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The Role of Commitment in an Extended Theory of Planned Behavior: Test of Its Mediating Effect with Partial Least Squares Structural Equation Modeling

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Abstract: The theory of planned behavior (TPB) is popular for studying behavioral intentions. While the direct relationships between the three antecedents (i.e., attitudes toward the behavior, subjective norms, and perceived behavioral control) and intentions in the TPB have been extensively studied, the authors of this study hoped to draw attention to the variable "commitment". It is interesting to explore whether commitment mediates the relationship between the three antecedents and intentions. Furthermore, this study attempted to investigate if the TPB is appropriate for explaining students' intentions to learn sustainability. Like many other countries, sustainability has been widely integrated into primary and secondary education in China. However, if students are not interested in or feel that they are not capable of learning sustainability, they may be reluctant to do so. Therefore, this study aimed to examine an extended TPB model with a sample of 181 students from a public junior secondary school in China through factor-based partial least squares structural equation modeling. The results showed that the model could explain the intention to learn sustainability. Specifically, this research found that commitment mediated the relationships of attitudes toward learning sustainability, subjective norms, and perceived behavioral control to the behavioral intention.

Keywords: theory of planned behavior; commitment; PLS-SEM; geography education; intention

MSC: 62H15

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1. Introduction

The theory of planned behavior (TPB) is popular for studying behavioral intentions. It is hypothesized that attitudes toward the behavior, subjective norms, and perceived behavioral control are the antecedents of behavioral intentions [1]. Attitudes toward the behavior refer to the extent of an individual's positive or negative reaction to a specific behavior; subjective norms refer to the extent to which an individual responds positively to the social preferences of the referent others; perceived behavioral control refers to an individual's perception of his or her confidence in performing a specific behavior [2]. For Ajzen [3], perceived behavioral control is the general state of both perceived self-efficacy (i.e., one's confidence in the ability to perform a specific behavior) and perceived controllability (i.e., one's confidence in having the resources to perform a specific behavior), which are the internal and external influences of behavioral intention, respectively. Ajzen and his colleagues are continually pushing for the latest advances and applications of the theory through their own research work [4–8]. Since it was proposed, the theory has been widely applied in various contexts (e.g., [9–11]). Moreover, the context of the current study is about students' intentions to learn sustainability knowledge (will be discussed in detail in the next section). In regard to school and college education, this theory is considered having important implications for explaining students' behavioral intentions, including college students' intentions to use a wiki for group work [2], students' intentions to take

English courses in Chinese schools [12], Chinese students' communicative intentions [13], and college students' mobile learning intentions [14].

Although the direct relationship between the three antecedents and intentions have been extensively studied, the authors of this study would like to draw attention to the variable "commitment", which may play a role in explaining behavioral intentions. Commitment, generally referring to "a promise or firm decision to do something" (in the Cambridge Dictionary), is rarely employed in an extended TPB model. However, an individual's commitment to an organization (i.e., organizational commitment) has long been the determinant of the intention to stay or quit an organization (e.g., [15,16]). This has also been extended to the study of commitment beyond organizational commitment, such as employee and job commitment [17,18]. For example, Cuskelly and Hoye [19], studying the retention of early career sports officials, found that the commitment to officiating affected the intention to continue officiating. In a study of personal information management motivation, Hwang, Lin, and Shin [20] found a significant relationship between knowledge system commitment and knowledge sharing intentions. Moreover, Lee and Jeong [16] used a sample of 459 employees from multiple companies in South Korea and found that organizational commitment mediated the positive relationship between job insecurity and turnover intention. Based on other studies' findings that affective commitment was amongst the strongest dimension in explaining the intention to remain in a company, Orgambídez, Borrego, and Vazquez-Aguado [21] further found a significant relationship between general self-efficacy of work and affective commitment to the organization. Therefore, it would be interesting to explore whether commitments should be included in the TPB. Recently, Ajzen and Kruglanski [22] proposed the inclusion of motivation to act as a mediator between the three antecedents and intentions in explaining an intentional behavior. In a similar vein, this study posits that the TPB is extended with commitment, which attenuates the links between the three antecedents and intentions.

To test the proposed extended TPB model, this study uses partial least squares structural equation modeling (PLS-SEM). Unlike the covariance-based SEM (CB-SEM), the PLS-SEM is the variance-based SEM (VB-SEM), suitable for testing path models with non-normal data and smaller samples [23]. Since a purposive and convenient sample was employed (i.e., violation of multivariate normality of the data) in this study, the PLS-SEM method is more appropriate to examine the hypothesized model. This study uses WarpPLS7.0 developed by Professor Ned Kock. The Factor-Based PLS Type CFM3 algorithm is adopted because it can improve computation efficiency [24]. The robust factor-based method (also known as consistent PLS [23]), similar to the CB-SEM, is employed to account for measurement errors. In addition, this software tool can determine the structural model fit [24], which is crucial in this study to examine the mediating role of commitment. There is no shortage of studies on mediating effects in the mainstream literature (e.g., [25–27]). The test of mediating effects will be described in a later section.

2. The Context of This Study

The concept of sustainability has been integrated into primary and secondary education in China [28]. Another related term is sustainable development (SD). For Maude [29] (p. 47), sustainability refers to "a sustainable state or condition", while SD refers to "a process of economic and social change". For Liu [30] (p. 246), sustainability education (SE), also known as education for SD (ESD) or education for sustainability (EfS), emphasizes "social, economic, and environmental sustainability and the interaction of these three elements". Take geography as an example. According to China's newly revised Geography Curriculum Standard for Compulsory Education [31], students should understand the concept of SD in geography so that they can learn to become active and responsible citizens, so as to protect the environment and maintain good social characteristics of the country as well as the world. Sustainability has thus become part of the standard geography curriculum, which should contribute to the development of a holistic experience not only around philosophical and theoretical issues but also around practical ones [32].

