainability is lacking, but the UN SDGs offer opportunities to implement sustainability practices in higher education (Filho et al., 2018).

RESEARCH METHODOLOGY

This study aimed to assess the awareness and perceptions of prospective teachers at Bataan Peninsula State University using a descriptive-comparative and correlational design.

A descriptive-comparative design is used to describe variables and examine differences in variables in two or more groups that occur naturally in a setting (Nurse Key, 2017). The descriptive-comparative design was appropriate for this study because it sought to describe the difference in perception and awareness of prospective teachers when they were grouped according to profile.

A descriptive-correlational design is used to gather numerical data that is then evaluated using statistically based methodologies in order to explain phenomena, attitudes, opinions, actions, or other defined factors. In research investigations that aim to present static images of circumstances as well as establish the relationship between various variables, a descriptive-correlational design is used (Ivy Panda, 2020). The descriptive-correlational design was also appropriate for this study because it sought to describe the perception and awareness of prospective teachers and their relationships with each other regarding the integration of ESD.

The study was conducted among all 4th-year prospective teachers at Bataan Peninsula State University-Dinalupihan Campus (BPSU-DC) across its 4 different programs in the educational field. The table below shows the total population for the study.

The researchers utilized the full random sampling technique. Random sampling, also known as probability

Table 1. Demographic Profile of the Respondents

Variable		Frequency	Percentage
Sex	Male	39	21.5
	Female	142	78.5
	Total	181	100.0

sampling, is a sampling technique that makes it possible to randomize sample selection, which means that each sample has an equal chance of being chosen to represent the entire population (Taylor, 2023). The researchers obtained their ideal sample size of 160–200 using the Raosoft sample size calculator.

In obtaining the data needed for this study, the researchers used a pre-validated questionnaire from Gericke et al. (2019) consisting of the following parts: Part I aimed to get the demographic profile of the respondents, such as sex and program major; Part II was intended for the assessment of the ESD knowledge; Part III was intended for the evaluation of the ESD attitude; and Part IV was for the assessment of the ESD behavior.

The researchers read some theses, books, magazines, and journals. They visited some websites on the internet that were relevant to the variables of the study and eventually considered using the Questionnaire on Sustainable Development by Gericke et al. (2019). The pre-validated questionnaire had already been used multiple times by other researchers studying the same field.

The researchers used an adapted and validated questionnaire. A Sustainability Consciousness Questionnaire (SCQ) was theoretically and empirically developed by Gericke et al. (2019), which includes a fifty-item questionnaire scale that measures three variables: ESD knowledge, ESD attitude, and ESD behavior. For further understanding, prospective teachers' demographic profile (sex) was examined to mediate relationships between two variables and the aforementioned three (3) ESD variables. The questionnaire was pilot tested with 15 non-participating respondents from the BPSU-Balanga campus' College of Education. The internal consistency of the items was determined statistically using Cronbach's alpha. Part 2 of the instrument had a Cronbach's Alpha of 0.990. Part 3 of the instrument had a Cronbach's Alpha of 0.958. Finally, Part 4 of the instrument had a Cronbach's Alpha of 0.907. All three parts passed the standard of 0.700 Cronbach's Alpha value which means that the questionnaire is valid in the locality and is ready to be administered to the actual population.

Data Processing and Statistical Treatment

1. Frequency. This was used to determine the number of respondents who responded to the item.
2. Percentage. This is the rate per hundred, which is obtained by dividing the total number of respondents' responses.
3. Weighted average mean. This was used to identify the levels of agreement among the respondents in terms of the Sustainability Consciousness Questionnaire (SCQ).
4. A t-test was used to determine the significant difference in the ESD Knowledge, Attitude, and behavior of the respondents when grouped according to sex.
5. Pearson's correlation: to measure the relationship between teachers' ESD Knowledge, Attitude, and Behavior.

The conceptual paradigm for assessing the perceptions and awareness of prospective teachers on the integration of education for sustainable development is a framework that aims to evaluate the ESD knowledge, behavior, and attitude of pre-service teachers regarding the integration of sustainable development concepts into the educational system. This paradigm is designed to serve as the basis for developing a training program that will equip prospective teachers with the necessary skills and knowledge to incorporate sustainable development principles into their teaching practices.

