Chapter 16
Determinants of Teachers' Intentions to Integrate Education for Sustainable Development (ESD) Into Physical Education and Health Curricula

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ABSTRACT

Education for Sustainable Development (ESD) is essential for promoting sustainability and environmental stewardship among students. However, the intent of Filipino teachers to incorporate ESD principles into Physical Education and Health remains underexplored. This study examines the relationships between attitudes towards

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ESD, subjective norms, perceived behavioral control, behavioral intentions, self-reported behavior, subjective task value, ESD knowledge, and ESD integration beliefs among 363 educators. Utilizing PLS-SEM, the study finds perceived behavioral control as the strongest predictor of both behavioral intentions and self-reported behaviors, underscoring its role in enabling educators to implement ESD practices. ESD knowledge significantly influences perceived behavioral control, suggesting that enhancing knowledge could boost educators' confidence in ESD integration. Additionally, ESD integration beliefs impact attitudes and behavioral intentions. These findings offer insights for targeted interventions to support ESD integration within PE and Health curricula.

INTRODUCTION

The provision of basic education is no longer sufficient; the current ideal aims at an education that fosters social, economic, and environmental consciousness in students (Parra et al., 2020; SEAMEO INNOTECH, 2010). Education for Sustainable Development (ESD) plays a crucial role in cultivating a culture of sustainability and environmental stewardship among students (UNESCO, 2014). In the Philippines, where environmental issues such as climate change, biodiversity loss, and pollution pose significant challenges, integrating ESD into educational practices, particularly within Physical Education and Health (PEH) curricula, is essential (Boquet, 2017; De Leon, 2022). PEH, as compulsory subjects in Philippine schools (Commission on Higher Education, 2021; Department of Education, 2016), offer a unique platform to incorporate ESD principles, promoting physical activity while instilling environmental awareness and responsibility. Despite the recognized importance of ESD, the extent to which Filipino teachers intend to integrate sustainable development principles into their teaching practices remains underexplored. Therefore, this study aims to address this gap by examining the determinants that influence Filipino teachers' intentions to integrate ESD into PEH curricula.

Environmental sustainability can be effectively integrated into PEH curricula through various educational approaches (Boeve-de Pauw et al., 2022; Fröberg, Wiklander, & Lundvall, 2023). For instance, PE classes can incorporate outdoor activities such as nature walks and eco-friendly sports, which promote both physical well-being and an appreciation for the natural environment (Pasek et al., 2020). Similarly, health education classes can cover topics related to environmental conservation and sustainable living practices, empowering students to make informed decisions that positively impact both their personal health and the health of the planet (Davis & Cooke, 2007). Hands-on learning experiences, such as gardening projects and waste reduction initiatives, can teach students to apply sustainable principles in their

daily lives (Holloway et al., 2023; Paño et al., 2022). By integrating environmental sustainability into PEH curricula, educators can inspire environmentally conscious individuals committed to protecting the planet and promoting a sustainable future.

Theoretical frameworks such as the Theory of Planned Behavior (TPB) offer valuable insights into understanding human behavior, including intentions toward adopting new practices (Ajzen, 2012). According to TPB, intentions are influenced by three main factors: attitudes, subjective norms, and perceived behavioral control. Attitudes refer to individuals' evaluations of behavior, subjective norms reflect perceived social pressure to perform the behavior, and perceived behavioral control pertains to the perceived ease or difficulty of performing the behavior. Previous research applying TPB in educational contexts has shown that attitudes toward behavior, subjective norms, and perceived behavioral control significantly influence teachers' intentions and actual behaviors. However, few studies have specifically examined these determinants in the context of ESD integration into PEH curricula, particularly within the Philippine context. Understanding the factors that influence teachers' intentions to integrate ESD into PEH curricula is crucial for promoting environmental literacy and sustainable behaviors among Filipino students. By identifying these factors, this study aims to support the advancement of sustainable education initiatives in the Philippines, aligning with both national and global sustainable development goals.

LITERATURE REVIEW

Environmental Sustainability in PEH Curricula

Environmental sustainability in education is increasingly essential as the world faces mounting environmental challenges, making it critical to equip students with the knowledge and skills to navigate and address these issues (Olsson et al., 2022). Integrating ESD into PEH curricula presents a unique opportunity to promote a holistic approach to health that encompasses not only physical and mental well-being but also environmental stewardship. Embedding ESD principles into PEH enables educators to promote sustainable lifestyles by highlighting the interconnectedness of personal health and environmental impact (Merma-Molina et al., 2023). This approach helps students understand that their health choices, such as dietary habits, physical activity, and mental health practices, can have a significant impact on the

environment. Moreover, it fosters a sense of responsibility and empowers students to make informed decisions that contribute to the sustainability of their communities.

Practical strategies for integrating ESD into PEH include implementing outdoor education programs that underscore the significance of preserving natural spaces, engaging students in nature-based physical activities that forge a connection with the environment, and incorporating curriculum discussions that address the environmental impacts of health-related behaviors (Baena-Morales et al., 2021). These approaches not only enhance students' environmental literacy but also promote their physical and mental well-being through active engagement with nature (Dyment & Bell, 2008). Experiencing the natural world firsthand fosters a profound appreciation for it and encourages a lifelong commitment to environmental sustainability (Merma-Molina et al., 2023). This integrated approach ensures that students emerge as healthier individuals and more conscientious citizens, equipped to contribute to a sustainable future.

Teachers' Intention and Behavior in ESD

Teachers are central to the effective incorporation of ESD into educational curricula (Baena-Morales et al., 2021). Their intentions and behaviors are shaped by a complex interplay of factors, including their attitudes towards ESD, the influence of perceived social norms, and their sense of control over the behavior, as articulated in the TPB. These factors collectively influence their willingness to integrate ESD into their teaching practices, which then strongly predicts their actual implementation of such initiatives in the classroom (Ajzen, 1991). Research highlights that when teachers view ESD as both valuable and pertinent to their educational goals, they are more inclined to incorporate it into their lessons (Hsu, 2004). Moreover, the presence of a supportive environment, characterized by encouragement from school administrators and colleagues, along with the availability of resources and professional development opportunities, significantly boosts teachers' confidence and perceived control over ESD implementation (Müller et al., 2021). As a result, creating positive attitudes, fostering supportive social contexts, and enhancing teachers' efficacy in delivering ESD are key elements for its successful integration into PEH curricula. These efforts ensure that ESD becomes a meaningful and sustained component of education, ultimately benefiting both students and the broader community (Zhukova et al., 2020).

