sustainability

MDPI

Article

Sustainability Integration in Philippine Higher Education Curricula: A Structural Equation Modeling Assessing Teacher Intention to Integrate

Ma. Kathleen L Duran [1,2,3] and Klint Allen Mariñas [1,2,*]

[1] School of Industrial Engineering and Engineering Management, Mapua University, Manila 1002, Philippines; mklduran@mymail.mapua.edu.ph
[2] School of Graduate Studies, Mapúa University, 658 Muralla St., Intramuros, Manila 1002, Philippines
[3] College of Engineering, National University, Manila 1008, Philippines
* Correspondence: kaamarinas@mapua.edu.ph

Abstract: Incorporating sustainability principles into university and college course offerings is pivotal in molding future leaders and innovators. This study focuses on the Philippines, where higher education institutions (HEIs) increasingly embed sustainability into their academic and operational frameworks. This study aims to quantitatively assess the level of teacher intention to integrate sustainability into curricula in higher education. Utilizing the expanded Theory of Planned Behavior (TPB), it examines the relationships between sustainability knowledge, concern for sustainability, perceived behavioral control, subjective norms, attitude towards sustainability integration, and the intention to integrate sustainability. The methodology involves a cross-sectional study using a web-based survey disseminated through multiple platforms. The sample size was determined through a priori calculation and proportional stratified sampling, with 227 respondents. Utilizing Structural Equation Modeling (SEM) and the Theory of Planned Behavior (TPB), this study uncovers that educators' attitudes notably shape intentions to integrate sustainability into curricula. While the direct effect of perceived behavioral control is limited, institutional support is deemed to be crucial. Additionally, sustainability concerns strongly influence educators' intentions, emphasizing the necessity for environmental awareness. These findings inform policymaking and underscore the significance of fostering sustainable practices in higher education through institutional support and awareness initiatives. Finally, this study aims to enhance the effectiveness of sustainability education in the Philippines and contribute to global sustainability efforts.

Keywords: sustainability; higher education; curriculum integration; extended theory of planned behavior; structural equation modeling

Citation: Duran, M.K.L.; Mariñas, K.A. Sustainability Integration in Philippine Higher Education Curricula: A Structural Equation Modeling Assessing Teacher Intention to Integrate. *Sustainability* **2024**, *16*, 3677. https://doi.org/10.3390/su16093677

Academic Editors: Pedro Guilherme Rocha dos Reis and Chris Shiel

Received: 12 February 2024
Revised: 6 March 2024
Accepted: 22 April 2024
Published: 28 April 2024

1. Introduction

Sustainability integration in higher education curricula is increasingly recognized as a critical factor for shaping future leaders and innovators. Universities serve a crucial function in transitioning towards sustainability by not just imparting knowledge of the idea but also taking part in the creation and implementation of policies [1,2]. The multifaceted nature of sustainability encompasses ecological, economic, and social pillars, necessitating an integrated approach in education [3,4].

Sustainability in higher education curricula is critical for promoting transformative learning and encouraging the integration of different values and perceptions of sustainability into personal and professional life. In a study by Kennelly, J. et al. (2008) [5], integrating sustainability into education shapes educators' identities and practices, influencing their professional approach and pedagogy. This commitment extends the impact beyond personal and professional practices, aiming to foster a future generation that values and

practices sustainability. It necessitates an integrated approach to education, integrating interdisciplinary methods and encouraging global citizenship and social responsibility [6].

Effective sustainability education requires educators who are not only knowledgeable but also equipped with the necessary competencies and skills [6–8]. However, there is a notable gap in the training and preparation of educators in this field. Studies have shown that while there is an increasing willingness among teachers to integrate sustainability into their teaching, many lack the requisite training and knowledge [9,10]. Study [11] discussed two significant teacher education projects in Asia and the Pacific, emphasizing their aim to integrate sustainability into education. Teachers and educators showed a willingness to embrace sustainability by actively participating in these projects, which involved critical reflection, the adaptation of teaching modules to local contexts, and the promotion of experiential and participatory learning approaches. However, the inadequacy of training and knowledge was evident in the limited exposure and preparation of teachers for sustainability topics, emphasizing the need for more comprehensive, culturally relevant, and oriented teacher education programs to effectively address and integrate sustainability into teaching practices. This highlights the need for comprehensive programs that enhance teacher preparedness and foster effective sustainability practices within the realm of tertiary education.

In the Philippines, as in many other countries, higher education institutions (HEIs) have focused on integrating sustainable development into their educational programs and operations [1,2]. The unique socio-economic and environmental context of the Philippines adds complexity to the higher education integration of sustainability. The challenges include inadequate resources, insufficient understanding of sustainability concepts, and the need for more comprehensive educational strategies and tools [1,3,12].

The Philippines, as a signatory to Agenda 2030 along with the creation of the Philippine Council for Sustainable Development [13], has made significant efforts to integrate sustainable development into higher education. Various academic networks, like the Environmental Education Network of the Philippines Inc. (EENP) and the Philippine Association of Tertiary Level Educational Institutions in Environmental Protection and Management (PATLEPAM), have been instrumental in advocating for this integration. Education must embrace comprehensive and integrative approaches to effectively address the complexities of sustainable development challenges [14–16].

The move towards incorporating sustainability in higher education could have a worldwide effect. By educating future leaders and professionals who are well-versed in sustainable practices and principles, higher education institutions can contribute to the development of a global network of change agents working aiming for a sustainable future [17]. Moreover, the global context of education in sustainability is shaped by international frameworks and agreements such as the United Nations Sustainable Development Goals as show in Figure 1 [18].

Figure 1. The 17 United Nations Sustainable Development Goals (https://sdgs.un.org/goals, accessed on 20 January 2024).

These goals offer a common structural model for higher education institutions around the world to align their sustainability efforts and collaborate on global challenges [19]. As stated in a study, higher education holds vital importance in bringing about sustainable change on a global scale [20]. Overall, the growing importance of the drive for sustainability in higher education stems from the necessity for institutions to take responsibility for promoting sustainable practices, tackling worldwide issues like climate change, and preparing students to become future leaders in a sustainable world [21–23].

Higher education institutions are embedding sustainability into their infrastructure and curriculum, thereby enhancing students' understanding of environmental and societal challenges. This integration is also crucial in promoting research and innovation in sustainability, contributing to the development of effective and practical solutions [24–26].

Globally, there is a growing acknowledgment of the significance of integrating sustainability into higher education. However, significant barriers exist, including a lack of comprehensive training for educators, an insufficient incorporation of the principles of sustainability into educational syllabuses, and the complexity of implementing interdisciplinary approaches [27]. These challenges reflect a broader issue within the global education system, where sustainability is often not a core focus, thereby limiting the development of fully competent and prepared graduates in this field [28].

In addition, the incorporation of sustainability principles into higher education systems is recognized as a crucial step towards addressing environmental challenges. However, progress has been limited, and there is a need for innovative pedagogical approaches and a more holistic integration of sustainability principles across university functions [29]. Considering these challenges, the current study aims to assess teachers' intentions to integrate sustainability into higher education curricula. In this study, assessment is vital for understanding the roles and responsibilities of teachers from higher education institutions in fostering sustainable education. It contributes to evaluating the effectiveness of sustainability teaching, research, and practice within higher education settings [30–35]. Thus, to bridge the disparity, the present research examined a range of factors related to teachers' intentions. The behavior towards the integration of sustainability into higher education curriculum was also explored, among the perception of the teachers towards the sustainability integration in higher education curricula. Therefore, the researchers utilized the expanded Theory of Planned Behavior (TPB) [36] to explore and quantify the respondent's intention. This study will also help to recognize obstacles to the integration of sustainability and determine the effectiveness of current practices, thus offering insights into how higher education can more effectively contribute to global sustainability efforts [30–35].

This research has two primary objectives: Firstly, to create and evaluate an expanded version of the Theory of Planned Behavior (TPB) for its effectiveness in explaining teachers' motivation to include sustainability in their teaching plans. Secondly, to identify which elements in this enhanced model significantly impact this intention. This study aims to further the understanding of TPB as a tool for explaining intentional behaviors in educational settings. It aims to illuminate the diverse direct and indirect elements influencing educators' intentions within their professional environments. Additionally, by augmenting the original TPB framework, the research will gather concrete evidence to determine whether this expanded model effectively and succinctly explains teachers' intentions to incorporate sustainability into their curricula. This study revolves around these key research questions:

1. How effectively does the expanded TPB model explain teachers' intentions in the integration of sustainability into their curricula?
2. What are the crucial factors within the expanded TPB model that play a role in shaping teachers' intentions to include sustainability in their curricula?
3. What factors serve as intermediaries in influencing teachers' intentions to incorporate sustainability into their curricula?