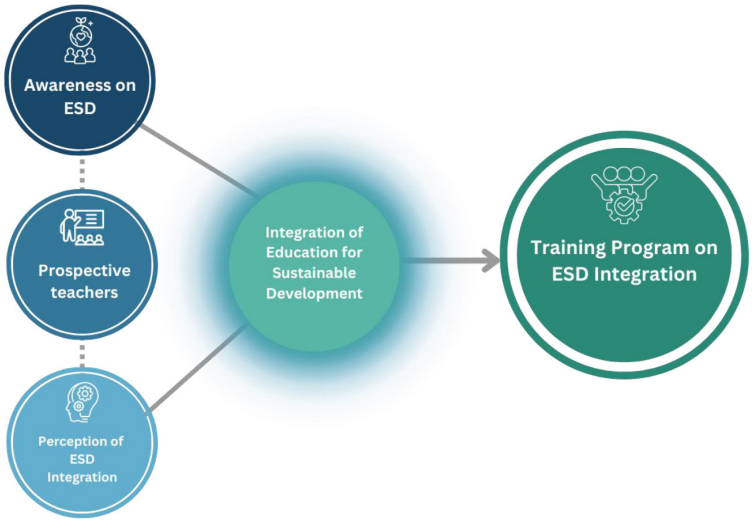

Fig. 1. Paradigm of the study

EMPIRICAL RESULTS AND ANALYSIS

Part 1. Self-Reported Awareness of Pre-Service Teachers on Education for Sustainable Development

Based on the data, 90.1% of pre-service teachers are aware of the importance of education for sustainable development, while 9.9% are not. This suggests a strong foundation for integrating sustainable development principles into the education system in the Philippines. However, the 9.9% lacking awareness indicates a need for targeted efforts, such as comprehensive training programs, professional development, and curriculum enhancements. This could involve comprehensive training programs, professional development opportunities, and curriculum enhancements that emphasize the multidimensional aspects of sustainable development. Addressing this gap will help ensure all future educators prioritize sustainability in their teaching, thereby preparing students to be responsible stewards of the environment and society.

Part 2. Pre-Service Teachers' Assessment of Their Knowledge of Education for Sustainable Development

The information in Table 3 shows that pre-service teachers at BPSU-DC generally agree with statements supporting the integration of sustainable development (SD) in education and disagree with negative statements about it. This indicates sufficient awareness of SD or ESD among these teachers. Item 1, with the highest mean of 4.22 ("Strongly Agree"), reflects their strong agreement on the importance of economic development for sustainable development.

Their positive response to integrating SD in education highlights their recognition of the interconnectedness of economic growth and sustainability. This signifies an understanding that economic progress should ensure long-term social and environmental well-being.

Table 2. Self-Reported Awareness of Pre-Service Teachers on Education for Sustainable Development

Awareness on ESD	Frequency	Percentage
Aware	163	90.1
Not Aware	18	9.9
Total	181	100.0

Table 3. Pre-Service Teachers' Assessment of Their Knowledge of Education for Sustainable Development

ESD Knowledge	Mean	SD	Verbal Interpretation
1. Economic development is necessary for sustainable development.	4.22	1.06	Strongly Agree
2. Improving people's chances for a long and healthy life contributes to sustainable development.	4.10	1.08	Agree
3. Reducing water consumption is necessary for sustainable development.	4.12	1.11	Agree
4. Preserving nature is not necessary for sustainable development.**	2.21	0.41	Disagree
5. A culture where conflicts are resolved peacefully through discussion is necessary for sustainable development.	3.99	1.06	Agree
6. Sustainable development demands that we humans reduce all sorts of waste.	3.99	1.07	Agree
7. People who exercise their democratic rights are necessary for sustainable development (for example, they vote in elections, involve themselves in social issues, and express their opinions)	4.14	1.04	Agree
8. Reinforcing girls' and women's rights and increasing equality around the world is necessary for sustainable development.	3.96	1.07	Agree
9. Respecting human rights is necessary for sustainable development.	4.13	1.05	Agree
10. To achieve sustainable development, all the people in the world must have access to good education.	4.10	1.08	Agree
11. Sustainable development requires that companies act responsibly toward their employees, customers, and suppliers.	4.14	1.08	Agree
12. Preserving the variety of living creatures is necessary for sustainable development (preserving biological diversity).	4.06	1.04	Agree
13. Having respect for other cultures is necessary for sustainable development.	4.17	1.08	Agree
14. Sustainable development requires fair distribution of goods and services among people in the world.	4.09	1.10	Agree
15. Wiping out poverty in the world is necessary for sustainable development.	3.93	1.04	Agree
16. Sustainable development requires a shift to renewable natural resources.	4.02	1.04	Agree
17. Sustainable development demands that people understand how the economy functions.	4.13	1.06	Agree
18. For sustainable development, big infectious diseases such as HIV/AIDS and malaria must be stopped.	3.98	1.09	Agree
19. For sustainable development, people need to be educated in how to protect themselves against natural disasters.	4.20	1.09	Agree
Composite Mean	**3.98**	**1.03**	**Agree**