The purpose of incorporating sustainability into education is to sustain the planet by allowing students to develop their ability to relate the concept to everyday life [33]. Because of this, SE has been added to different school curricula around the world [34]. According to Noble and McGrath [35], it is crucial for our young people to learn to be resilient before they reach adulthood. The education system should be able to foster positive attitudes in students, enabling them to think logically and to be able to distinguish right from wrong [36]. It is important to increase their understanding of sustainability during their mental development stage. In fact, SE involves not only "high-quality subject matter knowledge" but also "modern researched pedagogical content knowledge", and relies on "teachers' interpretations and transformations of subject matter knowledge" to stimulate students' interest in learning [32] (p. 2).

However, if students lack interest in or feel that they are not capable of learning sustainability, they may be reluctant to do so. Therefore, their perceptions of sustainability influence their intentions to learn sustainability because, as noted by Khudhair [37], such perceptions make a substantial contribution in driving their intentional behavior through their preferences for learning sustainability. Once they plan to study sustainability, their academic performance will improve. Existing literature contains a lot of research on students' learning intentions. For example, Cheng [25] found that students' attitudes toward e-collaboration were important in enhancing their intentions to collaborate online with group members on group projects. Likewise, the intent of learning sustainability is also worth exploring. By understanding the factors that influence students' behavioral intentions, schools can find ways to motivate students to learn sustainability. In addition, the commitment to learning sustainability may play a role in explaining students' learning intentions. Yet, the concept of learning commitment is rarely discussed in the extant literature [38]. Although infrequently used, similar terms have caught the attention of researchers. For example, students' involvement or engagement in online learning refers to their commitment to online learning [39,40]. Therefore, this study aims to fill the research gap by examining the role of commitment in an extended TPB. As such, the following research objectives have been set:

1. Determining the extent to which the TPB can explain students' intentions to learn sustainability through the factor-based PLS-SEM method.
2. Examining whether commitment plays a mediating role between the three antecedents (i.e., attitudes, subjective norms, and perceived behavioral control) and intentions.

3. Hypothesized Models

The present study aims to explore whether the commitment to learning sustainability plays a mediating role in explaining the intention to learn sustainability. As such, three models are developed: the original model of the TPB (i.e., Model A) and two extended models. In Model A, the three antecedents (i.e., attitudes toward learning sustainability, subjective norms, and perceived behavioral control) are proposed to influence the intention to learn sustainability (i.e., Hypotheses 1–3). In the first extended model (i.e., Model B), in addition to the above three hypotheses, it is further posited that attitudes toward learning sustainability (Hypothesis 4), subjective norms (Hypothesis 5), and perceived behavioral control (Hypothesis 6) are positively related to the commitment to learning sustainability, which in turn is positively related to the intention to learn sustainability (Hypothesis 7). In the second extended model (i.e., Model C), Hypotheses 1–3 are deleted while retaining the four new hypotheses in Model B. By comparing these a priori models with an empirical research design, it is possible to determine whether the inclusion of the variable "commitment" is suitable for explaining behavioral intentions. The hypotheses are listed below:

Hypothesis 1 (H1). *Attitudes toward the learning of sustainability are positively related to the intention to learn sustainability.*

Hypothesis 2 (H2). *Subjective norms are positively related to the intention to learn sustainability.*

Hypothesis 3 (H3). *Perceived behavioral control is positively related to the intention to learn sustainability.*

Hypothesis 4 (H4). *Attitudes toward learning sustainability are positively related to the commitment to learning sustainability.*

Hypothesis 5 (H5). *Subjective norms are positively related to the commitment to learn sustainability.*

Hypothesis 6 (H6). *Perceived behavioral control is positively related to the commitment to learning sustainability.*

Hypothesis 7 (H7). *The commitment to learning sustainability is positively related to the intention to learn sustainability.*

4. Research Method

4.1. Participants and Procedure

This is a quantitative study. An online survey was conducted and a self-report questionnaire in Chinese was designed to collect quantitative data from a sample of students in a public junior secondary school in Huizhou City, China. The experience of these students in learning sustainability in geography was the focus of this study because geography is one of the main subjects involved in teaching sustainability. As stated in the China's new Geography curriculum standards, the essence of the compulsory geography education is to understand the geographical environment and form geographical skills and SD concepts [31]. Thus, SE has become part of the standard geography curriculum. Furthermore, Huizhou City was selected because it is not a first-tier city and is generally considered to have lower educational performance than first-tier cities, such as Beijing, Shanghai, and Guangzhou. Motivating students' enthusiasm for learning is one of the core missions of teachers across the city. Therefore, this research may help to explore the issues that hinder students' acquisition of sustainability knowledge. Recommendations can then be made to increase students' intentions to learn sustainability.

The questionnaire was divided into two parts. The first part collected personal information (demographic background), such as gender, years of working, teaching subject, etc. The second part collected respondents' perceptions of the target variables (those in the later section of Measures). Ethical clearance was obtained. A total of 181 valid responses were received from a sampling frame of 259 students, representing a response rate of approximately 70%. An analysis of respondents' demographics reveals that approximately 50.3% were male students (n = 91) and approximately 49.7% were female students (n = 90). Their ages ranged from 12 to 16 (mean = 13.22). Respondents were asked about the number of subjects, other than geography, that were considered having elements of sustainability. The results were quite diverse. Seventy-seven respondents reported 1 subject, followed by 2 subjects (n = 68), 3 subjects (n = 14), and 4 subjects (n = 22). Specifically, most students (n = 156) studied sustainability from biology, followed by physics (n = 93), social studies (n = 58), and chemistry (n = 36). To test whether gender, age, the number of subjects with sustainability (i.e., their accumulated experience), and the subjects they taught acted as extraneous variables [41], t-statistic and correlation tests were performed. The results indicate that they were independent of the latent variables, with the exception of the number of subjects with sustainability that was modestly related to subjective norms (r = 0.16, $p < 0.05$) and perceived behavioral control (r = 0.18, $p < 0.05$). Therefore, all demographic variables were not included in further analysis.