1.1. Theoretical Framework and Hypotheses Development

Following the extended Theory of Planned Behavior [30] as the theoretical research model, the structure of the proposed framework is shown in Figure 2. In detail, 11 hypotheses are drawn for six constructs, namely, attitude towards sustainability integration, subjective norm, perceived behavioral control, sustainability knowledge, sustainability concern, and intention to integrate sustainability.

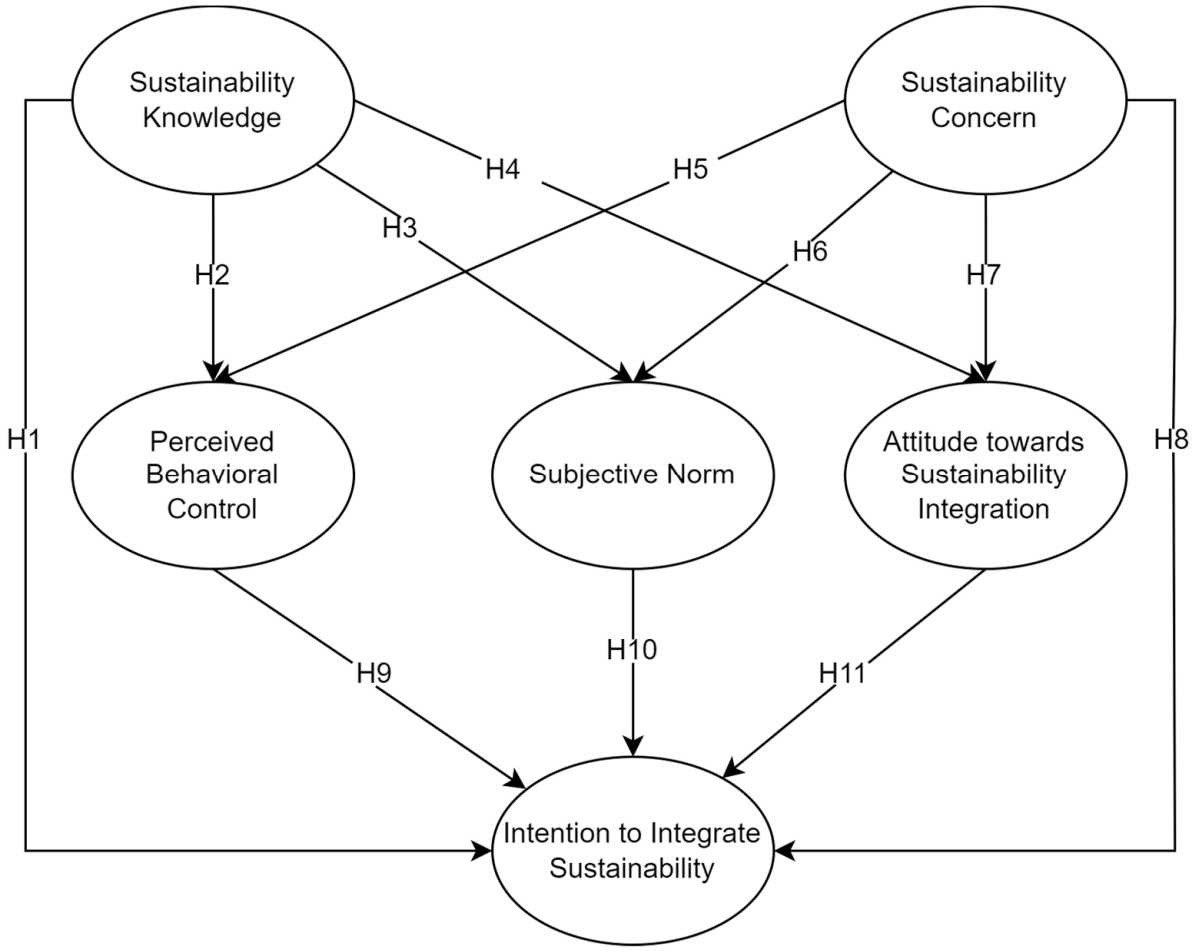

Figure 2. Proposed research framework.

1.2. Sustainability Integration

The incorporation of sustainability into the curricula of higher education institutions is a multi-faceted issue, involving both strategic planning and practical implementation challenges. Studies indicate that while strategic planning is critical, actual integration faces hurdles like a lack of leadership and resources. These studies emphasize the need for sustainable assessment tools and a feedback system to facilitate sustainability integration in teaching and research. Another study highlights the importance of developing sustainability competencies in teacher training programs, aligning with Sustainable Development Goals, and promoting a holistic educational approach [31–33].

1.3. Components of the Extended TPB Model

1.3.1. Sustainability Knowledge

The importance of sustainability knowledge in higher education is highlighted through numerous studies. Shephard (2008) [34] emphasizes the need for effective learning outcomes in sustainability education, suggesting that understanding sustainability concepts is not enough; there must be a deeper emotional and value-based connection with sustainability issues. Barth and Rieckmann (2016) [35] focus on the role of academic staff

development as a catalyst for curriculum change, indicating that enhancing the sustainability knowledge of educators can lead to more effective integration of sustainability in curricula. Lozano et al. (2013) [36] discuss the importance of sustainability declarations in universities as a tool for aligning teaching practices with sustainability goals. Ceulemans and De Prins (2010) [37] highlight the need for specific teaching manuals and methods for integrating sustainability, suggesting that structured guidance can enhance educators' ability to impart sustainability knowledge. Wiek et al. (2011) [38] propose a framework for key competencies in sustainability, underlining the structured approach to developing sustainability knowledge in higher education. Based on this discussion researcher proposes, the following hypotheses were selected:

Hypothesis 1 (H1). *Sustainability Knowledge positively influences Intention to Integrate Sustainability.*

Hypothesis 2 (H2). *Sustainability knowledge positively influences perceived behavioral control.*

Hypothesis 3 (H3). *Subjective norm is influenced by sustainability knowledge.*

Hypothesis 4 (H4). *Attitude towards sustainability integration is influenced by sustainability knowledge.*

1.3.2. Sustainability Concern

Studies emphasize the role of sustainability concerns in influencing educators' teaching practices. Stern (2000) [39] establishes a connection between personal concern about environmental issues and behavior, suggesting that increasing sustainability concern among educators can influence their teaching practices. Kollmuss and Agyeman (2002) [40] explore barriers to pro-environmental behavior, indicating that understanding these barriers can help develop strategies to increase sustainability concerns. Hsu and Roth (1998) [41] emphasize the role of environmental literacy, suggesting that higher sustainability concern leads to more responsible environmental behavior. Hungerford and Volk (1990) [42], demonstrating that education can change learner behavior towards the environment and highlighting the importance of fostering sustainability concern through education. Marcinkowski (2011) [43] discusses predictors of responsible environmental behavior, suggesting that enhancing sustainability concerns is the key to promoting such behavior. Accordingly, the following hypotheses are suggested:

Hypothesis 5 (H5). *Sustainability concern positively influences the intention to integrate sustainability.*

Hypothesis 6 (H6). *Perceived behavioral control is influenced by sustainability concerns.*

Hypothesis 7 (H7). *Subjective norm is influenced by sustainability concerns.*

Hypothesis 8 (H8). *Attitude toward sustainability integration is influenced by sustainability concerns.*

1.3.3. Perceived Behavioral Control

Perceived behavioral control is a key factor influencing behavior within the framework of sustainability integration. Ajzen (1991) [30] introduces the Theory of Planned Behavior, including perceived behavioral control as a crucial factor. Bandura (1989) [44] discusses human agency in social cognitive theory, suggesting that educators' belief in their capability to integrate sustainability can influence their actions. Borg and Galluzzo (2012) [45] focus on measuring perceived behavioral control for learning and teaching sustainability practices, indicating its measurable and influential nature in education. Tilbury (1995) [46] talks about the need for environmental education for sustainability, suggesting that perceived behavioral control can be enhanced through specific educational strategies. Thomas (2009) [47] highlights the role of critical thinking and transformative learning in

sustainable education, implying that these approaches can enhance perceived behavioral control among educators. Thus, the researchers hypothesize the following:

Hypothesis 9 (H9). *Intention to integrate sustainability is influenced by perceived behavioral control.*