Cultural and Contextual Factors Influencing Teachers' Intention

Teachers' intentions to integrate ESD are deeply shaped by cultural and contextual factors (Vukelić & Rončević, 2021). These elements, including prevailing cultural beliefs and societal values surrounding the environment, education, and health, play a critical role in shaping teachers' perceptions and attitudes (S. Zengaro & F. Zengaro, 2024). In societies where there is a strong cultural emphasis on environmental conservation and sustainability, teachers are more likely to adopt and advocate for ESD initiatives within their curricula (Stevenson, 2007). These cultural values provide a supportive backdrop that not only motivates teachers but also aligns with their professional responsibilities to educate students about sustainability. This alignment between cultural values and educational goals facilitates a more enthusiastic and effective integration of ESD, fostering an educational environment where sustainability is a shared priority.

Contextual factors such as school policies, available resources, and community support also play critical roles (Koester et al., 2021). Schools with strong sustainability policies and practices provide a conducive environment for teachers to implement ESD (Riess et al., 2022). Furthermore, access to teaching materials, professional development opportunities, and collaboration with environmental organizations enhances teachers' capacity to integrate sustainability into their curricula (Nolet, 2009). Socioeconomic factors (e.g., Garcia, 2022) can also impact the integration of ESD. Schools in under-resourced communities may face challenges in implementing ESD due to limited access to materials and training (Rundgren & Yamada, 2023). However, community partnerships and innovative approaches can help overcome these barriers and support sustainable education initiatives.

MAIN FOCUS OF THE CHAPTER

Despite growing interest in integrating ESD into PEH curricula, empirical research on the determinants of teachers' intentions to implement ESD, particularly through the TPB, remains limited. Current literature has not adequately addressed specific factors such as subjective task value, ESD knowledge, and integration beliefs, which are crucial for developing targeted strategies to support teachers in incorporating ESD into their practices. This study aims to fill this gap by employing the TPB framework to explore how attitudes towards ESD, subjective norms, perceived behavioral control, and other relevant factors shape teachers' intentions and subsequent behaviors. Understanding these determinants provides valuable in-

sights for policymakers and educators to enhance ESD integration in PEH curricula, promoting sustainability education in school settings.

As nations strive to achieve the United Nations Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education) and Goal 13 (Climate Action), incorporating ESD into PEH curricula is an innovative strategy to foster sustainability consciousness from a young age. This study's focus on understanding the determinants of teachers' intentions is critical, as educators play a pivotal role in translating global sustainability goals into actionable teaching practices. By examining these determinants, the research offers insights applicable across diverse educational contexts, making it a significant contribution to global educational innovations. The findings could inform international efforts to integrate ESD into curricula, highlighting the relevance of these factors not only in the Philippines but also in addressing global educational challenges.

THEORETICAL BASIS AND HYPOTHESIS DEVELOPMENT

Theory of Planned Behavior

The TPB was developed by Icek Ajzen in 1985 as an extension of the Theory of Reasoned Action (TRA), which was co-developed by Ajzen and Martin Fishbein. TRA posits that an individual's behavior is directly influenced by their intention to perform that behavior, which in turn is influenced by their attitude toward the behavior and subjective norms (Ajzen & Fishbein, 1980). However, TRA was found to be limited in its ability to predict behaviors over which individuals had incomplete volitional control. To address this, Ajzen introduced TPB by adding a third determinant of intention: perceived behavioral control (PBC), which reflects an individual's perception of their ability to perform a given behavior (Ajzen, 1991).

Since its inception, TPB has been widely adopted and extended across various fields. One notable extension is the incorporation of additional constructs to improve its predictive power. For instance, Conner and Armitage (1998) proposed adding past behavior as a predictor, demonstrating its significant influence on future intentions and behaviors. Another extension is the inclusion of moral norms, as shown by Manstead (2000), who found that moral obligations could predict intentions in contexts like recycling and ethical consumerism. The integration of TPB with other models has also been explored. For example, the Technology Acceptance Model (TAM), which focuses on technology use, has been combined with TPB to form a hybrid model (Garcia, 2023). Taylor and Todd (1995) demonstrated that combining TAM's perceived usefulness (PU) and perceived ease of use (PEU) with TPB's constructs could better predict technology adoption behaviors. To evaluate the fea-

sibility of integrating ESD into PEH curricula using TPB, the following constructs are considered: PBC, Attitude Toward the Behavior (AT), Subjective Norms (SN), ESD Knowledge (EK), Subjective Task Value (STV), ESD Integration Beliefs (IB), Behavioral Intention (BI), and Self-reported Behavior (SB).

Hypotheses

According to the TPB, attitudes towards a behavior significantly predict behavioral intentions (Ajzen, 1991). Thus, positive attitudes towards ESD will likely lead to stronger intentions to integrate ESD into PEH curricula. Subjective norms, which refer to the perceived social pressure to perform a behavior, also influence behavioral intentions (Mentel et al., 2024). Therefore, if teachers perceive that colleagues, administration, and parents support ESD integration, their intentions to incorporate ESD will be stronger. Additionally, perceived behavioral control, which denotes the perceived ease or difficulty of performing a behavior, influences both intentions and actual behavior (Ajzen, 1991, 2012). Teachers who feel capable and have the necessary resources are more likely to intend to integrate ESD. With this understanding, the following hypotheses are proposed (see Figure 1):

H1: Positive attitudes towards ESD will positively influence teachers' behavioral intentions to integrate ESD into PEH curricula.

H2: Perceived supportive subjective norms will positively influence teachers' behavioral intentions to integrate ESD.

H3: Higher perceived behavioral control will positively influence teachers' behavioral intentions to integrate ESD.

Additionally, STV refers to the personal significance or worth that an individual attributes to a specific task or activity. It encompasses several dimensions that collectively influence an individual's motivation and engagement with the task (Eccles & Wigfield, 2002). Teachers' STV for integrating ESD into their curricula would reflect their perceptions of how valuable and beneficial they find this integration. If teachers perceive high intrinsic value, attainment value, and utility value in teaching ESD, and if they believe the costs are manageable, they are more likely to hold positive attitudes towards ESD and be motivated to incorporate it into their teaching practices. Furthermore, knowledge about a subject can enhance understanding and appreciation, leading to more positive attitudes (Fishbein & Ajzen, 1975). Thus, teachers who are well-informed about ESD are likely to have favorable attitudes towards its integration. Stronger beliefs in the benefits of integrating ESD, which shape attitudes towards it (Ajzen, 1991), will also positively influence teachers' attitudes towards ESD. Therefore, the following hypotheses are proposed:

H4: Greater subjective task value of ESD will positively influence teachers' attitudes towards ESD.

