

Article

Sustainable Behavior: Study Engagement and Happiness among University Students in South Korea

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Abstract: The purpose of the present study was to investigate the relationships among sustainable behavior, study engagement, and happiness. The participants were 202 undergraduate students. The present study used structural equation modeling to examine the relationship among variables, and two models were examined. The analyses revealed that the present data best fit Model 1, in which sustainable behavior was directly associated with happiness and mediated by study engagement ($\chi^2(24) = 46.743$, Turker-Lewis Index = 0.933, Comparative Fit Index = 0.955, Root Mean Square Error of Approximation = 0.06). The results indicate that sustainable behavior affect happiness directly. Additionally, sustainable behaviors affect happiness indirectly by mediation of study engagement. In closing, implications for educational practices are discussed.

Keywords: sustainable behavior; engagement; happiness

1. Introduction

Sustainability requires the protection of natural and human (social) environments. Activities related to social sustainability are referred to as sustainable behavior. Sustainable behavior is intended to save and protect limited natural resources, allow equitable access for everyone, and to foster cooperation and assistance among people [1,2]. Sustainable behavior takes into consideration the needs of both current and future generations, and is exhibited by pro-ecological behavior, equity, and altruistic behavior [3]. Pro-ecological behavior is purposeful behavior dedicated to the conservation and protection of natural resources; equity is defined as the equitable access to resources, based on the consideration of both present and future generations; and altruistic behavior is behavior designed to enhance human well-being by maximizing others' interests rather than one's own interests [4]. Steady efforts have been made since 1992 to implement sustainable behavior in educational settings, but the outcomes of the efforts have been scarce due to a lack of clear understanding of sustainable behavior. Social sustainability and equity in education affect a learner's well-being. Therefore, educators need to take a new approach in teaching sustainable behaviors and changing attitudes to align with these behaviors.

In recent years, a growing number of studies have examined sustainable behavior in relation to educational and psychological factors; happiness research is the primary example [5]. Happiness is an expected outcome of participating in sustainable development. Lykken and Tellegen [6] maintained that, among variables that influence a person's happiness, 50% are genetic, 10% are environmental, and 40% are inner activity. Inner activity includes everything that people think and do in everyday life. Emmons and McCullough [7] classified inner activity into three types: Thanking others, acting kindly to others, and setting up a personal goal or planning a meaningful activity. Happiness is generated from these behavioral strategies, which are indicators of sustainability [8]. People who engage in pro-ecological behavior were found to perceive themselves as happier than those who do not, and individuals who care about fairness experience a high level of subjective well-being [9]. In addition,

cooperative, compassionate, and altruistic people, who accommodate others' requests, were found to experience greater happiness [10]. These study results demonstrate positive psychological outcomes of sustainable behavior.

Veenhoven [11] argued that education and training for a better future contribute to happiness. It is, therefore, advantageous to facilitate both students' understanding of environmental problems and their involvement in solutions through an education that contributes to sustainable development.

Study engagement is a positive study-related state of mind, and includes passion, dedication, and commitment [12,13]. It refers to the investment of effort in study, i.e., being strongly involved in study. It includes a behavioral (e.g., effort) and affective (e.g., enjoyment, positive attitude about study) subtype [14,15]. Engagement related to good health and has a positive affect [16]. Chambel and Curral [17] reported that students who are deeply engaged in learning show both a high level of academic performance and a positive well-being. Other research has shown that an engaged person experiences greater levels of well being [18,19]. This implies that engaging in study helps individuals experience happiness.

In a study on measures to facilitate a positive learning status, Ouweneel et al. [20] found that thanking others and exhibiting altruistic and kind behaviors provoke positive learning-related emotions. It was found that students experienced positive emotions by engaging in kind behavior, and this facilitated students' engagement in learning [21]. Christenson et al. [22] also demonstrated that both behavioral and affective components play important roles in student engagement. This suggests that experiencing positive emotions from engaging in behavior leading toward a common good results in a deeper engagement in learning, which contributes to subjective well-being and happiness.

The results of previous studies suggest that participating in sustainable behavior to protect natural and human environments contributes to individuals' engagement and happiness; positive emotions—such as happiness—in turn, contribute to learners' well-being. Happiness can transform an individual and facilitate positive behavior. Educators, therefore, must pay attention to students' happiness. Studies on sustainable behavior and positive psychological factors are, unfortunately, significantly lacking. Therefore, this study aims to investigate the structural relationships among sustainable behavior, study engagement, and happiness, in college undergraduates, to inform the direction of sustainable education and student happiness.