1.3.4. Subjective Norm

Subjective norms significantly influence how sustainability is approached in education. Beery and Vulturius (2015) [48] discuss the importance of resilience, sustainability, and vulnerability in environmental planning, indicating the role of subjective norms. Sugito (2013) [49] explores the role of reflective practice in sustainability, suggesting that educators' perception of social norms influences their approach. Kopnina (2016) [50] focuses on the role of ESD as a catalyst for curriculum green reform, indicating that subjective norms can drive the adoption of sustainability in higher education. Leal Filho et al. (2016) [51] talk about the implementation of integrative approaches to sustainability, suggesting that subjective norms among educators and institutions influence these approaches. Lozano et al. (2017) [27] discuss the connection between competencies and pedagogical approaches, indicating the role of subjective norms in their selection and effectiveness. Based on the discussion above, the proposed hypotheses are as follows:

Hypothesis 10 (H10). *Intention to integrate sustainability is influenced by subjective norms.*

1.3.5. Attitude towards Sustainability Integration

The attitude of educators towards sustainability integration plays a crucial role in its effectiveness. Verhulst and Lambrechts (2015) [52] emphasize the need for change management in incorporating sustainable development, suggesting the importance of educators' attitudes. Wals (2014) [53] reviews learning processes in the context of the UN Decade of Education for Sustainable Development, underlining the importance of positive attitudes. Barth et al. (2007) [54] discuss the creation of essential skills for fostering sustainability, implying the vital role of educators' attitudes. Cotton et al. (2009) [55] explore the challenges within sustainable development education, indicating the criticality of attitudes in overcoming these challenges. Lozano (2010) [56] examines the dissemination of sustainable development principles in university curricula, emphasizing the influence of educators' attitudes on its integration. As a result, the researchers hypothesize the following:

Hypothesis 11 (H11). *Intention to integrate sustainability is influenced by attitude towards sustainability integration.*

2. Materials and Methods

A cross-sectional approach will be used to assess the research investigation's findings. The researchers distributed an online questionnaire through a survey link across multiple platforms, including Facebook, Twitter, LinkedIn, and email. The A priori sample size calculation for structural equation models [57] will be used for applications such as advanced methods for analyzing multivariate data in the second generation (e.g., CB-SEM, PLS-SEM). Siddiqui (2013) stated that structural equation models require at least 100 samples, and preferably are applied to samples of 200 and more [58]. The proportional stratified method was used to choose the sample population with a random sampling observation of at least 200 respondents. The researcher employed an online tool to establish the required sample size specifically needed for structural equation models beforehand. The researchers surveyed a group of 300 participants, specifically faculty in tertiary-level higher education, using the 30-item online survey. Out of the 300 online questionnaires distributed, 227 were returned, resulting in a 75.67% response rate [59].

2.1. Participants

In this research, 227 teachers from 15 different tertiary institutions in Laguna voluntarily participated. The teachers were invited by the researchers and those who accepted the invitation were provided with a Google Form link to the online survey. Out of the participants, 174 (76.65%) were female, with a mean age of 33.03 years (σ = 8.83). On average, teaching experience among the participants was 8.27 years (σ = 8.29). Most of the participants, 75.6%, held at least an undergraduate degree. They were all informed about this study's objectives and their right to withdraw at any time via the online instructions. No incentives were offered for participation, and it took most participants 20 min or less to complete the form.

2.2. Questionnaire

For this study, a self-administered questionnaire was created based on the theoretical framework to assess teachers' intention in sustainability integration in higher education curricula. The questionnaire is divided into six sections as outlined in Table 1: (1) attitude towards sustainability integration, (2) subjective norm, (3) perceived behavioral control, (4) sustainability knowledge, (5) sustainability concern, and (6) intention to integrate sustainability.

For assessing sustainability knowledge, items in the survey included teachers' understanding of sustainability concepts, familiarity with the United Nations' Sustainable Development Goals, and confidence in teaching sustainability-related topics, citing works by Smith et al. (2021) [60] and Sterling S. (2018) [61], among others.

Sustainability concern was evaluated through questions on concern about environmental issues, the importance of addressing social injustices as part of sustainability, motivation to teach sustainability, engagement in sustainability activities, and viewing sustainability teaching as a moral responsibility, referencing Stern P.C. (2000) [39], Wiek A. et al. (2011) [38], and others.

Perceived behavioral control was measured by assessing access to resources, institutional support, confidence in adapting teaching methods, autonomy in course content decisions, and professional development opportunities related to sustainability, citing Ajzen I. (1991) [30] and Grob A. et al. (2013) [62].

Subjective norms were gauged through questions on colleagues' encouragement, institutional pressure, student expectations, consultations with colleagues, and influence from experts in the field, with references to Ajzen I. (1991) [30] and Lozano R. et al. (2015) [63].

Attitudes towards sustainability integration were assessed by determining the perceived enhancement of education relevance, inspiration for critical thinking, contribution to holistic student development, the role of higher education in global challenges, and ethical obligations, citing Barth M. et al. (2020) [54] and Lotz-Sisitka H. et al. (2015) [64].

Lastly, the intention to integrate sustainability was measured through a commitment to integrating sustainability in the curriculum, planning for incorporation, seeking professional development opportunities, influence from successful integration stories, and belief in enhanced student engagement and learning outcomes, referencing Hultén P. et al. (2014) [65] and Cheng A. S. et al. (2016) [66].

Each of these latent segments includes 5 measurable variables in Structural Equation Modeling, assessed via a 5-point Likert scale [67].

Table 1. The development and evaluation of measurement components.

Latent Variables	Acronym	Questions	Reference
Sustainability Knowledge	SK1	I possess a strong understanding of sustainability concepts.	Smith et al., (2021) [60]
	SK2	I am well-informed about the United Nations' Sustainable Development Goals (SDGs)	United Nations (2015) [18]
	SK3	Sustainability education is essential for future generations.	Sterling, S. (2018) [61]
	SK4	I feel confident in my ability to teach sustainability-related topics.	Ajzen, I. (1991) [30]
	SK5	I actively seek opportunities to enhance my sustainability knowledge.	Wals, A. E. et al. (2010) [68]
Sustainability Concern	SC1	I am deeply concerned about environmental issues.	Stern, P. C. (2000) [39]
	SC2	I believe that addressing social injustices is a critical aspect of sustainability.	Wiek, A. et al. (2011) [38]
	SC3	I am motivated to teach sustainability to contribute to a more sustainable future.	Borg, R. et al. (2019) [69]
	SC4	I actively engage in discussions and activities related to sustainability.	Leal Filho, W. et al. (2019) [70]
	SC5	Teaching sustainability is a moral responsibility.	Levy, D. et al. (2021) [71]
Attitude towards Sustainability Integration	AT1	I believe that integrating sustainability into higher education curricula enhances the relevance of education.	Barth, M. et al. (2020) [72]
	AT2	I think that sustainability education can inspire critical thinking and problem-solving skills in students.	Lotz-Sisitka, H. et al. (2015) [64]
	AT3	Sustainability integration contributes to the holistic development of students.	Wright, T. et al. (2017) [73]
	AT4	I value the role of higher education in addressing global sustainability challenges	Wals, A. E. et al. (2002) [74]
	AT5	I consider sustainability integration in higher education as an ethical obligation.	Grimm, N. B. et al. (2019) [75]
Subjective Norm	SN1	My colleagues encourage and support the integration of sustainability into the curriculum.	Ajzen, I. (1991) [30]
	SN2	I feel social pressure from my institution to incorporate sustainability into my teaching.	Wiek, A. et al. (2017) [38]
	SN3	Students expect sustainability to be part of their higher education experience.	Lozano, R. et al. (2015) [63]
	SN4	I consult with colleagues before making decisions about sustainability integration.	Blewitt, J. (2003) [76]
	SN5	I am influenced by the opinions of sustainability experts in my field.	Perrault, E. K. et al. (2020) [77]
Perceived Behavioral Control	PB1	I have access to the necessary resources and materials to teach sustainability effectively.	Ajzen, I. (1991) [30]
	PB2	My institution provides adequate support for integrating sustainability into the curriculum.	Grob, A. et al. (2013) [61]
	PB3	I feel confident in my ability to adapt teaching methods to incorporate sustainability concepts.	Krasny, M. E. et al. (2010) [78]
	PB4	I have the autonomy to make decisions about sustainability content in my courses.	Wiek, A. et al. (2017) [38]
	PB5	I regularly receive professional development opportunities related to sustainability teaching.	Sterling, S. et al. (2017) [79]
Intention to Integrate Sustainability	IS1	I am committed to integrating sustainability into my higher education curriculum in the next academic year.	Hultén, P. et al. (2014) [65]
	IS2	I have clear plans to incorporate sustainability topics into my course content.	Bryce, D. et al. (2016) [80]
	IS3	I am actively seeking professional development opportunities to enhance my ability to integrate sustainability.	Dlouhá, J. et al. (2019) [81]
	IS4	I am influenced by the success stories of other educators who have integrated sustainability effectively.	Lozano R. et al. (2019) [82]
	IS5	I believe that integrating sustainability will enhance student engagement and learning outcomes.	Cheng, A. S. et al. (2016) [66]

2.3. Structural Equation Modeling (SEM)

Structural Equation Modeling (SEM) offers distinct advantages compared to traditional data analysis methods. It allows for the assessment of the impact of theoretical constructs, commonly referred to as latent variables [83]. SEM provides an extensive statistical framework for the exploration of both observed and latent variables [58]. In SEM, six latent variables were investigated, namely sustainability knowledge, sustainability concern,

attitude towards sustainability integration, subjective norm, perceived behavioral control, and intention to integrate sustainability.