H5: Greater knowledge about ESD will positively influence teachers' attitudes towards ESD.

H6: Stronger beliefs in the benefits of integrating ESD will positively influence teachers' attitudes towards ESD.

Moreover, positive outcome beliefs not only shape attitudes but can also directly enhance behavioral intentions (Fishbein & Ajzen, 1975). Therefore, teachers who believe in the positive impact of ESD are more likely to incorporate it into their teaching. Additionally, greater knowledge about ESD will positively influence teachers perceived behavioral control over integrating ESD. Knowledge can enhance confidence and perceived control over a behavior (Bandura, 1986), so teachers with extensive ESD knowledge may feel more capable of integrating it effectively into their curricula. This increased perceived control can further strengthen their intentions to integrate ESD. Hence, the following hypotheses are proposed:

H7: Stronger beliefs in the benefits of integrating ESD will positively influence teachers' behavioral intentions to integrate ESD.

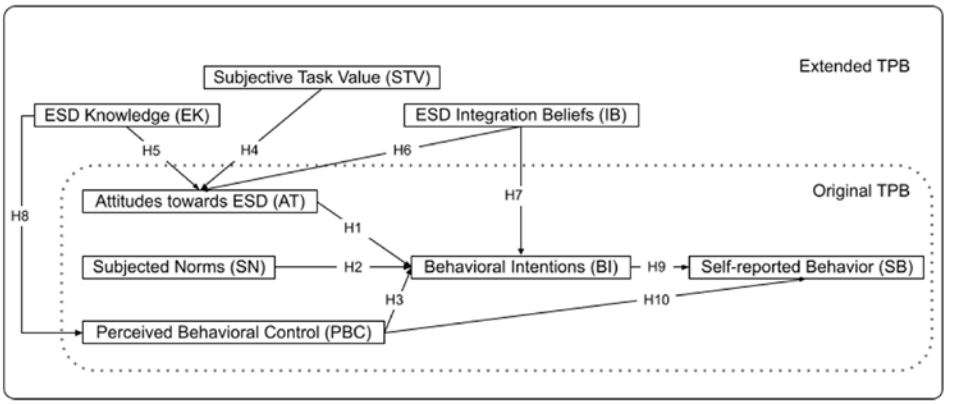
H8: Greater knowledge about ESD will positively influence teachers perceived behavioral control over integrating ESD.

Finally, intentions are the immediate antecedents of behavior according to TPB (Ajzen, 1991). Teachers with strong intentions to integrate ESD are more likely to report actual integration of ESD in their teaching. Perceived behavioral control, besides influencing intentions, can directly affect behavior, especially when the behavior requires skills or resources (Ajzen, 2012). Therefore, teachers who perceive high control over integrating ESD are more likely to report engaging in such behavior, reinforcing the importance of both perceived behavioral control and behavioral intentions in predicting self-reported behavior. Accordingly, the following hypotheses are proposed:

H9: Stronger behavioral intentions to integrate ESD will positively influence self-reported ESD integration behavior.

H10: Higher perceived behavioral control will positively influence self-reported ESD integration behavior.

Figure 1. Proposed Research Model with Hypothesized Paths



METHODOLOGY

This cross-sectional study employed Partial Least Squares Structural Equation Modeling (PLS-SEM) to develop a theoretical framework aimed at elucidating the factors influencing teachers' intentions to integrate ESD into PEH curricula. PLS-SEM, recognized for its ability to handle complex models with numerous constructs and indicators, was chosen due to its suitability for exploratory research and its effectiveness in modeling relationships between latent variables (Hair et al., 2011). Guided by the TPB, the initial model was constructed around five core constructs: AT, SN, PBC, BI, and SB. The model was further expanded to include three additional constructs: STV, EK, and IB, which were critical in assessing the determinants of ESD integration. Connections between these constructs were informed by a comprehensive literature review, as detailed in the preceding sections. To validate the measurement model, confirmatory factor analysis (CFA) was conducted, ensuring the reliability and validity of the constructs (Mustafa et al., 2022). The study adhered strictly to ethical principles as outlined by the educational institution and complied with the ethical guidelines set forth in the Declaration of Helsinki (Ehni & Wiesing, 2024).

Questionnaire Items

The constructs presented in Table 1 were adapted from existing research studies and tailored to reflect the integration of ESD into PEH curricula. A judgment-based approach was used to evaluate the initial questionnaire for completeness, format, and readability, involving researchers and language experts. Based on feedback from this evaluation, minor refinements were made, including the addition of new statements and simplification of existing ones. Subsequently, a pilot test was conducted with a convenience sample of 40 teachers to evaluate the validity and reliability of the revised questionnaire items. All constructs demonstrated a Cronbach's alpha coefficient ranging from 0.72 to 0.99, indicating strong internal consistency across the questionnaire. The final validated questionnaire comprised two main sections: (1) demographic information, capturing details such as age, gender, teaching experience, highest educational attainment, and academic rank, among others; and (2) construct measurement, consisting of 40 items designed to assess the eight constructs outlined in the research model. Each measurement item utilized a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Table 1. Survey Questionnaire Constructs and Definition of Latent Variables

Constructs	**Definition and Source**
Attitudes towards ESD (AT)	*Teachers' positive or negative evaluations of integrating ESD into their curricula (Ajzen, 1991)*
AT1	I believe integrating ESD into Physical Education and Health is essential.
AT2	I believe teaching ESD will benefit students' understanding of sustainability.
AT3	I believe ESD integration enhances the relevance of Physical Education and Health curricula.
AT4	I enjoy teaching topics related to ESD.
AT5	I believe ESD should be a priority in education.
Subjective Norms (SN)	*Teachers' perceived social pressures to integrate ESD (Ajzen, 1991)*
SN1	I believe my colleagues support integrating ESD into the curriculum.
SN2	I feel that my school administration encourages ESD integration.
SN3	I think parents value the inclusion of ESD in their children's education.
SN4	I believe educational policies support ESD integration.
SN5	I perceive a positive school culture towards sustainability.
Perceived Behavioral Control (PBC)	*Teachers' perceptions of their ability to integrate ESD, considering resources and support available (Ajzen, 1991)*
PBC1	I feel confident in my ability to teach ESD topics.
PBC2	I have the necessary resources to integrate ESD.