4.2. Measures

There are five latent variables in this study. The items that measured these variables were mainly adapted from Ajzen [42] and are listed in Appendix A. Their measures were described as follows:

1. Attitudes toward the behavior were measured by using a seven-point bipolar adjective scale, such as boring/interesting and negative/positive, for four items;
2. Subjective norms were measured with four items, using a Likert seven-point scale, from strongly disagree (1) to strongly agree (7);
3. Perceived behavioral control was measured using a seven-point Likert scale in two items from strongly disagree (1) to strongly agree (7);
4. Intention to learn sustainability was measured in three items by using a seven-point Likert scale ranging from strongly disagree (1) to strongly agree (7);
5. Adapted from Cuskelly and Hoye [19], this study used a seven-point Likert scale ranging from strongly disagree (1) to strongly agree (7) with three items, in terms of enjoyment and comfort of learning sustainability, to measure the commitment to learning sustainability.

4.3. Statistical Analysis

The PLS-SEM was employed to examine both measurement and structural models (see Appendix B for Model A with both latent variables and corresponding measurable items). In the measurement model, the relationship between a latent variable and its respective measurable items was proposed. This involves testing the reliability and validity of the measure, including composite reliability, Cronbach alpha reliability and convergent validity [23].

In the structural model, the relationship between two latent variables (i.e., the relationship between an independent variable and a dependent variable) was proposed. The survey results were interpreted by (1) the adjusted R^2 contribution of all independent variables that explained the variance of their respective dependent variable and (2) the beta coefficient (β) of each independent variable that explained the variance of its respective dependent variable. Compared to the R^2 value, the adjusted R^2 value is more suitable for comparing various models with the same dependent variable because the adjusted value corrects for the expansion in R^2 coefficients caused by non-significant independent variables in each latent variable block [23,24]. For the test of the structural model, the method suggested by Kock [24] was employed, which will be described in the next section.

5. Results

Table 1 shows the mean scores, standard deviations, and correlations for the five latent variables. The mean scores of the variables indicate that all variables were positively rated, with mean scores ranging from 4.67 to 5.38 (out of a seven-point scale). The standard deviations of the variables also indicate that the subject scores for each variable tended to be quite close to the mean score. Finally, the table shows that the latent variables were all significantly correlated. Therefore, the hypotheses are worth examining.

Table 1. Means, standard deviations, and correlations for the five latent variables.

Variable	Mean	SD	1	2	3	4	5
AT	5.35	1.11	(0.873)				
SN	5.14	1.24	0.710 ***	(0.851)			
PBC	4.67	1.37	0.463 ***	0.545 ***	(0.783)		
COM	5.04	1.21	0.836 ***	0.763 ***	0.594 ***	(0.851)	
INT	5.38	1.24	0.806 ***	0.644 ***	0.555 ***	0.832 ***	(0.836)

Notes: AT = attitudes toward the learning of sustainability; SN = subjective norms; PBC = perceived behavioral control; COM = commitment to learning sustainability; INT = intention to learn sustainability; numbers in parentheses are square roots of average variances extracted; *** $p < 0.001$.

5.1. Test of the Measurement Model

Measurement biases were assessed through the test of reliability, convergent validity, and discriminant validity of the reflective measures of the latent variables [23]. Table 2 presents the results. First, the internal consistency of the latent variables was good because their composite reliability values ranged from 0.759 to 0.927 and Cronbach's alpha values ranged from 0.758 to 0.928, both of which were above the threshold of 0.7 [24]. Second, the convergent validity of all latent variables appeared to be sufficient because (1) their AVE values were between 0.613 and 0.762, exceeding the threshold of 0.50 and (2) each item has a structure loading above 0.7 for its respective latent variable [23]. Third, the discriminant validity of all latent variables was confirmed by meeting the Fornell–Larcker criterion; that is, the square root of AVE of each latent variable was higher than the correlation coefficients between this latent variable and other latent variables (see Table 1) [23].

Table 2. Results for assessing the measurement model.

Variable	AVE	Composite Reliability	Cronbach's Alpha	Structure Loadings
AT	0.762	0.927	0.928	0.845 ↔ 0.913
SN	0.725	0.913	0.913	0.744 ↔ 0.903
PBC	0.613	0.759	0.758	0.743 ↔ 0.821
COM	0.725	0.888	0.888	0.831↔ 0.869
INT	0.698	0.874	0.874	0.797 ↔ 0.856

Notes: AT = attitudes toward the learning of sustainability; SN = subjective norms; PBC = perceived behavioral control; COM = commitment to learning sustainability; INT = intention to learn sustainability; AVE = average variance extracted.