Legend: *1.00 – 1.80 = Strongly Disagree; 1.81 – 2.60 = Disagree; 2.61 – 3.40 = Neutral; 3.41 – 4.20 = Agree; 4.21 – 5.00 = Strongly Agree* [**Negative Item (reverse-coded)]

While there is overall agreement on the significance of SD in education, the slightly lower mean for item 15 suggests room for improvement in emphasizing individual responsibility and behavior change in achieving sustainability goals. Behavior change is crucial for reducing ecological footprints and creating a sustainable future. Continued efforts to enhance education for sustainable development can address this aspect, improving students' understanding and commitment to sustainable practices. According to the Brentanian theory of awareness, experiential learning is essential for students to fundamentally grasp the concept of sustainability (Montague, 2017).

Part 3. Pre-Service Teachers' Perception on the Integration of Education for Sustainable Development (ESD) in Terms of ESD Attitude

The data in Table 4 suggests that BPSU-DC pre-service teachers generally agree with positive statements about sustainable development (SD) concepts and education and disagree with negative ones. Unlike Table 3, none of the items reached a "Strongly Agree" average, but the collective agreement reflects a positive attitude towards SD. Notably, item 14 received a "Neutral" rating, indicating uncertainty about its negative statement.

Table 4. Pre-Service Teachers' Perception on the Integration of Education for Sustainable Development (ESD) in Terms of ESD Attitude

ESD Attitude	Mean	SD	Verbal Interpretation
1. I think that everyone ought to be given the opportunity to acquire the knowledge, values and skills that are necessary to live sustainably.	4.18	1.06	Agree
2. I think that we who are living now should make sure that people in the future enjoy the same quality of life as we do today.	4.08	1.07	Agree
3. I think that companies have a responsibility to reduce the use of packaging and disposable articles.	4.14	1.08	Agree
4. Using more natural resources than we need does not threaten the health and well-being of people in the future.**	2.22	0.42	Disagree
5. I think that we need stricter laws and regulations to protect the environment.	4.18	1.05	Agree
6. I think it is important to reduce poverty.	4.14	1.03	Agree
7. I think that companies in rich countries should give employees in poor nations the same conditions as in rich countries.	3.98	1.10	Agree
8. I think that it is important to take measures against problems which have to do with climate change.	4.14	1.07	Agree
9. I think that the government should provide financial aid to encourage more people to make the shift to green cars.	4.17	1.07	Agree
10. I think that the government should make all its decisions on the basis of sustainable development.	4.04	1.12	Agree
11. I think that it is important that people in society exercise their democratic rights and become involved in important issues.	4.08	1.07	Agree
12. I think that people who pollute land, air or water should pay for the damage they cause to the environment.	4.18	1.08	Agree
13. I think that women and men throughout the world must be given the same opportunities for education and employment.	4.20	1.07	Agree
14. I think it is okay that each one of us uses as much water as we want.**	2.90	1.43	Neutral
Composite Mean	**3.90**	**1.05**	**Agree**

Legend: *1.00 – 1.80 = Strongly Disagree; 1.81 – 2.60 = Disagree; 2.61 – 3.40 = Neutral; 3.41 – 4.20 = Agree; 4.21 – 5.00 = Strongly Agree* [**Negative Item (reverse-coded)]

Overall, the data indicates a positive attitude among pre-service teachers towards sustainable development, providing a solid foundation for integrating SD into the education system. This is similar to Anyolo et al. (2018), who found that teachers positively viewed incorporating ESD into the senior secondary school curriculum.