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Table 1. Continued

Constructs	Definition and Source
PBC3	I can overcome challenges in integrating ESD.
PBC4	Professional development for ESD is available to me.
PBC5	I have enough time to include ESD in my curriculum.
Behavioral Intentions (BI)	*Teachers' intentions to perform specific actions related to integrating ESD (Ajzen, 1991)*
BI1	I intend to integrate ESD into my curriculum next year.
BI2	I plan to seek professional development in ESD.
BI3	I intend to collaborate with colleagues on ESD integration.
BI4	I will regularly include ESD topics in my lessons.
BI5	I plan to evaluate the effectiveness of ESD in my teaching.
Self-reported Behavior (SB)	*The actual integration of ESD into curricula as reported by teachers (Bamberg & Möser, 2007)*
SB1	I frequently include ESD topics in my lessons.
SB2	I have implemented ESD projects in my classes.
SB3	I collaborate with colleagues on ESD activities.
SB4	I use ESD resources in my teaching.
SB5	I assess the impact of ESD integration in my teaching.
Subjective Task Value (STV)	*Teachers' beliefs about the importance and usefulness of integrating ESD for educational outcomes (Eccles & Wigfield, 2002)*
STV1	I consider the benefits of ESD integration to outweigh any challenges I might face.
STV2	I think that incorporating ESD into the curriculum will help students understand the impact of their actions on the environment.
STV3	I believe that ESD integration will enhance students' critical thinking and problem-solving skills.
STV4	I believe that integrating ESD will provide practical skills that students can use in their daily lives.
STV5	I feel that ESD topics are relevant and useful for my students' future.
ESD Knowledge (EK)	*Teachers' Understanding of environmental issues and sustainability concepts (Kollmuss & Agyeman, 2002)*
EK1	I am knowledgeable about ESD principles.
EK2	I understand how to integrate ESD into my teaching.
EK3	I stay updated on ESD-related developments.
EK4	I can explain ESD concepts to my students.
EK5	I have attended training sessions on ESD.
ESD Integration Beliefs	*Teachers' beliefs in the importance of integrating ESD into curricula (Fishbein & Ajzen, 2009)*

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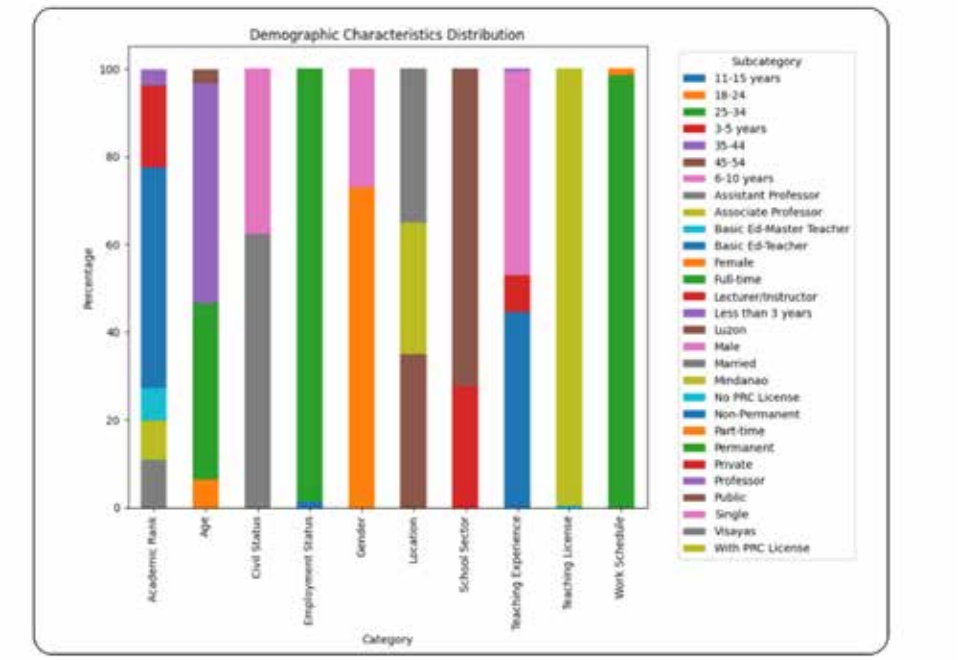
Table 1. Continued

Constructs	Definition and Source
IB1	I believe ESD integration is beneficial for student learning.
IB2	I think ESD enhances the curriculum's relevance.
IB3	I believe ESD promotes students' engagement.
IB4	I feel that ESD fosters a positive learning environment.
IB5	I believe integrating ESD addresses important global issues.

Participants and Data Collection

The participants in this study included PE teachers currently employed in educational institutions across the Philippines at the time of data collection. Convenience sampling and chain referral sampling methods were employed to recruit participants. Non-probability sampling is deemed acceptable for testing theoretical assumptions (Kohler, 2019). The data was collected via an online self-administered questionnaire distributed through Google Forms between July and August 2024 to various educational institutions nationwide. To enhance the response rate, colleagues were requested to disseminate the questionnaire to their respective institutions and professional networks. A total of 363 responses that were collected contained comprehensive responses, all of which were valid and included in the final analysis (see Figure 2). The participants were predominantly female (n = 265, 73%) and married (n = 227, 62.50%), with most falling within the 35-44 age range (n = 182, 50.10%; standard deviation$n$ = 6.45). The majority had 6 to 10 years of teaching experience (n = 169, 46.60%; standard deviation$n$ = 3.04). Almost all participants were full-time employees (n = 358, 98.60%) with permanent positions (n = 358, 98.60%), and a substantial portion held the rank of basic education teacher (n = 176, 48.50%). Nearly all of the PE teachers were licensed professional teachers (n = 361, 99.40%) working in public educational institutions (n = 263, 72.50%). To ensure a representative sample, data was collected from PE teachers across the three main geographical areas of the country: Luzon (n = 127, 35%), Visayas (n = 127, 35%), and Mindanao (n = 109, 30%).