5.2. Test of the Three Structural Models

Structural models were assessed by means of the full collinearity test, output model fit, coefficient of determination (R^2) for each dependent variable, and the standardized beta coefficient (β) for each hypothesized relationship [23,24]. To test for multicollinearity (also known as full collinearity) among the latent variables in the three structural models, this study employed the full collinearity VIF (FCVIF), which could also be used to assess common method biases. The FCVIF identifies both vertical and lateral collinearity involving all latent variables in a structural model, thereby outperforming the "classic" VIF that considers only vertical collinearity [24]. For minor multicollinearity and common method biases, the FCVIF value of a variable should be less than 3.3 for regression-based models and less than 5 for models incorporating measurement errors, such as factor-based PLS-SEM models [43], while this threshold could also be relaxed to 10 for highly correlated variables [24]. Tables 3–5 show that the FCVIF values were all less than 5, except for commitment in models B and C where the value was slightly larger than 5, suggesting that both multicollinearity and common method biases were trivial. For readers' information, the "classic" or vertical collinearity VIF values for the latent variables in the three models ranged from 1.614 to 4.275 (where only one of them was higher than 3.3), all below the threshold of 5 for factor-based PLS-SEM [24].

Table 3. Results for assessing the structural model A.

Dependent Variable	Independent Variable			R^2	Adjusted R^2
	AT β	SN β	PBC β		
INT	0.591 ***	0.203 **	0.162 *	0.740	0.736
(3.880)	(4.244)	(2.635)	(1.685)	-	-

Notes: Numbers in parentheses are FCVIF values. AT = attitudes toward the learning of sustainability; SN = subjective norms; PBC = perceived behavioral control; INT = intention to learn sustainability; β = beta coefficient; R^2 = coefficient of determination; FCVIF = full collinearity variance inflation factor. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Table 4. Results for assessing the structural model B.

Dependent Variable	Independent Variable				R^2	Adjusted R^2
	AT β	SN β	PBC β	COM β		
COM	0.521 ***	0.311 ***	0.172 **	-	0.795	0.791
INT	0.406 ***	−0.071	0.101	0.383 ***	0.672	0.664
(3.898)	(4.126)	(2.616)	(1.679)	(5.503)	-	-

Notes: Numbers in parentheses are FCVIF values. AT = attitudes toward the learning of sustainability; SN = subjective norms; PBC = perceived behavioral control; COM = commitment to learning sustainability; INT = intention to learn sustainability; β = beta coefficient; R^2 = coefficient of determination; FCVIF = full collinearity variance inflation factor. *** $p < 0.001$; ** $p < 0.01$.

Table 5. Results for assessing the structural model C.

Dependent Variable	Independent Variable				R^2	Adjusted R^2
	AT β	SN β	PBC β	COM β		
COM	0.531 ***	0.303 ***	0.172 **	-	0.800	0.797
INT	-	-	-	0.838 ***	0.703	0.701
(3.880)	(4.244)	(2.635)	(1.685)	(5.643)	-	-

Notes: Numbers in parentheses are FCVIF values. AT = attitudes toward the learning of sustainability; SN = subjective norms; PBC = perceived behavioral control; COM = commitment to learning sustainability; INT = intention to learn sustainability; β = beta coefficient; R^2 = coefficient of determination; FCVIF = full collinearity variance inflation factor. *** $p < 0.001$; ** $p < 0.01$.

Tables 3–5 show the test results for the three structural models (A, B, and C), respectively. In these models, each dependent variable was significantly explained by the corresponding independent variable(s), as indicated by their respective adjusted R^2 values. In a regression model, the β value indicates whether an independent variable is significantly related to a dependent variable. Since the β value is standardized, the higher the β value, the stronger the relationship between the two variables. Figures 1–3 illustrate the results of the three hypothesized models. Moreover, if the hypothesized relationship is found to be significant, a hypothesis is supported, and vice versa. In Table 3, attitudes toward learning sustainability, subjective norms, and perceived behavioral control explained 73.6% of the variance in learning intentions of sustainability, while in Tables 4 and 5, attitudes, subjective norms, and perceived behavioral control explained 79.1% and 79.7%, respectively, for the variance in commitment to learning sustainability. Furthermore, in Table 4, attitudes, subjective norms, perceived behavioral control, and the commitment to learning sustainability explained 66.4% of the variance in the intention to learn sustainability, while in Table 5, the commitment to learning sustainability explained 70.1% of the variance in the intention to learn sustainability.

5.3. Comparison of the Three Structural Models

To compare the three structural models to find the best-fit model, three indicators were used: average path coefficient (APC), average R^2 (ARS), and average adjusted R^2 (AARS) [24]. They measured the explanatory power of a model, and the best-fit model should have the largest values of these indicators [24]. While each of the three structural models showed a very good data fit, Model C (APC: 0.461, $p < 0.001$; ARS: 0.752, $p < 0.001$; AARS: 0.749, $p < 0.001$) outperformed Model A (APC: 0.319, $p < 0.001$; ARS: 0.740, $p < 0.001$; AARS: 0.736, $p < 0.001$) and Model B (APC: 0.281, $p < 0.001$; ARS: 0.733, $p < 0.001$; AARS: 0.728, $p < 0.001$). This shows that Model C was the best fit for the data.