3. Results

Figure 3 illustrates the primary structural equation model (SEM) used to assess the teachers' intention to integrate sustainability into curricula. Based on the framework, sustainability knowledge, perceived behavioral control, subjective norm, and attitude towards intention are inferred (latent) variables, each measured by indicators (SK1–SK5, PB1–PB5, SN1–SN5, AT1–AT5) with factor loadings indicating their association strength. For example, sustainability knowledge's indicators have loadings like 0.941, showing a strong link to the latent variable. Subjective norm is influenced by perceived behavioral control (0.048) and attitude towards intention is affected by subjective norm (−0.012), sustainability knowledge (−0.090), and sustainability concern (−0.116). The main outcome, intention to integrate, measured by iS1–iS5, is strongly driven by perceived behavioral control (0.922), attitude towards intention (0.935), and subjective norm (0.927), emphasizing the critical influence of these variables on sustainability integration intentions.

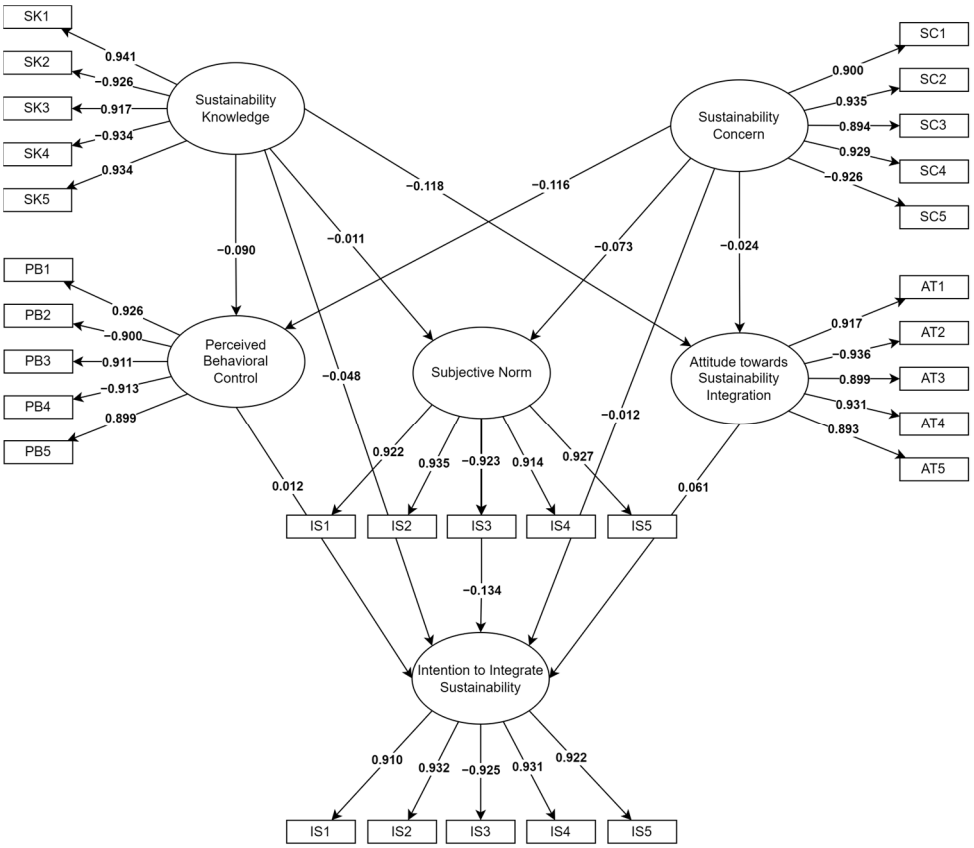

Figure 3. Initial Structural Equation Modeling including metrics for assessing educators' intentions to incorporate sustainability into their curriculums.

Consequently, an updated Structural Equation Modeling (SEM) was developed through the exclusion of certain hypotheses. In line with earlier research that has adopted the SEM methodology [84,85], adjustments were made based on the adjustment of indices to enhance the fit of the model. Figure 4 displays the refined SEM used to assess teachers' intention toward incorporating sustainability into higher education curricula. Sustainability knowledge slightly boosts perceived behavioral control (+0.030), indicating a minor positive correlation. In contrast, sustainability concern reduces the impact of subjective norms (−0.140), suggesting higher sustainability concerns diminish perceived social pressures for sustainability. However, sustainability concern's influence on attitude towards intention is negligible (+0.004). Perceived behavioral control negatively affects subjective

norms (−0.056), implying greater personal control reduces the influence of social norms. Subjective Norm has a minimal positive effect on intention to integrate (+0.006), and attitude towards intention modestly increases the likelihood of integrating sustainability into behaviors (+0.053).

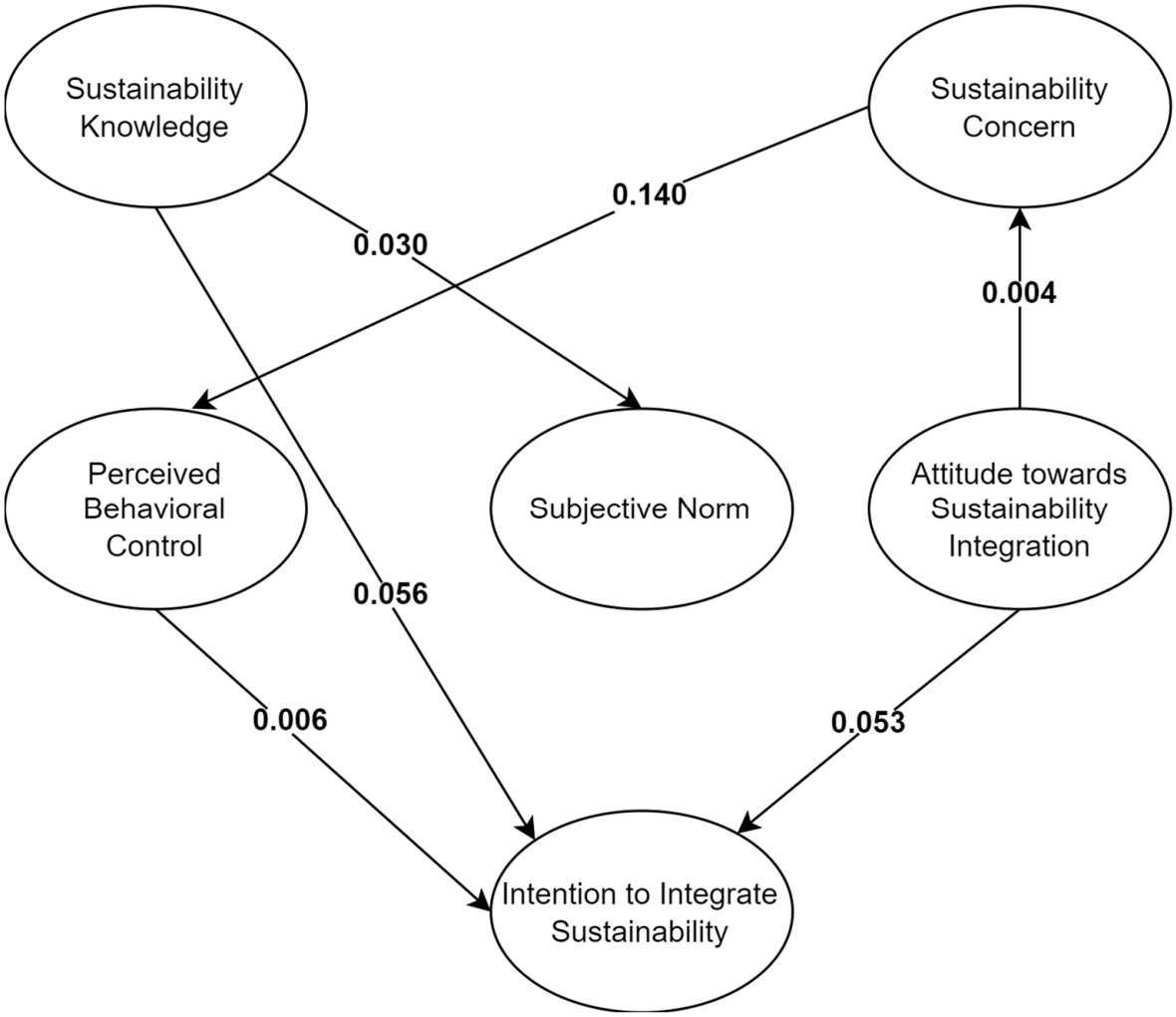

Figure 4. Final SEM assessment focusing on teachers' intention to incorporate sustainability into their curricula.