Figure 2. Demographic Characteristics of the Participants



Data Analysis

Data analysis was performed using IBM SPSS Statistics 22 for descriptive statistics and SmartPLS 4.0 for Partial Least Squares Structural Equation Modeling (PLS-SEM), chosen due to the sample size (n = 363). Hair et al. (2021) suggested that PLS-SEM is appropriate for this sample size, as the minimum required sample size should be ten times the maximum number of arcs pointing to any latent variable in the PLS path model. With 10 arcs, a sample of 100 would suffice, making 363 responses more than adequate (Hair & Alamer, 2022). The analysis followed a three-step approach: first, confirmatory factor analysis (CFA) was conducted to validate the measurement model; next, PLS-SEM was employed using SmartPLS 4.0 to calculate standardization and correlation coefficients; finally, the structural model's fit was assessed using advanced tools and benchmarks in SmartPLS 4.0, ensuring a robust evaluation of the model (Sarstedt & Cheah, 2019).

RESULTS

This study employed PLS-SEM path modeling to examine the direct relationships between exogenous and endogenous constructs, including AT, SN, PBC, BI, SB, STV, EK, and IB. PLS-SEM is particularly suited for handling complex models with multiple constructs and indicators, and it performs well with small to medium sample sizes, making it appropriate for our sample of 363 participants. This technique is robust for models characterized by small samples, non-normal data, and formative measures, offering both predictive and exploratory insights. PLS-SEM facilitates the optimal prediction of relationships among variables and maximizes the shared covariance among latent variables to enhance model interpretation (Dash & Paul, 2021). Furthermore, this approach involves the development of a theoretically and logically sound path model. This subsection presents the study's descriptive statistics and measurement model evaluation, as well as the analysis of the structural model.

Descriptive Statistics and Measurement Model Evaluation

The dataset presented in Table 2 provides a comprehensive overview of the descriptive statistics, reliability, and validity of the constructs measured in the study on the determinants of teachers' intentions towards integrating ESD in PEH curricula. The mean scores for each item within the included constructs range from 3.99 to 4.14, indicating generally positive responses from the participants, with standard deviations between 0.66 and 0.76, reflecting a moderate level of variability in responses. Moreover, the reliability and validity metrics suggest that the measurement model is robust (Hair et al., 2021). Cronbach's Alpha values for all constructs exceed the threshold of 0.7, ranging from 0.841 to 0.869, indicating good internal consistency. Composite Reliability (CR) values, which range from 0.887 to 0.905, further confirm the reliability of the constructs. The Average Variance Extracted (AVE) values, ranging from 0.611 to 0.657, are all above the recommended minimum of 0.5, demonstrating adequate convergent validity. Factor loadings for individual items within each construct are all above 0.75, supporting the constructs' unidimensionality and the strong relationship between the items and their respective constructs (Hair et al., 2017).

Table 2. Descriptive Statistics, Reliability, and Validity of Constructs

Constructs	Item	Mean	SD	Factor Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Attitude towards ESD	AT1	4.09	0.75	0.830	0.869	0.905	0.657
	AT2	4.02	0.72	0.853			
	AT3	3.99	0.72	0.777			
	AT4	4.06	0.71	0.810			
	AT5	4.04	0.73	0.779			
Behavioral Intentions	BI1	4.06	0.68	0.774	0.853	0.895	0.630
	BI2	4.13	0.72	0.796			
	BI3	4.07	0.70	0.822			
	BI4	4.09	0.69	0.794			
	BI5	4.11	0.71	0.783			
ESD Knowledge	EK1	4.11	0.70	0.817	0.857	0.898	0.637
	EK2	4.13	0.68	0.812			
	EK3	4.11	0.69	0.781			
	EK4	4.12	0.66	0.809			
	EK5	4.07	0.73	0.770			
ESD Integration Beliefs	IB1	4.12	0.67	0.780	0.843	0.888	0.614
	IB2	4.09	0.68	0.772			
	IB3	4.10	0.68	0.786			
	IB4	4.08	0.70	0.780			
	IB5	4.08	0.72	0.799			
Perceived Behavioral Control	PBC1	4.01	0.70	0.761	0.851	0.894	0.627
	PBC2	4.06	0.76	0.807			
	PBC3	4.08	0.72	0.791			
	PBC4	4.11	0.71	0.808			
	PBC5	4.10	0.68	0.791			
Self-reported Behavior	SB1	4.10	0.66	0.777	0.841	0.887	0.611
	SB2	4.11	0.71	0.788			
	SB3	4.09	0.68	0.776			
	SB4	4.10	0.70	0.793			
	SB5	4.09	0.69	0.776			

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Table 2. Continued

Constructs	Item	Mean	SD	Factor Loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Subjective Norms	SN1	4.01	0.70	0.777	0.844	0.889	0.616
	SN2	4.04	0.71	0.790			
	SN3	4.10	0.72	0.839			
	SN4	4.03	0.76	0.765			
	SN5	4.09	0.67	0.750			
Subjective Task Value	STV1	4.12	0.68	0.787	0.844	0.889	0.616
	STV2	4.07	0.68	0.789			
	STV3	4.06	0.66	0.787			
	STV4	4.14	0.67	0.778			
	STV5	4.11	0.70	0.784			

The data presented in Table 3 utilizes the Fornell-Larcker criterion to assess discriminant validity among the constructs in the study on the determinants of teachers' intentions towards integrating ESD in PEH curricula (Fornell & Larcker, 1981; (Henseler et al., 2015). Discriminant validity is crucial in ensuring that each construct is distinct and measures what it is intended to, without overlapping excessively with other constructs (Sarstedt & Cheah, 2019). The diagonal values in the table represent the square root of the Average Variance Extracted (AVE) for each construct, with all values exceeding 0.75, indicating a strong level of convergent validity. These values should be higher than the correlations between the constructs (off-diagonal values) to confirm discriminant validity. For example, the square root of the AVE for AT is 0.817, which is greater than its correlation with all other constructs, such as BI (0.673) and EK (0.675). This pattern holds across all constructs, affirming that each construct shares more variance with its own indicators than with other constructs.