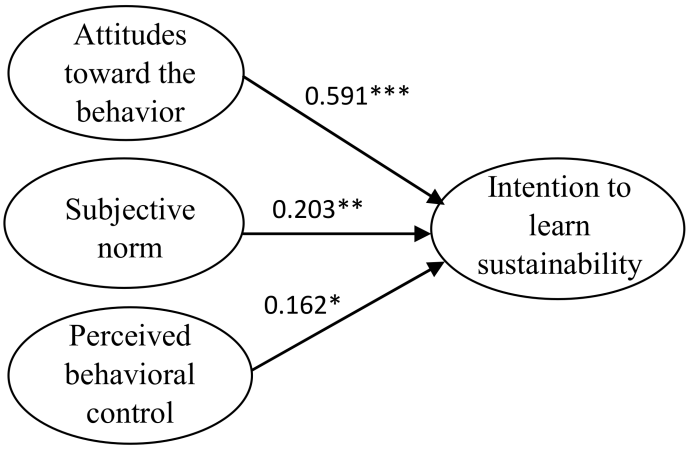


Figure 1. The results for the original model A. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

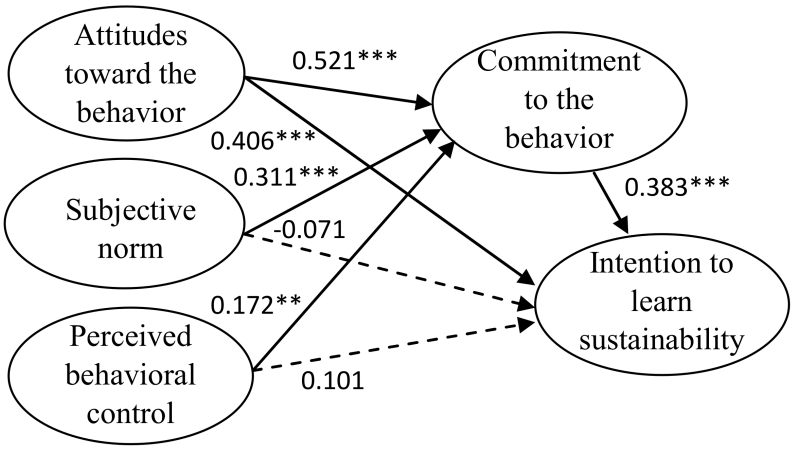


Figure 2. The results for Model B. A solid line means a significant relationship, while a dotted line means a non-significant relationship. *** $p < 0.001$; ** $p < 0.01$.

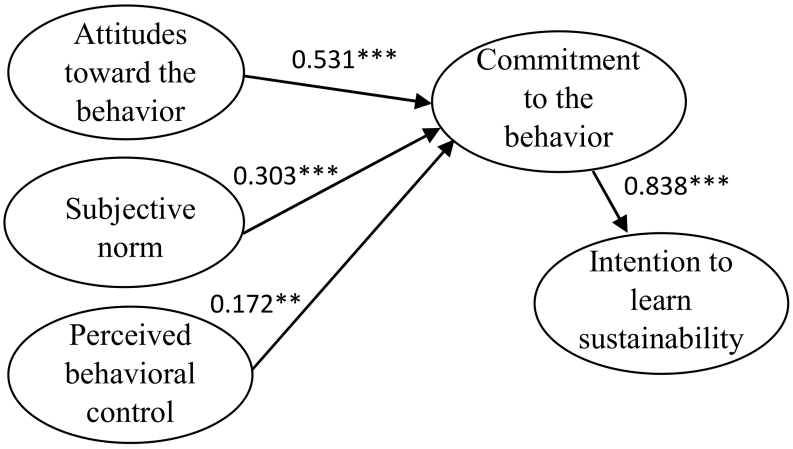


Figure 3. The results for Model C. *** $p < 0.001$; ** $p < 0.01$.

Regarding the influence of each independent variable in Model C, attitudes toward the behavior ($\beta = 0.531$, $p < 0.001$), subjective norms ($\beta = 0.303$, $p < 0.001$), and perceived behavioral control ($\beta = 0.172$, $p < 0.01$) were significantly related to the commitment to learning sustainability, supporting H4, H5, and H6, respectively. The study has also found that the commitment to learning sustainability was significantly related to the intention of

learning sustainability (β = 0.838, $p < 0.001$), supporting H7. Finally, as this study supports Model C, H1, H2, and H3 were removed and would not be explained.

5.4. Test of Mediating Effects of the Commitment to Learning Sustainability

To provide stronger evidence to determine whether commitment could play a role in Model C, an investigation of its mediating effect was conducted [44]. In light of the findings reported in the previous sections, the mediating role of commitment was examined. A two-step approach was used in this study [25]. The first step involved evaluating the three conditions given by Baron and Kenny [45]. If any of these conditions are not met, the mediating effect would be negligible [46]. Once these conditions are met, another mediation test (i.e., the second step) would be performed. Given the results shown in Tables 3–5, the three conditions were met. First, attitudes, subjective norms, and perceived behavioral control were significantly associated with intentions. Second, attitudes, subjective norms, and perceived behavioral control were significantly associated with commitments. Third, commitment and intention were significantly related after controlling for attitudes, subjective norms, and perceived behavioral control.

The second step is to perform the Sobel's product of coefficients test, which is probably the most popular method to test for mediation effects [47]. This test relies on standard errors and is suitable for nonlinear multivariate analyses, including WarpPLS [24]. The Sobel's z-value and the significance level of each mediating effect were computed according to the formula provided by Preacher and Hayes [48]. The results show that the commitment to learning sustainability significantly mediated the relationships of attitudes (z = 6.808; $p < 0.001$), subjective norms (z = 4.116; $p < 0.001$), and perceived behavioral control (z = 2.351; $p < 0.01$) to the intention to learn sustainability.