2. Literature Review

2.1. Sustainable Behavior and Happiness

Sustainable behavior is directed at protecting natural and human (social) environments. Sustainable behaviors included in this study are pro-ecological behavior, altruistic behavior, and equitable behavior. Pro-ecological behavior is purposeful and is an effective behavior in relation to the protection of natural resources. It includes conservation of water and energy, and reusing and recycling resources [3]. Altruistic behavior is a motivated state toward promoting others' well-being, and refers to the tendency to maximize others' interests over one's own [23]. Pro-social and altruistic behavior is an indicator of sustainable behavior, and is described as the behavior of seeking others' interests [24]. Equity pertains to impartiality within oneself and with others, and views on social, racial, economic, age, or gender biases. It values, not only equitable distribution of limited resources, but also the balance between the human and sociophysical environments. This type of sustainable behavior is related to individuals' psychological factors, of which the primary example is happiness.

Happiness emanates from enjoyment, satisfaction, and a positive sense of well-being, and conveys the feeling that life is meaningful and worthy [25]. Ryan and Deci [26] assert that happiness can be defined as the affective-cognitive state of thinking and feeling positively about one's life. Diener [27] argued that subjective judgment of how people feel about their lives is more important than objective criteria. Therefore, being satisfied with one's life through sustainable behavior can be an important criterion for happiness. Those who engage in sustainable behaviors were found to perceive themselves

as happier than those who did not. People who live an equitable life experience more subjective happiness [9], and altruistic people are happier than selfish people [28]. Moreover, people who engage in sustainable behavior were found to be more intimate and feel happier in relationships with significant others [29].

2.2. Sustainable Behavior and Study Engagement

Corral-Verdugo [30] argued that sustainable behavior requires control of external stimuli and inner environment. This is because people preserve resources for the environment and future generations, and put others' interests before their own. The same applies to students' learning. It was found that, when students have autonomy and self-control, they were more engaged in studying [31]. Committed and engaged students have mastery achievement goals and a high level of self-control [32]. This suggests that engagement requires inner control, and increases when individuals have autonomy in their work [33,34]. Self-efficacy experienced in the learning process is another important factor that provides learners with a sense of well-being [35]. Thus far, the relationship between sustainable behavior and study engagement has not been studied. However, studies on sustainable behavior require self-control, and the fact that people who have self-control are more engaged in study suggests that these variables are associated.

2.3. Study Engagement and Happiness

McInnis [36] viewed study engagement as diligent intellectual activity and purposeful participation in learning. In other words, study engagement is associated with the level of energy a learner invests in studying, both physically and psychologically [37]. In this study, study engagement is defined as the ongoing positive state of being motivated to study. This includes passion, dedication, and commitment [12,13]. When students have positive attitudes toward studying, they are more engaged in studying because they are motivated. In a study of Australian college students, Cotton et al. [38] reported that students that were more deeply engaged in study showed better performance and higher satisfaction with respect to their academics. This suggests that study engagement is associated with high academic performance and positive emotions [39,40]. Gavin and Mason [41] also reported that happiness was associated with individuals' levels of engagement, and that engagement and happiness led groups to success [42].

3. Purpose of This Study

The aim of this study was to examine the association among sustainable behavior, study engagement, and happiness in a sample of Korean undergraduate students. Based on a literature review, two Structural Equation Modeling analyses were employed. The models incorporated results from previous studies; Corral-Verdugo et al. [43], Schaufeli et al. [40], and Ouweneel et al. [44], which concluded that sustainable behavior and study engagement positively influence happiness. In addition, this study assumed that sustainable behavior is associated with study engagement. According to previous studies, study engagement and sustainable behavior, both, have behavioral components, such as control over one's own behavior [30,31]. Additionally altruistic behaviors provoke positive learning-related emotions and deeper engagement [20,21]. These results indicate that sustainable behavior and study engagement are related to happiness. Model 1 hypothesizes that the effect of sustainable behavior on happiness is partially mediated by study engagement. Model 2 hypothesizes that the effect of sustainable behavior on happiness is fully mediated by study engagement. In this study, the models were compared to explain the relationships between the variables.