Table 3. Discriminant Validity (Fornell-Larcker Criterion)

Constructs	AT	BI	EK	IB	PBC	SB	SN	STV
Attitude towards ESD (AT)	0.817							
Behavioral Intentions (BI)	0.673	0.794						
ESD Knowledge (EK)	0.675	0.780	0.798					
ESD Integration Beliefs (IB)	0.675	0.775	0.813	0.783				
Perceived Behavioral Control (PBC)	0.670	0.793	0.781	0.784	0.792			

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Table 3. Continued

Constructs	AT	BI	EK	IB	PBC	SB	SN	STV
Self-reported Behavior (SB)	0.671	0.811	0.821	0.797	0.782	0.782		
Subjective Norms (SN)	0.730	0.755	0.725	0.762	0.784	0.736	0.785	
Subjective Task Value (STV)	0.686	0.795	0.825	0.844	0.787	0.833	0.768	0.785

Note: Diagonal values represent the square root of average variance extract (AVE), and off-diagonal values are correlations between constructs.

Consequently, the correlations between the constructs range from moderate to high, with the highest correlation observed between EK and STV at 0.825. Despite these high correlations, the square root of the AVE for each construct remains greater than these correlations, satisfying the Fornell-Larcker criterion. This demonstrates that the constructs are distinct from one another, supporting the model's overall discriminant validity and reinforcing the robustness of the PLS-SEM analysis (Henseler et al., 2014).

Structural Model Analysis

Table 4 presents the results of the structural model path coefficients, hypothesis testing, and effect size for the study examining the determinants of teachers' intentions towards integrating ESD in PEH curricula. Each hypothesis is associated with a path coefficient (β), which reflects the strength and direction of the relationship between constructs (Hair & Alamer, 2022). For instance, Hypothesis 3, which posits that PBC influences BI, has a β value of 0.356, indicating a moderate positive relationship. The associated t-value of 5.757 and a p-value of 0.000 suggest that this relationship is statistically significant, supporting the hypothesis. Additionally, the effect size (f^2) of 0.131 indicates that PBC has a moderate effect on BI. Notably, most of the hypotheses are supported, with significant p-values (less than 0.05) and corresponding positive t-values. Hypothesis 1, however, is not supported as the p-value of 0.071 exceeds the threshold for statistical significance. The f^2 values vary across the relationships, with EK's influence on PBC (H8) showing the largest effect size of 1.564, indicating a substantial impact.

Table 4. Structural Model Path Coefficients, Hypothesis Testing and Effect Size

Hypothesis	β	**t-value**	f^2	**p-value**	**Decision**
H1: Attitude towards ESD → Behavioral Intentions	0.114	1.803	0.019	0.071	Not Supported
H2: Subjective Norms → Behavioral Intentions	0.175	2.506	0.030	0.012	Supported
H3: Perceived Behavioral Control → Behavioral Intentions	0.356	5.757	0.131	0.000	Supported
H4: Subjective Task Value → Attitude towards ESD	0.281	2.403	0.038	0.016	Supported
H5: ESD Knowledge → Attitude towards ESD	0.258	2.591	0.038	0.010	Supported
H6: ESD Integration Beliefs → Attitude towards ESD	0.228	2.187	0.026	0.029	Supported
H7: ESD Integration Beliefs → Behavioral Intentions	0.286	4.177	0.090	0.000	Supported
H8: ESD Knowledge → Perceived Behavioral Control	0.781	25.558	1.564	0.000	Supported
H9: Behavioral Intentions → Self-reported Behavior	0.515	7.975	0.339	0.000	Supported
H10: Perceived Behavioral Control → Self-reported Behavior	0.374	5.540	0.179	0.000	Supported

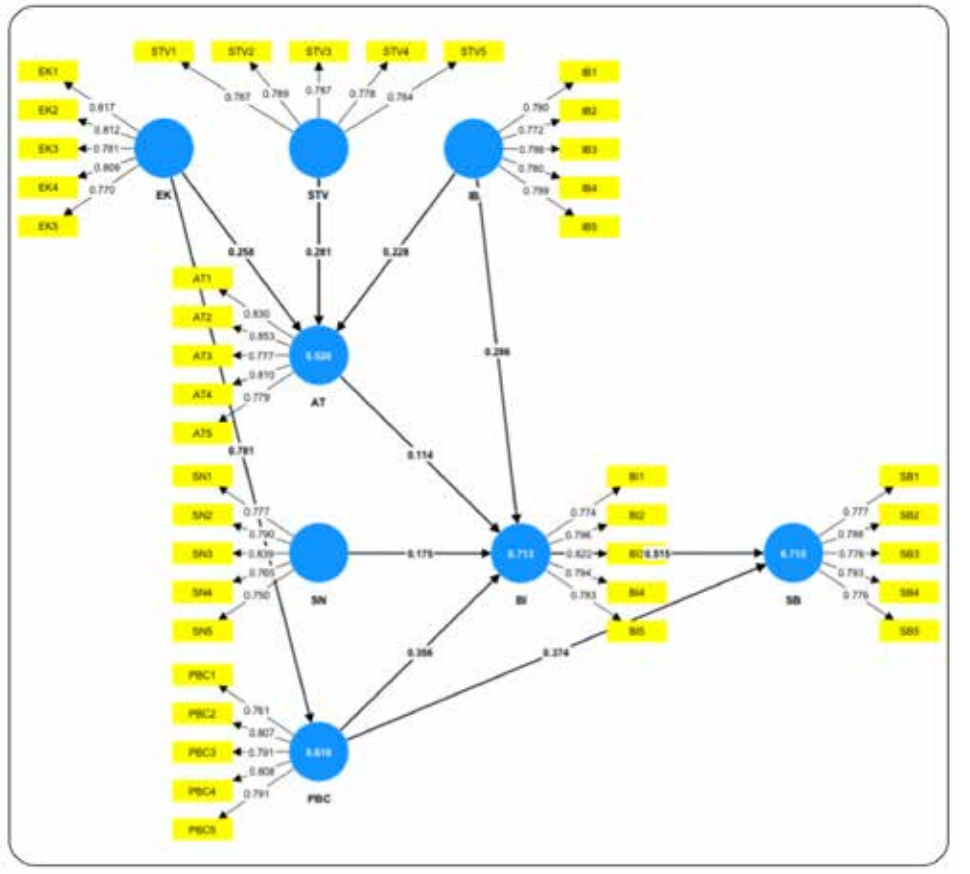
Furthermore, Table 5 provides a detailed assessment of the Coefficient of Determination (R^2) and Predictive Relevance (Q^2) for the endogenous constructs in the study. The construct AT shows an R^2 value of 0.520, indicating that the model accounts for 52% of the variance in this construct, which is considered a moderate level of explanatory power (Hair et al., 2021). With a Q^2 value of 0.499, the model demonstrates strong predictive relevance, suggesting that it can reliably predict attitudes towards ESD. For BI, the R^2 is substantial at 0.713, meaning the model explains 71.3% of the variance in this construct. The Q^2 value of 0.689 further underscores the model's predictive strength, highlighting its very strong relevance in predicting behavioral intentions. PBC has an R^2 value of 0.610, which reflects a moderate to high level of explanatory power, with the model explaining 61% of the variance. The Q^2 value of 0.607 confirms strong predictive relevance, indicating that the model is effective in predicting perceived behavioral control. Lastly, SB also exhibits a substantial R^2 value of 0.710, showing that 71% of the variance is accounted for by the model. The corresponding Q^2 value of 0.698 points to very strong predictive relevance, indicating that the model is highly reliable in predicting self-reported behavior.