A positive attitude towards ESD fosters lifelong learning, critical thinking, creativity, and problem-solving abilities, empowering individuals to contribute to sustainable solutions. It promotes responsibility, ethical behavior, sustainable lifestyles, and global awareness. Ultimately, this attitude can drive transformative change, creating a more sustainable and equitable future for all.

Part 4. Pre-Service Teachers' Perception on the Integration of Education for Sustainable Development (ESD) in terms of ESD Behavior

The data in Table 5 indicates that pre-service teachers at BPSU-DC generally agree with statements showing positive behaviors towards sustainable development (SD) and education, and generally disagree with negative statements. Item 17 falls within the "Strongly Agree" range, showing collective agreement with positive behaviors towards SD.

This positive trend suggests that pre-service teachers understand how to act sustainably. Positive behavior towards Education for Sustainable Development (ESD) is crucial for creating a sustainable future. It equips individuals with the knowledge, skills, and attitudes needed to address environmental, social, and economic challenges. By promoting practices like responsible consumption, renewable energy, and biodiversity conservation, positive

Table 5. Pre-Service Teachers' Perception on the Integration of Education for Sustainable Development (ESD) in terms of ESD Behavior

ESD Behavior	Mean	SD	Verbal Interpretation
1. Where possible, I choose to cycle or walk when I'm going somewhere, instead of travelling by motor vehicle.	4.01	1.08	Agree
2. I never waste water.	3.76	1.06	Agree
3. I recycle as much as I can.	3.78	1.05	Agree
4. When I use a computer or mobile to chat, to text, to play games and so on, I always treat others as respectfully as I would in real life.	4.07	1.10	Agree
5. I often make lifestyle choices which are not good for my health.**	2.14	0.35	Disagree
6. I do things which help poor people	3.96	1.04	Agree
7. I pick up rubbish when I see it out in the countryside or in public places.	3.77	0.98	Agree
8. I don't think about how my actions may damage the natural environment.**	2.14	0.35	Disagree
9. I often purchase second-hand goods over the internet or in a shop.	3.59	0.97	Agree
10. I always separate food waste before putting out the rubbish when I have the chance.	3.76	1.03	Agree
11. I avoid buying goods from companies with a bad reputation for looking after their employees and the environment.	3.85	1.03	Agree
12. I have changed my personal lifestyle in order to reduce waste (e.g., throwing away less food or not wasting materials).	3.84	1.06	Agree
13. I work on committees (e.g. the student council, my class committee, the cafeteria committee) at my school.	3.37	1.23	Neutral
14. I treat everyone with the same respect, even if they have another cultural background than mine.	4.20	1.04	Agree
15. I support an aid organization or environmental group.	3.92	1.04	Agree
16. I watch news programs or read newspaper articles to do with the economy.	3.71	1.05	Agree
17. I show the same respect to men and women, boys and girls.	4.25	1.08	Strongly Agree
Composite Mean	**3.65**	**0.97**	**Agree**

Legend: *1.00 – 1.80 = Strongly Disagree; 1.81 – 2.60 = Disagree; 2.61 – 3.40 = Neutral; 3.41 – 4.20 = Agree; 4.21 – 5.00 = Strongly Agree* [**Negative Item (reverse-coded)]

behavior towards ESD helps mitigate climate change, protect ecosystems, and ensure social equity. ESD also fosters critical thinking, creativity, and problem-solving abilities, empowering individuals to actively shape a sustainable society. This fosters awareness, empowerment, and action, leading to a more environmentally conscious and socially just world.

Part 5. Differences in Pre-Service Teachers' ESD Knowledge

The independent sample t-test results (p=.068) show no significant difference in respondents' ESD knowledge between males and females. This suggests that gender does not influence the acquisition or understanding of ESD concepts. Similar findings in studies by Mojilis (2019) and Shivakumara et al. (2015) support this conclusion, indicating balanced gender representation in the sample populations. Consistent methodologies across studies further strengthen reliability.