4. Methods

4.1. Subjects

The subjects of this study were 202 undergraduate students who volunteered. Participants were recruited from metropolitan areas in South Korea. The questionnaire was administered to undergraduates during the last week of the fall semester. Of the study population, 103 participants (51%) were male and 99 participants (49%) were female. Of those participants, 51 (25.2%) were first year students, 72 (35.6%) were in their second year, 43 (21.3%) were in their third year, and 36 (17.8%) were in their fourth year. The students ranged in age, from 20 to 32; the mean age was 22.9.

4.2. Measures

Sustainable behavior was measured using the Sustainable Behavior Scale [45]. This scale consists of three factors; pro-environmental behavior, altruistic behavior, and fairness, and includes twelve items measuring the frequency of participation in sustainable behavior on a five-point Likert scale. An example of a pro-environmental item is: I recycle paper; altruistic behavior: I yield my turn to those who are in a hurry; and fairness: Everyone has a right to education. Higher scores indicate a higher level of behavior in the factor measurements. The scale reliability was 0.85. Study engagement was measured using the Study Engagement Scale [46], which is based on Gallini, Sarah and Moely's (2003) [47] academic engagement study. Study engagement items included: I enjoy taking classes; I am interested in this course; and I try to apply what I learn from class to real life; this scale consisted of three items. The items were five-point Likert scaled and the scale reliability was 0.76. Happiness was measured using the happiness scale [46], which is based on Lyubomirsky and Lepper's (1999) [48] happiness theory. The happiness scale consisted of a single factor of three items on five-point Likert scale. The happiness items included: I am happy, I enjoy my life, and I am satisfied with my life. The scale reliability was 0.72.

4.3. Data Analysis

This study aimed to determine the structural relationship among undergraduate students' sustainable behavior, study engagement, and happiness. The study was conducted by establishing research models, based on previous studies, and compared Models 1 and 2. To evaluate the model fit of structural equations, maximum likelihood was used, and the model fit was compared using χ^2 (chi-squared statistics), χ^2/df (degree of freedom), root means square error of approximation (RMSEA), comparative fit index (CFI), and the Tucker-Lewis index (TLI). Following the model-fit comparison, the model with greatest parsimony and validity was selected as the final model, direct and indirect effects and path coefficients of the final model were then examined. The comparison of model fit and direct and indirect effects was conducted using Amos 18.0 (IBM: Armonk, NY, USA). Reliability and correlations among variables were investigated using SPSS 19.0 (IBM: Armonk, NY, USA).

5. Results

5.1. Descriptive Statistics and Interrelations of Variables

In Table 1, the socio-demographic characteristics are presented. Pro-environmental behavior and fairness differed according to gender. Women showed higher levels of pro-environmental behavior and fairness than men ($p < 0.01$, $p < 0.05$). School grade comparisons showed that the 2nd year students (M/SD = 11.0/1.9; $n = 72$) were more actively involved in study than the 4th year students. Additionally, 4th year students (M/SD = 13.7/1.3; $n = 36$) showed higher levels of fairness than 1st and 2nd year students. Meanwhile, altruistic behavior and happiness differences were not found in genders and grades.

Table 1. Socio-demographic characteristics and gender differences ($N = 202$).

Variables	Male	Female	t	F/scheffe
	M/SD	M/SD	(Gender)	(Year)
Pro-environmental behavior	10.5/2.2	11.4/1.7	-3.2 **	1.2
Altruistic behavior	11.7/2.4	12.2/1.5	-1.9	1.3
Fairness	12.6/2.0	13.2/1.7	-2.2 *	3.8 * (4 > 1, 2)
Study engagement	10.2/2.3	10.6/1.7	-1.5	4.8 ** (2 > 4)
Happiness	10.6/2.2	10.6/2.0	-0.1	2.2

* $p < 0.05$, ** $p < 0.01$.

Prior to investigation of the relationships among sustainable behavior, study engagement, and happiness, descriptive statistics, correlation coefficients, and factor analysis of independent variables were compared. As shown in Table 2, correlations among variables showed an overall positive correlation. Happiness, as the dependent variable, was found to be most highly correlated with sustainable behavior, followed by correlation with study engagement. Means and standard deviations of variables were found to range between 10.42 (SD = 2.02) and 50.0 (SD = 6.9). Among sublevel factors of sustainable behavior, fairness (M = 17.28; SD = 2.48) scored highest, followed by pro-environmental behavior (M = 17.01; SD = 3.46), and altruistic behavior (M = 15.78; SD = 2.78). As shown in Table 3, five factors were rotated to a varimax solution. These factors are accounted for 71.3% of the total variance and each factor comprised sets of items that were interpretable and content relevant.