Table 5. Coefficient of Determination and Predictive Relevance

Endogenous Construct	R^2	Q^2	**Interpretation**
Attitude towards ESD	0.520	0.499	Moderate R^2; Strong predictive relevance
Behavioral Intentions	0.713	0.689	Substantial R^2; Very strong predictive relevance
Perceived Behavioral Control	0.610	0.607	Moderate to high R^2; Strong predictive relevance
Self-reported Behavior	0.710	0.698	Substantial R^2; Very strong predictive relevance

The structural model presented in Figure 3, on the other hand, reveals that EK significantly impacts both AT and PBC, with coefficients of 0.258 and 0.781, respectively, indicating that greater ESD knowledge fosters more positive attitudes and a stronger sense of control over ESD-related actions (Ringle et al., 2023). STV is also positively associated with AT, with a coefficient of 0.281, suggesting that the value teachers place on ESD tasks contributes to their attitudes towards ESD. Additionally, IB is shown to influence both AT and BI, with coefficients of 0.228 and 0.286, respectively. This demonstrates that beliefs in the importance of integrating ESD into teaching positively affect both attitudes and intentions to engage in ESD-related behaviors.

Figure 3. Structural Model of Path Coefficients



Moreover, the model indicates that SN and PBC positively influence BI, with path coefficients of 0.175 and 0.356, respectively. This implies that perceived social pressure and perceived control are significant predictors of teachers' intentions to perform ESD-related behaviors. Finally, BI and PBC directly impact SB, with coefficients of 0.515 and 0.374, respectively, highlighting the strong role of intentions and perceived control in driving actual ESD-related behaviors. The model's explanatory power is reflected in the R^2 values for the endogenous constructs, with AT, BI, PBC, and SB explaining 52%, 71.3%, 61%, and 71% of the variance, respectively. These values suggest that the model has moderate to substantial explanatory power, providing valuable insights into how teachers' knowledge, beliefs, attitudes, and perceptions influence their intentions and behaviors related to integrating ESD into their teaching practices.

DISCUSSION

The structural model explores the intricate relationships among various constructs that influence educators' integration of ESD into their teaching practices. Understanding these relationships is crucial as ESD has gained prominence as a key educational objective, promoting sustainability and responsible behavior among students (Riess et al., 2022; UNESCO, 2014). The findings provide insights into how teachers' knowledge, beliefs, attitudes, and perceptions shape their intentions and behaviors related to ESD, revealing significant pathways that educators and policymakers can target to enhance ESD integration.

The findings reveal a strong positive relationship between EK and both AT ($\beta = 0.258$) and PBC ($\beta = 0.781$). This suggests that educators who possess a deeper understanding of ESD concepts are more likely to develop positive attitudes towards its integration and feel more capable of implementing ESD-related activities in their classrooms. Previous studies have highlighted the importance of knowledge as a foundation for attitude formation (Ajzen, 1991; Manika et al., 2018). Specifically, in the context of ESD, prior research has shown that teachers with higher levels of environmental knowledge are more inclined to adopt sustainable practices and promote these among their students (García-Muñio et al., 2024). The significant impact of ESD knowledge on perceived behavioral control aligns with the TPB, which posits that individuals who believe they have the requisite knowledge and skills are more likely to feel confident in executing specific behaviors (Ajzen, 2012).

STV also emerged as a significant predictor of AT ($\beta = 0.281$), indicating that the importance teachers place on ESD-related tasks significantly influences their attitudes towards ESD. This finding is consistent with the Expectancy-Value Theory, which suggests that individuals are more likely to engage in tasks they value highly (Wigfield & Eccles, 2000). In educational contexts, teachers who perceive ESD as a valuable and meaningful component of their curriculum are more likely to develop positive attitudes toward its implementation. Research by Pauw et al. (2022) supports this notion, showing that teachers who recognize the value of integrating sustainability into their teaching are more motivated to adopt ESD practices.

The results further demonstrate that ESD IB significantly influences both AT ($\beta = 0.228$) and BI ($\beta = 0.286$). This underscores the importance of teachers' beliefs in the relevance and feasibility of integrating ESD into their teaching. According to TPB, beliefs about the outcomes of a behavior are critical determinants of attitudes and intentions (Ajzen, 1991). Teachers who believe that integrating ESD will have positive outcomes for their students are more likely to develop favorable attitudes and strong intentions towards such integration. This finding is supported by a study conducted by Stössel et al. (2021), which found that student teachers' beliefs in

the efficacy of ESD were significant predictors of their willingness to incorporate sustainability topics into their curricula.

Notably, the findings also highlight that both SN ($\beta = 0.175$) and PBC ($\beta = 0.356$) are significant predictors of BI. This suggests that teachers' intentions to integrate ESD are influenced not only by their own attitudes and beliefs but also by the perceived social pressure from colleagues, administrators, and the broader educational community. This aligns with the TPB, which emphasizes the role of subjective norms in shaping behavioral intentions (Ajzen, 1991). A study by (Maidou et al., 2019) corroborated this finding, showing that perceived support from peers and the school environment plays a critical role in teachers' intentions to engage in pro-environmental behaviors, including ESD integration.