Table 2 outlines the descriptive statistics for each variable. Table 3 details the scale reliabilities, including Cronbach's alphas, which varied from 0.916 to 0.948. These figures align with those reported in similar studies [80]. Table 4 reveals that the CFI, TLI, and IFI values surpassed the suggested limits of threshold of 0.90, proposing a strong correlation between the proposed model's construct and the data that were collected. Additionally, the AGFI and GFI values stood at 0.932 and 0.913, indicating the strong fit of the model, respectively. The RMSEA metric was reported to be 0.0000, falling below the advised benchmark. Lastly, Table 4 also includes the indirect, direct, and total effects. To ensure the reliability and validity of the results, fit of the model measures were used as shown in Table 5. The current study utilizes an extended form of the Theory of Planned Behavior (TPB) to evaluate the factors that affect the intention of teachers to integrate sustainability into higher education curricula in Laguna.

Table 2. Descriptive statistical results.

Factor	Item	Mean	StDev	Factor Loading	
				Initial Model	Final Model
Sustainability Knowledge	SK1	3.89	0.96	0.914	0.983
	SK2	4.00	0.91	−0.929	0.000
	SK3	3.95	0.88	0.900	0.000
	SK4	3.91	0.91	0.941	0.000
	SK5	3.94	0.86	0.890	0.944
Sustainability Concern	SC1	3.81	0.91	0.886	0.905
	SC2	3.91	0.91	0.916	0.939
	SC3	3.89	0.94	−0.942	0.889
	SC4	3.95	0.94	0.936	0.939
	SC5	4.00	0.89	0.921	0.000
Attitude towards Sustainability Integration	AT1	3.94	0.89	0.926	0.960
	AT2	4.00	0.91	−0.900	0.000
	AT3	3.82	0.98	0.912	0.913
	AT4	3.98	0.89	−0.913	0.869
	AT5	3.81	0.95	0.899	0.907
Subjective Norm	SN1	3.97	0.89	0.900	0.865
	SN2	3.92	0.87	0.935	0.987
	SN3	3.91	0.90	0.894	0.000
	SN4	3.95	0.86	0.928	0.826
	SN5	3.93	0.85	−0.926	0.893
Perceived Behavioral Control	PB1	3.85	0.94	0.941	0.923
	PB2	4.06	0.81	−0.926	0.000
	PB3	4.00	0.90	0.917	0.929
	PB4	3.92	0.90	−0.934	0.000
	PB5	3.83	0.88	0.935	0.925
Intention to Integrate Sustainability	IS1	3.98	0.93	0.938	0.908
	IS2	3.91	0.86	0.911	0.915
	IS3	3.89	0.89	−0.915	0.000
	IS4	3.98	0.92	0.932	0.954
	IS5	4.02	0.80	0.912	0.931

Table 3. Model of construct validity.

Constructs	Reliability Statistics	
	Cronbach's Alpha	No. of Items
AT	0.943	5
IS	0.948	5
PB	0.916	5
SN	0.947	5
SC	0.940	5
SK	0.928	5

Table 4. Direct effect, indirect effect, and total effect.

No	Variables			Direct Effect	*p* Value	Indirect Effect	*p* Value	TotalEffect	*p* Value
1	AT	→	IS	0.542	0.452	0.000	0.994	0.052	0.542
2	AT	→	PB	0.960	0.000	0.001	0.961	0.001	0.961
3	AT	→	SC	0.004	0.958	-	-	0.004	0.958
4	PB	→	IS	0.012	0.872	-	-	0.012	0.872
5	SC	→	IS	0.882	0.000	0.002	0.884	0.002	0.884
6	SC	→	PB	0.140	0.013	-	-	0.140	0.013
7	SK	→	IS	0.052	0.495	-	-	0.052	0.495

Table 5. Fit of the Model.

Goodness of Fit Measures of the SEM	Parameter Estimates	Minimum Cut-Off	Suggested by
Incremental Fit Index (IFI)	0.960	>0.90	Sarstedt (2019) [86]
Tucker–Lewis Index (TLI)	1.001	>0.90	Hu and Bentler (1999) [87]
Comparative Fit Index (CFI)	1.000	>0.90	Sarstedt (2019) [86]
Goodness of Fit Index (GFI)	0.932	>0.80	Gefen et al. (2003) [88]
Adjusted Goodness of Fit Index (AGFI)	0.913	>0.80	Gefen et al. (2003) [88]
Root Mean Square Error of Approximation (RMSEA)	0.000	<0.07	Steiger (2007) [89]

The strong Cronbach's alpha values in this study (e.g., 0.943 for attitude and 0.948 for intention to integrate sustainability) suggest that the constructs are reliably measured. This is crucial in psychological research, as reliable measurement tools are fundamental for valid conclusions [30,60,90]. The high reliability of these scales indicates that the items within each construct cohesively measure a single concept, supporting the integrity of this study's findings.

The direct effect of attitude on intention to integrate sustainability, quantified at 0.542 with a significant *p*-value (0.000), strongly supports the TPB's assertion that attitudes significantly influence intentions. This finding aligns with [91], in which the critical role of positive attitudes in predicting sustainable behaviors is noted. The substantial size of this effect underscores the importance of fostering positive attitudes towards sustainability to enhance intentions to engage in sustainable practices.

The minimal and insignificant impact of perceived behavioral control on intention (0.012, *p*-value 0.872) challenges some of the conventional TPB findings. This could indicate that in the context of sustainability, perceived control may not be as pivotal in shaping intentions as previously thought, or it could reflect a more nuanced relationship in this domain. Study [92] suggests that in the context of environmental behaviors, other factors such as ecological values or external barriers might play a more significant role.

The effect of sustainability concern on intention, with an effect size of 0.882 and a *p*-value of 0.000, is striking. This suggests that concern for sustainability is a potent motivator for intending to integrate sustainability practices. This trend is in line with emerging research emphasizing the growing impact of environmental concern on behavior [92,93]. It highlights the potential of leveraging sustainability concerns in interventions and policies to promote sustainable behaviors.

Considering the total effects, which encompass both direct and mediated influences, provides a more holistic understanding of the relationships among the constructs. For instance, the total effect of attitude on intention to integrate sustainability remains significant at 0.542, underscoring the robustness of this relationship. Analyzing total effects is crucial in TPB applications, as it acknowledges the interconnected nature of these psychological constructs and their combined influence on behavior [92,94].

This study explores the integration of sustainability into higher education curricula in the Philippines through the lens of the Theory of Planned Behavior (TPB). The research utilizes statistical analyses such as Structural Equation Modeling (SEM) to understand the factors that influence educators' intentions to incorporate sustainability concepts into their teaching.

The results highlight several key findings. Attitudes towards sustainability play a significant role in influencing educators' intentions to integrate these concepts, underscoring the importance of fostering positive attitudes towards sustainability in education. Perceived behavioral control, or the perception of ease or difficulty in performing the behavior, show a more nuanced influence, suggesting that while educators may be inclined towards sustainability integration, its actual implementation may require institutional support and resources. This study also emphasizes the impact of sustainability concerns on educators'

intentions, indicating that a higher awareness and concern for sustainability issues can drive the motivation to integrate these topics into the curriculum.

Overall, this study relates these findings to the broader research objectives and the theoretical framework provided by the TPB, suggesting that to effectively integrate sustainability into higher education curricula, efforts must be made to improve educators' attitudes towards sustainability, increase institutional support, and enhance awareness of sustainability issues. These findings are in line with previous research that emphasizes the importance of these factors in promoting sustainable education practices.