6. Discussion

This study has found that Model C was the best-fit model. The results show that the extended TPB is suitable for explaining the intent of learning sustainability. The main contribution of this study is twofold. First, the study has found that attitudes, subjective norms, and perceived behavioral control could explain the commitment to learning sustainability. This is a new discovery that alters our understanding of the consequence of these three exogenous variables, which were originally thought to be directly related to behavioral intentions. Perhaps, adding the variable "commitment" to the TPB offers a more comprehensive model for understanding the phenomenon. Future research in this area is therefore strongly recommended. Among these three exogenous variables, students who had a more positive attitude toward learning sustainability were found to be more committed to learning sustainability. For example, school gardening may help students develop their intrinsic values in conserving flora and fauna [49]. Teachers may also increase students' awareness of local environmental issues, with a particular focus on how knowledge of sustainability can improve the situation. Moreover, students who were followers of their referent others were found to be more committed to learning sustainability if such referent others would like them to do so. Thus, it becomes important to find who their referent others are. Their encouragement and support for students should not be ignored. On the other hand, students who were more confident in learning sustainability were found to be more committed to learning it. In order to help students to improve their self-efficacy of learning sustainability, teachers should plan effective learning activities to stimulate students' interest in learning [50]. With the aid of modern computer technology and geography teaching equipment, teachers can help students overcome the difficulties in studying junior middle school geography that is usually involved in understanding SD issues with scientific methods. As pointed out by Cai [51], geography teachers should provide students with rich and joyful geography lessons while learning sustainable geography knowledge.

Second, this research has found that commitment was positively related to the intention to learn sustainability. This is another new discovery and is consistent with the

existing literature that organizational commitment is the cause of the intention to quit or stay in the organization, especially empirical studies like Lee and Jeong [16] who found the mediating role of organizational commitment between job insecurity and turnover intention. This enhances the understanding of the TPB, which has not yet accounted for the commitment-intention pair that has long been adopted in the study of employee turnover. Since environmental awareness and consciousness are the common goals of learning both geography and SD [52], teachers should help students develop an interest in environmental protection in order to strengthen their willingness to learn sustainability, especially focusing on certain consumption behaviors as the underlying causes of corresponding environmental consequences, thereby encouraging greater participation in learning sustainable resource spending [53].

7. Conclusions

This study, perhaps the first of its kind, supports an extended TPB model that adds the variable "commitment" as a mediator regulating the influences of attitudes, subjective norms, and perceived behavioral control on sustainability learning intentions. It also demonstrates how to compare the three theoretical models using the robust factor-based PLS-SEM through the structural model fit indicators. Besides its empirical contributions, this study has limitations. First, the sample was students from a junior secondary school in China; thus, the results may not be generalized to a larger population, such as all schools in China, let alone schools in other countries. The results should be interpreted with care. Having said that, this study still provides some useful information for those who are interested in this research topic or teachers who need to teach sustainability in a subject. Furthermore, this research used a cross-sectional questionnaire survey, which had the problem of common method biases. Yet, this has been resolved by checking FCVIF. The method bias effect was trivial in this study. All in all, this may be the first study to consider the inclusion of commitment into a TPB model. It is recommended to continue examining the value of commitment in explaining behavioral intentions. Among other theories, the three-dimensional model of organizational commitment proposed by Allen and Meyer [15] has been widely used to study employee turnover. Future research may explore the role of these dimensions (i.e., affective, continuance, and normative) of other commitment types in explaining behavioral intentions, such as comparing the effects of these dimensions of commitment to learning sustainability on the intention to learn sustainability. Other compelling insights may then emerge.

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Appendix A

Table A1 lists the items for measuring each variable.

Table A1. Corresponding items for each variable.

Variable	Item
Attitudes toward learning sustainability	I feel that learning sustainability in geography is boring/interesting. I feel that learning sustainability in geography is negative/positive. I feel that learning sustainability in geography is useless/useful. I feel that learning sustainability in geography is bad/good.
Subjective norm	I would like to learn sustainability in geography because people who are important to me think that I should do it. I think that people whose opinions I value would encourage me to learn sustainability in geography. People who are important to me think that learning sustainability in geography is good. I know some people who are important to me have learnt sustainability in geography.
Perceived behavioral control	If I want to, it is easy for me to learn sustainability in geography. To me, learning sustainability in geography is not a challenge.
Intention to learn sustainability	I intend to learn sustainability in geography. I am willing to learn sustainability in geography. I plan to learn sustainability in geography.
Commitment to learning sustainability	I enjoy discussing about sustainability with others. I feel comfortable in learning sustainability in geography. In general, I am dedicated to learning sustainability in geography.

Appendix B

Figure A1 exhibits the original TPB model with both variables and their corresponding items.

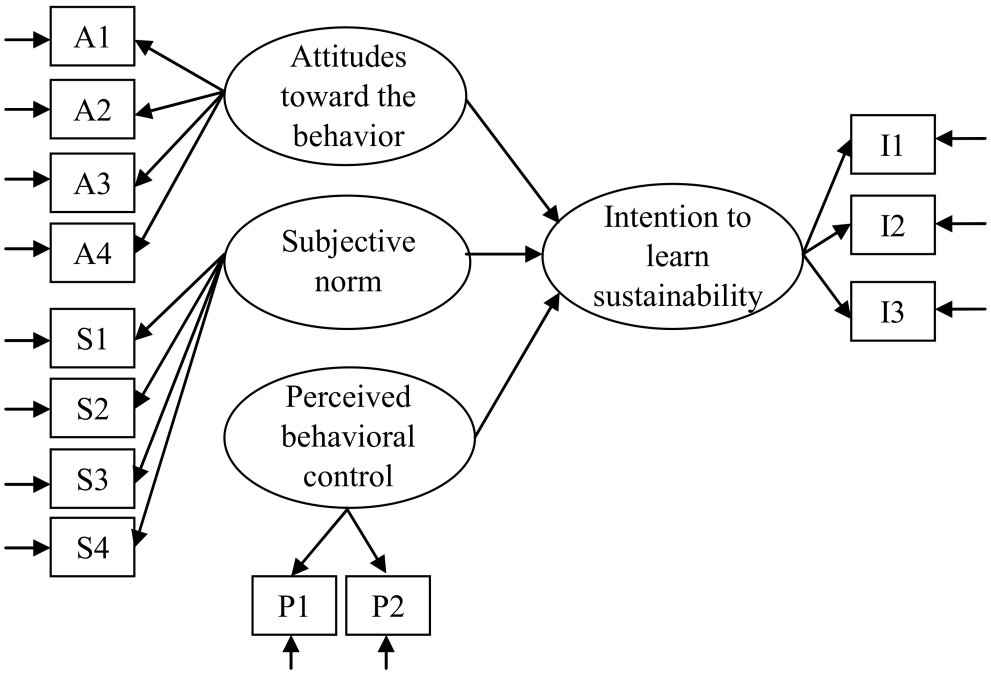


Figure A1. The original TPB model (same as Model A).