Finally, the findings reveal that BI ($\beta = 0.515$) and PBC ($\beta = 0.374$) are strong predictors of SB, indicating that teachers' intentions to integrate ESD are likely to translate into actual classroom practices, especially when they feel in control of the required tasks. This finding is consistent with TPB, where intentions are the most immediate determinants of behavior (Ajzen, 1991). Research by Vukelić and Rončević (2021) supported this relationship, demonstrating that teachers with strong intentions to incorporate sustainability topics into their teaching are more likely to report engaging in such behaviors. The high R^2 values for behavioral intentions (0.713) and self-reported behavior (0.710) in the dataset indicate that the model explains a substantial portion of the variance in these constructs, underscoring the robustness of these predictors.

Policy Implications

The study highlights implications for educators and policymakers aiming to enhance the integration of ESD in educational settings. First, increasing teachers' knowledge about ESD, particularly in relation to PEH curricula, can have a significant impact on their intentions to integrate these principles. For example, national policies should mandate continuous professional development workshops for PEH teachers that covers how to incorporate sustainability into fitness activities, nutrition education, or outdoor sports could enhance their understanding and confidence in applying ESD concepts (Baena-Morales et al., 2021). This might include training on how to integrate environmental sustainability into sports equipment choices or how to teach students about the impact of physical activity on both personal health and environmental sustainability (Merma-Molina et al., 2023). In relation to this integration, educational policymakers should consider embedding ESD principles directly into the national PEH curricula by revising existing standards to include

explicit sustainability outcomes. This ensures that all students receive a consistent and comprehensive education on sustainability through these subjects (see Figure 4).

Second, fostering a supportive environment within schools where the value of ESD in PEH is emphasized can positively influence teachers' attitudes. For instance, a school might implement a policy that highlights the importance of sustainability in physical activities and health education, such as by promoting eco-friendly sports equipment or including sustainable practices in school health programs (Fröberg, Wiklander, Baena-Morales, et al., 2023; F. Zengaro & S. Zengaro, 2024). Hence, adequate funding must be allocated to ensure schools have access to essential ESD teaching materials, resources for outdoor and nature-based activities, and technology that supports sustainable education initiatives (Arif et al., 2024; Diaz et al., 2024; Lobo et al., 2024). By prioritizing ESD in school-wide initiatives and communicating its benefits, schools can create a culture that values and supports the integration of sustainability into PEH curricula. Lastly, creating a positive social environment where ESD is endorsed by peers and administrators can further strengthen teachers' intentions (Garcia, 2024; Maidou et al., 2019). Accountability and evaluation mechanisms should be established to monitor and assess the effectiveness of ESD integration, with regular evaluations on how well schools implement ESD and its impact on student outcomes. For example, establishing a network or community of practice among PEH teachers where they can share successful strategies for integrating ESD, collaborate on sustainability-focused projects, and receive recognition for their efforts can enhance their motivation and commitment. When school leaders actively support and advocate for ESD in PEH, it reinforces teachers' intentions to incorporate sustainability into their teaching practices, leading to more effective and widespread integration of ESD principles.

Figure 4. ESD initiatives for PEH Curricula in Schools

Limitations and Future Research Directions

The study's findings, while insightful, are limited by several factors. Self-reported measures of behavior may suffer from social desirability bias, potentially inflating estimates of ESD integration. Future research should use observational or third-party assessments for more objective data. Additionally, the cross-sectional design restricts causal inferences about the relationships between attitudes, perceived behavioral control, and behavioral intentions; longitudinal studies are needed to clarify the directionality and temporal sequence of these variables. Lastly, the generalizability of the results may be constrained by the specific educational context of the sample (Kukull & Ganguli, 2012), suggesting a need for replication in diverse settings to assess the broader applicability of the findings.

To enhance understanding of factors influencing ESD integration, future research should explore several key areas. Longitudinal studies could reveal how teachers' knowledge, attitudes, and behaviors evolve with sustained professional development and changing policies (Barber et al., 2024; Nozaleda, 2024). Expanding the structural model to include variables such as institutional support, ESD resources, and community involvement could provide a more comprehensive view of ESD enablers

and barriers. Research should also evaluate the effectiveness of different professional development programs in improving ESD practices. Additionally, linking ESD integration with student outcomes would provide evidence of its benefits and promote its adoption. Finally, investigating the role of technology in supporting ESD, such as through digital tools and interactive platforms, could enhance engagement and accessibility for students.

CONCLUSION

PEH education can contribute significantly to achieving broader global sustainability objectives. However, the extent to which these opportunities are being fully leveraged remains unclear among educators. Building upon the lack of prior research, this study theoretically proposed and empirically validated an extended TPB in educational settings. Based on the PLS-SEM analysis, the study concludes that enhancing perceived behavioral control and ESD knowledge among educators is crucial for promoting ESD integration in educational settings. While attitudes play a role, they are less influential compared to the direct effects of perceived behavioral control and ESD knowledge on behavioral intentions and self-reported behaviors. Therefore, future efforts should focus on empowering educators with the necessary knowledge and skills to confidently implement ESD practices, aligning their beliefs with ESD principles, and fostering an environment that supports sustainable behaviors. These strategies are vital for achieving long-term sustainability goals within the education sector.

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KEY TERMS AND DEFINITIONS

Education for Sustainable Development (ESD): A holistic approach to education that aims to empower learners with the knowledge, skills, values, and attitudes necessary to address global challenges such as environmental degradation, social inequality, and economic instability. ESD encourages critical thinking and problem-solving to foster a sustainable future.

Physical Education and Health: A subject in educational curricula that focuses on the development of physical fitness, motor skills, and health awareness. It promotes the importance of physical activity, healthy living, and wellness, and can incorporate topics such as environmental consciousness and sustainable practices.

PLS-SEM (Partial Least Squares Structural Equation Modeling): A statistical technique used for modeling complex relationships between observed and latent variables. PLS-SEM is often used in social sciences and business research to test theoretical models and hypotheses, especially when the data is not normally distributed, or sample sizes are small.

Sustainability Education: A field of education focused on equipping learners with the knowledge and tools to contribute to a more sustainable world. It emphasizes understanding the interconnections between environmental, social, and economic systems and encourages responsible decision-making for long-term sustainability.

Theory of Planned Behavior (TPB): A psychological theory that explains human behavior by examining three key determinants: attitudes, subjective norms, and perceived behavioral control. TPB is commonly used to predict and understand intentions and behaviors, including the adoption of new practices such as sustainable education.