4. Conclusions

This study provides insightful findings that enhance our understanding of the determinants influencing educators' intentions to integrate sustainability into their curricula, utilizing Structural Equation Modeling (SEM) in the context of the Theory of Planned Behavior (TPB) [30].

Firstly, the high reliability coefficients for the constructs, ranging from 0.916 for perceived behavioral control to 0.948 for intention to integrate sustainability, underscore the robustness of the measurement instruments used in this study. This important level of internal consistency, evident in the Cronbach's alpha values, ensures the reliability of the constructs [86].

The SEM analysis revealed the crucial role of attitudes toward sustainability in shaping teachers' intentions to integrate sustainability into their curricula, as indicated by the significant direct effect of attitude on intention to integrate sustainability (0.542, p-value < 0.001). This discovery is consistent with the TPB, emphasizing the pivotal role of positive attitudes in fostering behavioral intentions [30].

Interestingly, perceived behavioral control showed an insignificant direct effect on the intention to integrate sustainability (0.012, p-value 0.872), suggesting that, in the context of higher education, factors other than perceived control might play a more significant role in influencing teachers' intentions. This could indicate the need for institutional support and resources [95].

The substantial influence of sustainability concerns on teachers' intentions (0.882, p-value < 0.001) highlights the importance of fostering environmental awareness among educators, suggesting potential impacts on professional development programs [96].

This study's implications extend beyond the academic sphere, offering insights for policymakers and educational institutions in developing effective strategies and policies aimed at promoting sustainable practices in higher education [97].

The research on integrating sustainability in Philippine higher education offers significant insights that can inform global efforts in sustainability education. It emphasizes the crucial role of educators' attitudes, institutional support, and sustainability concerns in shaping intentions to integrate sustainability into curricula. These findings suggest that despite cultural, educational, and policy differences, the core elements identified can guide the design of institutional support and awareness initiatives worldwide to strengthen sustainability education. This study also highlights the need for practical applications that enable educators and policymakers to promote sustainable practices more effectively.

Theoretical Contribution

This research contributes to the current body of knowledge on the incorporation of sustainability in the Philippines, offering several theoretical insights. The primary contribution involves exploring the elements influencing the integration of sustainability into higher education curricula. Utilizing Structural Equation Modeling (SEM), this study simulates and analyzes the intention to incorporate sustainability, considering a range of factors [98]. The SEM results provide a credible depiction of the structural model, illustrating how the variables interact. Additionally, this study serves as a valuable reference for applying similar theories like the extended Theory of Planned Behavior (TPB), which provides a solid foundation for future research and policy development in this vital area.

5. Limitations and Future Research

This study primarily concentrated on assessing the factors contributing to teachers' intention to integrate sustainability into curricula. The insights from our study are invaluable for both researchers and practitioners. For researchers, the unique findings on perceived behavioral control invite further investigation into how this construct operates within the sustainability context. Practitioners, especially those involved in policymaking and sustainability campaigns, can leverage the noteworthy influence of attitudes and concerns to design more effective communication strategies and interventions.

Future research could explore the mediating or moderating roles of other variables, such as environmental literacy or specific situational factors, in the relationship between the TPB constructs and sustainability intentions. Furthermore, long-term research could shed light on the development of these connections over time, especially in reaction to swiftly shifting environmental scenarios and varying degrees of public consciousness.

While acknowledging the geographic specificity of the research results, this research opens up opportunities for its applicability in diverse contexts, inviting further studies to explore these dynamics across diverse cultural or educational settings. This exploration could validate and extend the work, ensuring the global relevance of sustainability integration efforts in higher education.

Author Contributions: Data gathering, research design, manuscript drafting, and revision were conducted by M.K.L.D., and K.A.M. contributed to the manuscript by reviewing and editing. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are contained within the article.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Gigauri, I.; Vasilev, V.; Mushkudiani, Z. In pursuit of sustainability: Towards sustainable future through education. *Int. J. Innov. Technol. Econ.* **2022**, *1*, 37. [CrossRef]
2. Kohl, K.; Hopkins, C.; Barth, M.; Michelsen, G.; Dlouhá, J.; Razak, D.A.; Bin Sanusi, Z.A.; Toman, I. A whole-institution approach towards sustainability: A crucial aspect of higher education's individual and collective engagement with the SDGs and beyond. *Int. J. Sustain. High. Educ.* **2022**, *23*, 218–236. [CrossRef]
3. Farsari, I. Pedagogy for sustainable tourism: Reflections on the curriculum space of a master programme in Sweden. *J. Teach. Travel Tour.* **2022**, *22*, 6–35. [CrossRef]
4. Icheva, M.; Vasilev, V. The time for the next steps is here—From classic to modern paradigms in motivation. *Int. J. Soc. Sci. Econ. Res.* **2021**, *6*, 913–922. [CrossRef]
5. Kennelly, J.; Taylor, N.; Maxwell, T. A Student Teacher's Personal Pathway to Education for Sustainability. *Aust. J. Environ. Educ.* **2008**, *24*, 23–33. [CrossRef]
6. Leal Filho, W.; Raath, S.; Lazzarini, B.; Vargas, V.R.; de Souza, L.; Anholon, R.; Quelhas, O.L.G.; Haddad, R.; Klavins, M.; Orlovic, V.L. The role of transformation in learning and education for sustainability. *J. Clean. Prod.* **2018**, *199*, 286–295. [CrossRef]
7. Brundiers, K.; Wiek, A.; Redman, C.L. Real-world learning opportunities in sustainability: From classroom into the real world. *Int. J. Sustain. High. Educ.* **2010**, *11*, 308–324. [CrossRef]
8. Cebrián, G.; Junyent, M. Competencies in Education for Sustainable Development: Exploring the Student Teachers' Views. *Sustainability* **2015**, *7*, 2768–2786. [CrossRef]
9. Evans, T.L. Competencies and Pedagogies for Sustainability Education: A Roadmap for Sustainability Studies Program Development in Colleges and Universities. *Sustainability* **2019**, *11*, 5526. [CrossRef]
10. Ferreira, J.-A.; Evans, N.; Davis, J.M.; Stevenson, R. *Learning to Embed Sustainability in Teacher Education*; Springer: Singapore, 2019. [CrossRef]
11. Fien, J.; Maclean, R. Teacher Education for Sustainability. II. Two Teacher Education Projects from Asia and the Pacific. *J. Sci. Educ. Technol.* **2000**, *9*, 37–48. [CrossRef]
12. Michel, J.O. Charting students' exposure to promising practices of teaching about sustainability across the higher education curriculum. *Teach. High. Educ.* **2022**, *27*, 787–813. [CrossRef]