References

1. Ajzen, I. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* **1991**, *50*, 179–211.
2. Cheng, E.W.L. Choosing between the theory of planned behavior (TPB) and the technology acceptance model (TAM). *Educ. Technol. Res. Dev.* **2019**, *67*, 21–37.
3. Ajzen, I. Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *J. Appl. Soc. Psychol.* **2002**, *32*, 665–683.
4. Ajzen, I.; Schmidt, P. Changing behavior using the theory of planned behavior. In *The Handbook of Behavior Change*; Hagger, M.S., Cameron, L.D., Hamilton, K., Hankonen, N., Lintunen, T., Eds.; Cambridge University Press: Cambridge, UK, 2020; pp. 17–31.
5. Bamberg, S.; Ajzen, I.; Schmidt, P. Travel mode choice as reasoned action. *Int. Encycl. Transp.* **2021**, *6*, 63–70.
6. La Barbera, F.; Ajzen, I. Control interactions in the theory of planned behavior: Rethinking the role of subjective norm. *Eur. J. Psychol.* **2020**, *16*, 401–417.
7. La Barbera, F.; Ajzen, I. Understanding support for European integration across generations: A study guided by the theory of planned behavior. *Eur. J. Psychol.* **2020**, *16*, 437–457.
8. Sok, J.; Borges, J.R.; Schmidt, P.; Ajzen, I. Farmer behavior as reasoned action: A critical review of research with the theory of planned behavior. *J. Agric. Econ.* **2021**, *72*, 388–412.
9. Alzubaidi, H.; Slade, M.L.; Dwivedi, Y.K. Examining antecedents of consumers' pro-environmental behaviors: TPB extended with materialism and innovativeness. *J. Bus. Res.* **2021**, *122*, 685–699.
10. Delvecchio, E.; Germani, A.; Raspa, V.; Lis, A.; Mazzeschi, C. Parenting styles and child's well-being: The mediating role of the perceived parental stress. *Eur. J. Psychol.* **2020**, *16*, 514–531.
11. Kırseven, M.Y.; Işıklı, S. Investigation of the effects of violence experience during political demonstrations. *Eur. J. Psychol.* **2020**, *16*, 479–497.
12. Girardelli, D.; Patel, V.K.; Martins-Shannon, J. "Crossing the Rubicon": Understanding Chinese EFL students' volitional process underlying in-class participation with the theory of planned behavior. *Educ. Res. Eval.* **2017**, *23*, 119–137.
13. Zhong, Q.M. Understanding Chinese learners' willingness to communicate in a New Zealand ESL classroom: A multiple case study drawing on the theory of planned behavior. *System* **2013**, *41*, 740–751.
14. Cheon, J.; Lee, S.; Crooks, S.; Song, J. An investigation of mobile learning readiness in higher education based on the theory of planned behavior. *Comput. Educ.* **2012**, *59*, 1054–1064.
15. Allen, N.; Meyer, J. The measurement and antecedents of affective, continuance, and normative commitment to the organization. *J. Occup. Psychol.* **1990**, *63*, 1–18.
16. Lee, S.H.; Jeong, D.Y. Job insecurity and turnover intention: Organizational commitment as mediator. *Soc. Behav. Personal. Int. J.* **2017**, *45*, 529–536.
17. Emre, O.; De Spiegeleare, S. The role of work-life balance and autonomy in the relationship between commuting, employee commitment, and well-being. *Int. J. Hum. Resour. Manag.* **2021**, *32*, 2443–2467.
18. Min, K.; Hong, W. The effect of food sustainability and the food safety climate on the job stress, job satisfaction and job commitment of kitchen staff. *Sustainability* **2021**, *13*, 6813. [CrossRef]
19. Cuskelly, G.; Hoye, R. Sports officials' intention to continue. *Sport Manag. Rev.* **2013**, *16*, 451–464.
20. Hwang, Y.; Lin, H.; Shin, D. Knowledge system commitment and knowledge sharing intention: The role of personal information management motivation. *Int. J. Inf. Manag.* **2018**, *39*, 220–227.
21. Orgambídez, A.; Borrego, Y.; Vazquez-Aguado, O. Self-efficacy and organizational commitment among Spanish nurses: The role of work engagement. *Int. Nurs. Rev.* **2019**, *66*, 381–388.
22. Ajzen, I.; Kruglanski, A.W. Reasoned action in the service of goal pursuit. *Psychol. Rev.* **2019**, *126*, 774–786. [PubMed]
23. Hair, J.F.; Hult, G.T.M.; Ringle, C.M.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*; SAGE Publications, Inc.: Thousand Oaks, CA, USA, 2014.
24. Kock, N. *WarpPLS 7.0 User Manual*; ScriptWarp Systems: Laredo, TX, USA, 2021.
25. Cheng, E.W.L. Students working online for group projects: A test of an extended theory of planned behavior model. *Educ. Psychol.* **2017**, *37*, 1044–1056.
26. Gimeno-Arias, F.; Santos-Jaén, J.M.; Palacios-Manzano, M.; Garza-Sánchez, H.H. Using PLS-SEM to analyze the effect of CSR on corporate performance: The mediating role of human resources management and customer satisfaction. An empirical study in the Spanish food and beverage manufacturing sector. *Mathematics* **2021**, *9*, 2973. [CrossRef]
27. Heiny, J.; Ajzen, I.; Leonhäuser, I.-U.; Schmidt, P. Intentions to enhance tourism in private households: Explanation and mediated effects of entrepreneurial experience. *J. Entrep. Innov. Emerg. Econ.* **2019**, *5*, 128–148.
28. Liu, R.; Greene, R.; Li, X.; Wang, T.; Lu, M.; Xu, Y. Comparing geoinformation and geography students' spatial thinking skills with a human-geography pedagogical approach in a Chinese context. *Sustainability* **2019**, *11*, 5573. [CrossRef]
29. Maude, A. A sustainable view of sustainability? *Geography* **2014**, *99*, 47–50.
30. Liu, L. Where in the world of sustainability education is US geography? *J. Geogr. High. Educ.* **2011**, *35*, 245–263.
31. Chinese Ministry of Education (CMOE). *Revision of the 2021 Edition of the New Geography Curriculum Standard for Compulsory Education*; People's Education Press: Beijing, China, 2021.
32. Yli-Panula, E.; Jeronen, E.; Lemmetty, P. Teaching and learning methods in geography promoting sustainability. *Educ. Sci.* **2020**, *10*, 5.