In contrast, Nguyen et al.'s (2022) study claimed a gender difference in environmental knowledge, possibly due

Table 6. Test of Significant Difference in Pre-Service Teachers' ESD Knowledge when grouped as to Sex

Indicator	Sex	Mean	SD	t	p	Decision on Ho	Interpretation
ESD Knowledge	Male	4.16	0.61	1.850	0.068	Failed to reject Ho	Not Significant
	Female	3.93	0.91				

Note: *at 0.05 level of significance*.

to population distribution variations. They recommended increasing male respondents to verify results. This underscores the need for educational interventions to equally target both genders in promoting ESD knowledge, emphasizing equitable opportunities for understanding these concepts.

Part 6. Differences in Pre-Service Teachers' Perceptions on ESD Integration

The analysis utilized an independent sample t-test to assess whether perceptions towards ESD integration differed between male and female pre-service teachers. Results revealed that male pre-service teachers (M=4.13, SD=0.59) had significantly higher perceptions of ESD integration compared to females (M=3.84, SD=0.89), $t(181)=2.390$, $p=.019$, Cohen's D=0.382. This indicates a stronger inclination among male pre-service teachers to integrate ESD-related concepts into their teaching practices. However, there was no significant difference in ESD behavior between male and female respondents, $t(181)=1.004$, $p=.317$.

These findings suggest that while male pre-service teachers exhibit more positive attitudes towards ESD integration, this may not necessarily translate into observable differences in their actual teaching practices. This contrasts with previous research suggesting no gender dependency in environmental attitudes (Nguyen et al., 2022).

The discrepancy between perception and behavior underscores the importance of addressing gender-related differences in pre-service teachers' perceptions of ESD integration. It emphasizes the need for comprehensive training and support to ensure both male and female teachers effectively incorporate ESD concepts into their teaching practices. Additionally, future studies should consider larger and more representative samples to validate these findings and explore potential contributing factors to this phenomenon.

Part 7. Relationships between ESD Knowledge and Perception

The study utilized Pearson's product correlation to examine the relationship between pre-service teachers' ESD knowledge and their perception of ESD integration. Results show a strong, positive, and statistically significant correlation between ESD Knowledge and ESD Attitude (r=.848, $p<.001$), as well as between ESD Knowledge and ESD Behavior (r=.792, $p<.001$). This suggests that as ESD knowledge increases, pre-service teachers exhibit more favorable attitudes and behaviors towards ESD integration.

This finding aligns with Kalsoom et al.'s (2017) study, where participants demonstrated increased adoption of sustainable actions following enhanced awareness. Both studies suggest that ESD-related courses positively influence attitudes and behaviors toward sustainability.

Table 7. Test of Significant Difference in Pre-Service Teachers' Perceptions on ESD Integration when grouped as to Sex

Indicator	Sex	Mean	SD	*t*	*p*	Decision on Ho	Interpretation
ESD Attitude	Male	4.13	0.59	2.390	0.019	Reject Ho	Significant
	Female	3.84	0.89				
ESD Behavior	Male	3.76	0.57	1.004	0.317	Failed to reject Ho	Not Significant
	Female	3.63	0.77				

Note: *at 0.05 level of significance*.

Table 8. Test of Significant Relationship between ESD Knowledge and Perception towards ESD

Variables	r	*p*-value	Decision on Ho	Interpretation
ESD Knowledge and ESD Attitude	0.848	0.000	Reject Ho	Significant
ESD Knowledge and ESD Behavior	0.792	0.000	Reject Ho	Significant

Note: *at 0.05 level of significance*.

These findings underscore the importance of incorporating ESD principles into educational programs to foster positive attitudes and behaviors towards sustainability. They emphasize the need for comprehensive ESD training in teacher education programs to cultivate environmentally conscious teaching practices and facilitate broader transformations in attitudes and actions.

The strong correlation emphasizes the pivotal role of ESD knowledge in shaping pre-service teachers' perceptions and actions related to sustainability education. It highlights the significance of promoting ESD integration to develop a more environmentally conscious teaching workforce and encourage sustainable practices across subject areas.

CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

1. Majority Awareness of ESD among Pre-Service Teachers

The majority of pre-service teachers at BPSU-DC are aware of the importance of education for sustainable development (ESD). To address the gaps in knowledge among a few, targeted training programs, professional development opportunities, and curriculum improvements are needed. These efforts can enhance the Philippine education system's ability to promote sustainability and equip students with the necessary skills to tackle environmental and societal challenges.