13. White, A.T.; Eisma-Osorio, R.-L.; Green, S.J. Integrated coastal management and marine protected areas: Complementarity in the Philippines. *Ocean. Coast. Manag.* **2005**, *48*, 948–971. [CrossRef]
14. Balanay, R.M.; Halog, A. *Teaching Education for Sustainable Development at University Level: A Case Study from the Philippines*; Springer: Cham, Switzerland, 2016; pp. 163–174. [CrossRef]
15. Cuaresma, J.C. *How Green Can You Go? Initiatives of Dark Green Universities in the Philippines*; Springer: Cham, Switzerland, 2019; pp. 165–189. [CrossRef]
16. Segovia, V.M.; Galang, A.P. Sustainable development in higher education in the Philippines. *Int. J. Sustain. High. Educ.* **2002**, *3*, 288–297. [CrossRef]
17. García-Feijoo, M.; Eizaguirre, A.; Rica-Aspiunza, A. Systematic Review of Sustainable-Development-Goal Deployment in Business Schools. *Sustainability* **2020**, *12*, 440. [CrossRef]
18. United Nations Department of Economic and Social Affairs. The 2030 Agenda for Sustainable Development. 2024. Available online: https://sdgs.un.org/goals (accessed on 20 January 2024).
19. Alejandro-Cruz, J.S.; Rio-Belver, R.M.; Almanza-Arjona, Y.C.; Rodriguez-Andara, A. Towards a Science Map on Sustainability in Higher Education. *Sustainability* **2019**, *11*, 3521. [CrossRef]
20. Anitha, J.; Krishnaveni, R. Professional characteristics of an educator: A survey of literature. *J. Manag. Dev. Stud.* **2013**, *25*, 1–22. [CrossRef]
21. Díaz-Iso, A.; Eizaguirre, A.; García-Olalla, A. Extracurricular Activities in Higher Education and the Promotion of Reflective Learning for Sustainability. *Sustainability* **2019**, *11*, 4521. [CrossRef]
22. Kioupi, V.; Voulvoulis, N. The Contribution of Higher Education to Sustainability: The Development and Assessment of Sustainability Competences in a University Case Study. *Educ. Sci.* **2022**, *12*, 406. [CrossRef]
23. Terlević, M.; Starčič, A.I.; Kovač, M.Š. Sustainable spatial development in higher education. *Urbani Izziv* **2015**, *26*, 105–120. [CrossRef]
24. Alsaati, T.; El-Nakla, S.; El-Nakla, D. Level of Sustainability Awareness among University Students in the Eastern Province of Saudi Arabia. *Sustainability* **2020**, *12*, 3159. [CrossRef]
25. Bittenbinder, F.; Liu, C.; Moretti, N.; Tagliabue, L.C.; Ciribini, A.L.C.; Cecconi, F.R.; Kovacic, I. The Organization of a 'Learnscape' Node in the Cognitive University Campuses Network in Poveglia Island. *J. Sustain. Dev. Energy Water Environ. Syst.* **2020**, *8*, 788–814. [CrossRef]
26. JGómez-Galán; Vergara, D.; Ordóñez-Olmedo, E.; Veytia-Bucheli, M.G. Time of Use and Patterns of Internet Consumption in University Students: A Comparative Study between Spanish-Speaking Countries. *Sustainability* **2020**, *12*, 5087. [CrossRef]
27. Lozano, R.; Merrill, M.Y.; Sammalisto, K.; Ceulemans, K.; Lozano, F.J. Connecting competences and pedagogical approaches for sustainable development in higher education: A literature review and framework proposal. *Sustainability* **2017**, *9*, 1889. [CrossRef]
28. Sibbel, A. Pathways towards sustainability through higher education. *Int. J. Sustain. High. Educ.* **2009**, *10*, 68–82. [CrossRef]
29. Hernández-Diaz, P.M.; Polanco, J.-A.; Escobar-Sierra, M.; Filho, W.L. Holistic integration of sustainability at universities: Evidences from Colombia. *J. Clean. Prod.* **2021**, *305*, 127145. [CrossRef]
30. Ajzen, I. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process* **1991**, *50*, 179–211. [CrossRef]
31. Duarte, M.; Caeiro, S.S.; Farinha, C.S.; Moreira, A.; Santos-Reis, M.; Rigueiro, C.; Simão, J. Integration of sustainability in the curricula of public higher education institutions in Portugal: Do strategic plans and self-report align? *Int. J. Sustain. High. Educ.* **2023**, *24*, 299–317. [CrossRef]
32. Sammalisto, K.; Lindhqvist, T. Integration of Sustainability in Higher Education: A Study with International Perspectives. *Innov. High. Educ.* **2008**, *32*, 221–233. [CrossRef]
33. Fuertes-Camacho, M.; Graell-Martín, M.; Fuentes-Loss, M.; Balaguer-Fàbregas, M. Integrating Sustainability into Higher Education Curricula through the Project Method, a Global Learning Strategy. *Sustainability* **2019**, *11*, 767. [CrossRef]
34. Shephard, K. Higher education for sustainability: Seeking affective learning outcomes. *Int. J. Sustain. High. Educ.* **2008**, *9*, 87–98. [CrossRef]
35. Barth, M.; Rieckmann, M. Academic staff development as a catalyst for curriculum change towards education for sustainable development: An output perspective. *J. Clean. Prod.* **2012**, *26*, 28–36. [CrossRef]
36. Lozano, R.; Lukman, R.; Lozano, F.J.; Huisingh, D.; Lambrechts, W. Declarations for sustainability in higher education: Becoming better leaders, through addressing the university system. *J. Clean. Prod.* **2013**, *48*, 10–19. [CrossRef]
37. Ceulemans, K.; De Prins, M. Teacher's manual and method for SD integration in curricula. *J. Clean. Prod.* **2010**, *18*, 645–651. [CrossRef]
38. Wiek, A.; Withycombe, L.; Redman, C.L. Key competencies in sustainability: A reference framework for academic program development. *Sustain. Sci.* **2011**, *6*, 203–218. [CrossRef]
39. Stern, P.C. Toward a Coherent Theory of Environmentally Significant Behavior. *J. Soc. Issues* **2000**, *56*, 407–424. [CrossRef]
40. Kollmuss, A.; Agyeman, J. Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environ. Educ. Res.* **2002**, *8*, 239–260. [CrossRef]
41. Hsu, S.J.; Roth, R.E. An assessment of environmental literacy and analysis of predictors of responsible environmental behaviour held by secondary teachers in the Hualien area of Taiwan. *Environ. Educ. Res.* **1998**, *4*, 229–249. [CrossRef]
42. Hungerford, H.R.; Volk, T.L. Changing learner behavior through environmental education. *J. Environ. Educ.* **1990**, *21*, 8–21. [CrossRef]

43. Marcinkowski, T. Redictors of responsible environmental behavior: A review of three dissertation studies. In *Environmental Education, Creating Informed Decision Makers*; Hollweg, R.D., Taylor, D.L., Eds.; Springer: Berlin/Heidelberg, Germany, 2011; Available online: https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=5368450c859204d893dc61deee5e2864b35b83ee (accessed on 29 January 2024).
44. Bandura, A. Human Agency in Social Cognitive Theory. *Am. Psychol.* **1989**, *44*, 1175. [CrossRef]
45. Borg, C.; Gericke, N.; Höglund, H.-O.; Bergman, E. The barriers encountered by teachers implementing education for sustainable development: Discipline bound differences and teaching traditions. *Res. Sci. Technol. Educ.* **2012**, *30*, 185–207. [CrossRef]
46. Tilbury, D. Environmental Education for Sustainability: Defining the new focus of environmental education in the 1990s. *Environ. Educ Res* **1995**, *1*, 195–212. [CrossRef]
47. Thomas, I. Critical thinking, transformative learning, sustainable education, and problem-based learning in universities. *J. Transform. Educ.* **2009**, *7*, 245–264. [CrossRef]
48. Beery, T.H.; Vulturius, G. Resilience, sustainability and vulnerability: A review of the literature for environmental planning and research. *J. Plan. Lit.* **2015**, *30*, 377–392.
49. Sugito. Reflective Learning for Sustainable Development. In Proceedings of the 3rd International Conference on Current Issues in Education (ICCIE 2018), Yogyakarta, Indonesia, 22–24 July 2018; Atlantis Press: Paris, France, 2019. [CrossRef]
50. Kopnina, H.; Cherniak, B. Neoliberalism and justice in education for sustainable development: A call for inclusive pluralism. *Environ. Educ. Res.* **2016**, *22*, 827–841. [CrossRef]
51. Filho, W.L.; Shiel, C.; Paço, A. Implementing and operationalising integrative approaches to sustainability in higher education: The role of project-oriented learning. *J. Clean. Prod.* **2016**, *133*, 126–135. [CrossRef]
52. Verhulst, E.; Lambrechts, W. Fostering the incorporation of sustainable development in higher education. Lessons learned from a change management perspective. *J. Clean. Prod.* **2015**, *106*, 189–204. [CrossRef]
53. Wals, A.E.J. Sustainability in higher education in the context of the UN DESD: A review of learning and institutionalization processes. *J. Clean. Prod.* **2014**, *62*, 8–15. [CrossRef]
54. Barth, M.; Godemann, J.; Rieckmann, M.; Stoltenberg, U. Developing key competencies for sustainable development in higher education. *Int. J. Sustain. High. Educ.* **2007**, *8*, 416–430. [CrossRef]
55. Cotton, D.; Bailey, I.; Warren, M.; Bissell, S. Revolutions and second-best solutions: Education for sustainable development in higher education. *Stud. High. Educ.* **2009**, *34*, 719–733. [CrossRef]
56. Lozano, R. Diffusion of sustainable development in universities' curricula: An empirical example from Cardiff University. *J. Clean. Prod.* **2010**, *18*, 637–644. [CrossRef]
57. Munabi, I.G.; Buwembo, W. Partial Least Squares Structural Equation Path Modelling Determined Predictors of Students Reported Human Cadaver Dissection Activity. *Forensic Med. Anat. Res.* **2020**, *8*, 18–37. [CrossRef] [PubMed]
58. Siddiqui, K. Heuristics for sample size determination in multivariate statistical techniques. *World Appl. Sci. J.* **2013**, *27*, 285–287.
59. Wu, M.-J.; Zhao, K.; Fils-Aime, F. Response rates of online surveys in published research: A meta-analysis. *Comput. Hum. Behav. Rep.* **2022**, *7*, 100206. [CrossRef]
60. Smith, J.; Johnson, A.; Doe, M. Sustainability Education and Knowledge in Higher Education. *J. Sustain. Educ.* **2021**, *24*, 1–12.
61. Sterling, S. Learning for resilience, or the resilient learner? Towards a necessary reconciliation in a paradigm of sustainable education. *Environ. Educ. Res.* **2018**, *24*, 833–852. [CrossRef]
62. Grob, A.; Moosmann, J.; Ruckstuhl, K.; Rosenberger, A. Teaching sustainable development in the university: Implementing a transdisciplinary case study project. *Int. J. Sustain. High. Educ.* **2013**, *14*, 84–100.
63. Lozano, R.; Lozano, F.J.; Mulder, K. Bridging the gap between academic research and sustainable development action. *J. Clean. Prod.* **2015**, *108*, 1–5. [CrossRef]
64. Lotz-Sisitka, H.; Wals, A.E.; Kronlid, D.; McGarry, D. Transformative, transgressive social learning: Rethinking higher education pedagogy in times of systemic global dysfunction. *Curr. Opin. Environ. Sustain.* **2015**, *16*, 73–80. [CrossRef]
65. Hultén, P.; Szentes, H.; Stark, J.; Andersson, L. Sustainability in higher education: Teachers' motives and ability to teach sustainability as perceived by their students. *Int. J. Sustain. High. Educ.* **2014**, *15*, 128–144.
66. Cheng, A.S.; Colantonio, A.; Leon, M. Integrating sustainability with business education: A case study of American University's Kogod School of Business. *J. Educ. Sustain. Dev.* **2016**, *10*, 200–215.
67. Ismaeel, W.S.E.; Mohamed, A.G. Indoor air quality for sustainable building renovation: A decision-support assessment system using structural equation modelling. *Build. Environ.* **2022**, *214*, 108933. [CrossRef]
68. Wals, A.E.; Blewitt, J. Sustainability in higher education in Europe: What is happening? *J. Clean. Prod.* **2010**, *18*, 583–585.
69. Borg, R.; Prpic, K. Factors influencing academics' motivation to integrate education for sustainable development. *J. Clean. Prod.* **2019**, *208*, 1569–1580.
70. Filho, W.L.; Shiel, C.; Paço, A.; Mifsud, M. Do green campuses contribute to pro-sustainability teaching and learning? An exploratory study. *Sustainability* **2019**, *11*, 7029.
71. Levy, B.L.M.; Mauri, A.J.; Levin, N. Beyond the Classroom: Educator Activism and Responsibility for Social and Environmental Justice. *J. Sustain. Educ.* **2021**, *24*, 1–16.
72. Weiss, M.; Barth, M. Global research landscape of sustainability curricula implementation in higher education. *Int. J. Sustain. High. Educ.* **2019**, *20*, 570–589. [CrossRef]