33. Goekler, J. Teaching for the future: Systems thinking and sustainability. *Green Teach.* **2003**, *70*, 8–14.
34. UNESCO. Education for Sustainable Development. The United Nations Educational Scientific and Cultural Organisation, n.d. Available online: https://en.unesco.org/themes/education-sustainable-development (accessed on 25 July 2021).
35. Noble, T.; McGrath, H. Making it real and making it last! Sustainability of teacher implementation of a whole-school resilience programme. In *Resilience in Education*; Wosnitza, M., Peixoto, F., Beltman, S., Mansfield, C.F., Eds.; Springer: Cham, Switzerland, 2018; pp. 289–312.
36. Huang, H.; Cheng, E.W.L. Sustainability education in China: Lessons learnt from the teaching of geography. *Sustainability* **2022**, *14*, 513. [CrossRef]
37. Khudhair, N. The impact of applying mind mapping technique as a prewriting tool on EFL college students in essay writing. *J. Coll. Educ. Women* **2016**, *27*, 426–436.
38. Tsai, P.C.-F.; Yen, Y.-F.; Huang, L.-C.; Huang, I.-C. A study on motivating employees' learning commitment in the post-downsizing era: Job satisfaction perspective. *J. World Bus.* **2007**, *42*, 157–169.
39. Hew, K.F. Promoting engagement in online courses: What strategies can we learn from three highly rated MOOCS. *Br. J. Educ. Technol.* **2016**, *47*, 320–341.
40. Lawrence, K.C.; Fakuade, O.V. Parental involvement, learning participation, and online learning commitment of adolescent learners during the COVID-19 lockdown. *Res. Learn. Technol.* **2021**, *29*, 2544.
41. Reynolds, N.L.; Simintiras, A.C.; Diamantopoulos, A. Theoretical justification of sampling choices in international marketing research: Key issues and guidelines for researchers. *J. Int. Bus. Stud.* **2003**, *34*, 80–89.
42. Ajzen, I. Constructing a Theory of Planned Behavior Questionnaire. University of Massachusetts Amherst, n.d. Available online: https://people.umass.edu/aizen/pdf/tpb.measurement.pdf (accessed on 12 October 2021).
43. Kock, N. Common method bias in PLS-SEM: A full collinearity assessment approach. *Int. J. E-Collab.* **2015**, *11*, 1–10.
44. Felson, R.B. Self- and reflected appraisal among football players: A test of the median hypothesis. *Soc. Psychol. Q.* **1981**, *44*, 116–126.
45. Baron, R.M.; Kenny, D.A. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J. Personal. Soc. Psychol.* **1986**, *51*, 1173–1182.
46. Kock, N. Using WarpPLS in e-collaboration studies: Descriptive statistics, settings, and key analysis results. *Int. J. E-Collab.* **2011**, *7*, 1–18.
47. MacKinnon, D.P.; Fairchild, A.J.; Fritz, M.S. Mediation analysis. *Annu. Rev. Psychol.* **2007**, *58*, 593–614.
48. Preacher, K.J.; Hayes, A.F. SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behav. Res. Methods Instrum. Comput.* **2004**, *36*, 717–731. [PubMed]
49. Kopnina, H. Metaphors of nature and development: Reflection on critical course of sustainable business. *Environ. Educ. Res.* **2016**, *22*, 571–589.
50. Raath, S.; Hay, A. Preservice geography students' exposure to systems thinking and cooperative learning in environmental education. *J. Geogr.* **2019**, *118*, 66–76.
51. Cai, M. Also talk about how to develop junior middle school geography teaching under the background of new curriculum. *New Curric. Res.* **2015**, *1*, 34–35. (In Chinese)
52. Çifçi, T.; Koybaşi, F. Geographic consciousness in sustainable education: Students' views. *J. Educ. Pract.* **2017**, *8*, 49–55.
53. Collins, A.; Galli, A.; Patrizi, N.; Pulselli, F.M. Learning and teaching sustainability: The contribution of ecological foot print calculators. *J. Clean. Prod.* **2018**, *174*, 1000–1010.