2. Moderate Knowledge of ESD

Pre-service teachers at BPSU-DC possess adequate knowledge of sustainable development. This foundation suggests future educators will promote sustainable practices in their classrooms. However, enhancing this knowledge is essential for achieving broader sustainability goals and fostering a more environmentally conscious and responsible society.

3. Positive Attitudes toward ESD Integration

Pre-service teachers at BPSU-DC have generally positive attitudes towards integrating sustainable development in education. This indicates they are likely to advocate for ESD, influencing school policies and community practices. Comprehensive ESD training in teacher education programs is vital to ensure these future educators are well-equipped to teach sustainability effectively.

4. Positive ESD Behavior Perceptions

Pre-service teachers at BPSU-DC generally support sustainable development behaviors, suggesting they will integrate ESD into their teaching practices. However, a neutral stance on student leadership in ESD indicates a need for targeted training to emphasize its importance. Addressing this gap can empower future teachers to encourage active student participation in sustainability initiatives.

5. No Gender Difference in ESD Knowledge

Gender does not significantly impact ESD knowledge among pre-service teachers at BPSU-DC. Both males and females show similar levels of understanding, allowing for the design of uniform ESD training programs. This finding supports the potential for equal participation from all genders in promoting sustainable practices and highlights the importance of focusing on curriculum quality and teaching methodologies.

6. Gender Difference in ESD Attitudes

Male pre-service teachers at BPSU-DC exhibit more positive attitudes toward ESD integration than females. To bridge this gap, tailored interventions that boost female teachers' confidence and engagement with ESD are necessary. Gender-sensitive approaches in ESD training can ensure all teachers are equally motivated to promote sustainability.

7. Relationship between ESD Knowledge and Perception

There is a significant relationship between ESD knowledge and perception among pre-service teachers. Enhancing ESD awareness can lead to greater community engagement and proactive sustainability behaviors. Educators should use interactive teaching methods to make ESD more relatable, and organizations can design effective awareness campaigns highlighting the benefits of sustainable development.

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지속가능한 발전을 위한 통합 교육에 대한 예비 교사들의 인식: 연수 프로그램을 기준으로

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인간이 초래한 인위적 파괴로 인해 세계는 절실히 치유가 필요합니다. 필리핀 정부는 국가의 시급한 환경적, 사회적, 경제적 문제를 해결하기 위해 지속 가능한 발전 교육(ESD)을 우선시하고 추구해 왔습니다. 그러나 현재의 통합 방식이 단편적이기 때문에 교육과정에 ESD를 통합하는 것이 여전히 부족합니다. 관련 기관들은 환경 교육을 대학 필수 선택 과목으로 만드는 교육 과정을 만들기 위해 협력하고 있지만, 특히 ESD와 관련하여 데이터 기반의 보다 구체적인 조치를 취하기 위해서는 기초 데이터가 필요합니다. 기술적 연구 설계를 사용하여 이 연구는 필리핀 중부 루손의 한 주립 대학에서 무작위로 선정된 181명의 예비 교사(PST)의 ESD 인식과 인식을 평가했습니다. 연구 결과, 응답자의 90.1%가 ESD의 중요성에 대해 인식하고 있었습니다. 또한, 응답자들은 ESD를 교육에 통합하는 것에 일반적으로 동의했으며, 평균 수준의 ESD 지식과 ESD 개념에 대한 긍정적인 태도와 행동을 보였습니다. 성별로 분류했을 때 응답자의 ESD 지식에는 유의미한 차이가 없었지만, 남성과 여성 예비 교사 간의 ESD 태도는 유의미한 차이가 있었습니다. 반면, ESD 행동에 있어 남성과 여성 응답자 간에는 유의미한 차이가 없었습니다. ESD 지식, ESD 태도, ESD 행동 측면에서 프로그램에 따라 그룹화했을 때도 유의미한 차이가 없었습니다. 마지막으로, ESD 지식은 ESD 태도 및 ESD 행동과 모두 유의미한 관련이 있는 것으로 나타났습니다. 주요 결과는 예비 교사를 위해 특별히 설계된 ESD 교육 프로그램을 개발하는 데 고려되었습니다.

주제어: ESD 지식, ESD 태도, ESD 행동, 지속 가능한 발전 교육, 예비 교사, ESD 인식, ESD 인식도 (Peception)

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