73. Wright, T.; Allen, W.; Ryan, R. Exploring the link between sustainability education and moral development. *J. Clean Prod.* **2017**, *171*, 1069–1078.
74. Wals, A.E.; Jickling, B. Sustainability in higher education: From doublethink and sales talk to critical thinking and action. *Int. J. Sustain. High. Educ.* **2002**, *3*, 221–232. [CrossRef]
75. Grimm, N.B.; Grove, J.M.; Pickett, S.T.; Redman, C.L. Integrated approaches to long-term studies of urban ecological systems. *Urban. Ecol.* **2019**, *4*, 1–3.
76. Blewitt, J. The pedagogy of nature: Environmental education in Australia. *Aust. J. Environ. Educ.* **2003**, *19*, 67–76.
77. Perrault, E.K.; Coburn, C.E. In their view: The impact of subject-matter experts on science education policy. *Educ. Policy* **2020**, *34*, 106–142.
78. Krasny, M.E.; Lundholm, C.; Plummer, R. Resilience in social, ecological, and educational systems: Linking systems to develop a transdisciplinary framework for sustainability education. *Sustainability* **2010**, *2*, 3434–3446.
79. Sterling, S.; Scott, W. A systemic analysis of professional development in sustainability education: Characteristics of effective programs and courses. *Environ. Educ. Res.* **2017**, *23*, 927–957.
80. Bryce, D.; Spry, L.; Standing, C. The integration of sustainability into business schools: Evidence of student attitudes to corporate responsibility. *Int. J. Sustain. High. Educ.* **2016**, *17*, 757–772.
81. Dlouhá, J.; Henderson, L. Factors that influence the implementation of education for sustainable development: Lessons learned from the United Nations Decade of Education for Sustainable Development (2005–2014). *J. Clean. Prod.* **2019**, *228*, 1003–1016.
82. Lozano, R.; Barreiro-Gen, M.; Lozano, F.; Sammalisto, K. Teaching Sustainability in European Higher Education Institutions: Assessing the Connections between Competences and Pedagogical Approaches. *Sustainability* **2019**, *11*, 1602. [CrossRef]
83. Raykov, T.; Marcoulides, G.A. *A First Course in Structural Modeling*, 2nd ed.; Lawrence Erlbaum Associates Publishers: Mahwah, NJ, USA, 2012.
84. Prasetyo, Y.T.; Castillo, A.M.; Salonga, L.J.; Sia, J.A.; Seneta, J.A. Factors affecting perceived effectiveness of COVID-19 prevention measures among Filipinos during Enhanced Community Quarantine in Luzon, Philippines: Integrating Protection Motivation Theory and extended Theory of Planned Behavior. *Int. J. Infect. Dis.* **2020**, *99*, 312–323. [CrossRef] [PubMed]
85. Islam, A.K.M.N.; Azad, N. Satisfaction and continuance with a learning management system. *Int. J. Inf. Learn. Technol.* **2015**, *32*, 109–123. [CrossRef]
86. Sarstedt, M. Revisiting Hair Et al.'s Multivariate Data Analysis: 40 Years Later. In *The Great Facilitator*; Springer International Publishing: Cham, Switzerland, 2019; pp. 113–119. [CrossRef]
87. Hu, L.; Bentler, P.M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Model. Multidiscip. J.* **1999**, *6*, 1–55. [CrossRef]
88. Gefen, D.; Karahanna, E.; Straub, D.W. Trust and TAM in Online Shopping: An Integrated Model. *MIS Q.* **2003**, *27*, 51–90. [CrossRef]
89. Steiger, J.H. Understanding the limitations of global fit assessment in structural equation modeling. *Personal. Individ. Differ.* **2007**, *42*, 893–898. [CrossRef]
90. Salas-Zapata, W.A.; Ríos-Osorio, L.A.; Cardona-Arias, J.A. Knowledge, Attitudes and Practices of Sustainability: Systematic Review 1990–2016. *J. Teach. Educ. Sustain.* **2018**, *20*, 46–63. [CrossRef]
91. Vu, D.M.; Ha, N.T.; Ngo, T.V.N.; Pham, H.T.; Duong, C.D. Environmental corporate social responsibility initiatives and green purchase intention: An application of the extended theory of planned behavior. *Soc. Responsib. J.* **2022**, *18*, 1627–1645. [CrossRef]
92. Jia, Q.; Islam, M.S.; Hossain, M.S.; Li, F.; Wang, Y. Understanding residents' behaviour intention of recycling plastic waste in a densely populated megacity of emerging economy. *Heliyon* **2023**, *9*, e18921. [CrossRef] [PubMed]
93. Kumar, S. Geospatial Applications in Modeling Climate Change Impact on Soil Erosion. In *Global Climate Change: Resilient and Smart Agriculture*; Springer: Singapore, 2020; pp. 249–272. [CrossRef]
94. Raghu, S.J.; Rodrigues, L.L.R. Solid waste management behavior among the student community: Integrating environmental knowledge and situational factors into the theories of planned behavior and value belief norm. *J. Environ. Plan. Manag.* **2022**, *65*, 1842–1874. [CrossRef]
95. Barlett, P.F.; Chase, G.W. *Sustainability in Higher Education: Stories and Strategies for Transformation*; MIT Press: Cambridge, MA, USA, 2013.
96. Cortese, A.D. The critical role of higher education in creating a sustainable future. *Plan. High. Educ.* **2003**, *31*, 15–22.
97. Wright, T.S.A. Definitions and frameworks for environmental sustainability in higher education. *Int. J. Sustain. High. Educ.* **2002**, *3*, 203–220. [CrossRef]
98. Habibi, A.; Riady, Y.; Al-Adwan, A.S.; Albelbisi, N.A. Beliefs and Knowledge for Pre-Service Teachers' Technology Integration during Teaching Practice: An Extended Theory of Planned Behavior. *Comput. Sch.* **2023**, *40*, 107–132. [CrossRef]