Table 2. Descriptive statistics and correlations among variables ($N = 202$).

Variables	Pro-Environmental Behavior	Fairness	Altruistic Behavior	Sustainable Behavior	Study Engagement	Happiness
Pro-environmental behavior	1					
Fairness	0.299 **	1				
Altruistic behavior	0.445 **	0.588 **	1			
Sustainable Behavior	0.788 **	0.746 **	0.837 **	1		
Study Engagement	0.195 **	0.213 **	0.249 **	0.274 **	1	
Happiness	0.194 **	0.413 **	0.384 **	0.400 **	0.295 **	1
M	17.01	17.28	15.78	50.0	10.42	10.58
SD	3.46	2.48	2.78	6.9	2.02	2.14

** $p < 0.01$.**Table 3.** Factor analysis among variables ($N = 202$).

Measure	Component	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Pro-environmental behavior	1	0.829				
	2	0.702				
	3	0.661				
Altruistic behavior	4		0.805			
	5		0.744			
	6		0.723			
Fairness	7			0.838		
	8			0.812		
	9			0.790		
Study engagement	10				0.857	
	11				0.838	
	12				0.722	
Happiness	13					0.830
	14					0.756
	15					0.683
Eigenvalues		5.242	1.886	1.427	1.211	0.933

5.2. Moderated Model

This study used a hierarchical regression model to explore the moderating influence of study engagement on the relationship between sustainable behavior and happiness. First, this study estimated a model including only the main effect. Second, a moderating variable was added. In the third step, an interaction variable was added. Therefore, the results of the moderated regression showed that sustainable behavior and study engagement had significant effects on happiness; however, there was no significant interaction effect on happiness (Table 4).

Table 4. Results of the moderated regression analysis ($N = 202$).

Variables	β	Additional R2	F-Change	p
Step 1 sustainable behavior	0.41	0.17	42.5	***
Step 2 sustainable behavior, study engagement	0.46	0.03	9.1	**
Step 3 Sustainable behavior * study engagement	0.47	0.01	3.7	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

5.3. Measurement Model

The goodness of fit of measurement models was examined. The model fit was determined using χ^2 statistics, TLI, CFI, and RMSEA. CFI and TLI of 0.90 or higher is determined as a good fit and RMSEA of 0.08 or lower is considered better fit with data [49]. Test results of measurement model fit are shown in Table 5.

Table 5. Fit of the measurement model ($N = 202$).

Model	χ^2	df	χ^2/df	TLI	CFI	RMSEA
Measurement model	46.743	24	1.948	0.930	0.955	0.06

Note: TLI = Turker-Lewis index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation.

The test results of goodness of fit of measurement models consisting of sustainable behavior, study engagement, and happiness showed χ^2 of 46.743 ($df = 24$, $p < 0.001$), and standardized χ^2 of 1.948. In terms of fit indices, TLI 0.930, and CFI 0.955, indicated above the theoretical index level of 0.90, and RMSEA was also found to be 0.06 and meet criteria. Standardized factor loadings of individual measurement items were found to range between 0.48 and 0.87, meeting the criterion of 0.40 [50]. Path coefficients between measurement variables showed the range of 0.33–0.61, which was also found to be significant ($p < 0.001$).

5.4. Mediation Model

To test the fit of structural relation models, the fit of Models 1 and 2 were compared (see Table 6). Model 1 hypothesizes that sustainable behavior has a direct and an indirect effect on college students' happiness, mediated by study engagement. The model-fit test of Model 1 yielded χ^2 of 46.743 ($df = 24$, $p < 0.001$), and standardized χ^2 of 1.948. In terms of fit indices, TLI and CFI were 0.933 and 0.955, respectively, and RMSEA was 0.069. Model 2 hypothesizes that sustainable behavior has an indirect effect on college students' happiness, mediated by study engagement. The model fit test of Model 2 yielded χ^2 of 81.492 ($df = 25$, $p < 0.001$), and standardized χ^2 of 3.26. In terms of fit indices, TLI and CFI were 0.840 and 0.889, respectively, and RMSEA was 0.106. The comparisons of fit indices of Models 1 and 2 suggested that all indices for Model 1 were adequate, and the RMSEA was also an acceptable level. However, for Model 2, fit indices were out of the acceptable range. Regarding path coefficients between variables for Model 1, all path coefficients were statistically significant: Path between sustainable behavior and study engagement ($\beta = 0.33$), path between study engagement and

happiness ($\beta = 0.21$), and path between sustainable behavior and happiness ($\beta = 0.53$). In Model 2, both the path between sustainable behavior and study engagement ($\beta = 0.37$) and the path between study engagement and happiness ($\beta = 0.44$) were statistically significant. Based on an examination of the results of the model comparison, Model 1 was chosen as the final model in this study.

Table 6. Fit of the mediation model ($N = 202$).

Model	χ^2	df	χ^2/df	TLI	CFI	RMSEA
Model 1	46.743 ***	24	1.948	0.933	0.955	0.069
Model 2	81.492 ***	25	3.26	0.840	0.889	0.106

*** $p < 0.001$. Note. TLI = Turker-Lewis index; CFI = Comparative Fit Index; GFI = Goodness of Fit Index; RMSEA = Root Mean Square Error of Approximation.

Table 7 shows path coefficients of the final model. In terms of individual path coefficients, the path coefficient for sustainable behavior to study engagement was 0.33, the path coefficient for study engagement to happiness was 0.21, and the path coefficient for sustainable behavior to happiness was 0.53. The composite reliability (CR) was found to be at a significant level in all paths at 0.05.

Table 7. Results from the path model ($N = 202$).

Variables	β	S.E.	C.R.	p
sustainable behavior–study engagement	0.33	0.02	3.22	**
Study engagement–happiness	0.21	0.09	2.38	*
Sustainable behavior–happiness	0.53	0.03	4.06	***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

To verify the effects among sustainable behavior, study engagement, and happiness, direct effects, indirect effects, and total effects were determined. Table 8 shows direct and indirect effects between variables in the final model. Sustainable behavior was found to have direct effects of 0.33 on study engagement, and 0.53 on happiness. Study engagement was found to have a direct effect of 0.21 on happiness. Moreover, sustainable behavior was found to have the indirect effect of 0.07 on happiness mediated by study engagement, and a total effect of 0.61 on happiness. These results of the final model suggest that sustainable behavior has direct and indirect effects on happiness in college students, mediated by study engagement (Figure 1).

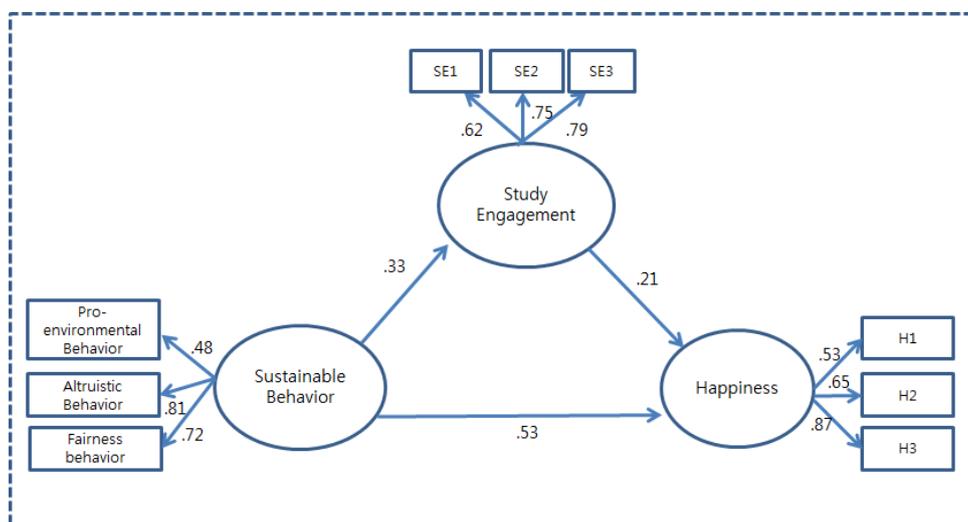


Figure 1. Structural equation model regarding standardized estimates.

Table 8. Results from the path model ($N = 202$).

Variables	Direct Effect	Indirect Effect	Total Effect
sustainable behavior–study engagement	0.33 ***		0.33 ***
study engagement–happiness	0.21 ***		0.21 ***
sustainable behavior–happiness	0.53 ***	0.07 ***	0.61 ***

*** $p < 0.001$.

6. Discussion

This study was conducted to investigate the relationships among sustainable behavior, study engagement, and happiness. Specifically, it modeled structural relations on the variables and investigated the influence of sustainable behavior on learners' happiness, mediated by study engagement. The study created two models: Model 1, in which sustainable behavior has direct and indirect effects on happiness, mediated by study engagement; and Model 2, in which sustainable behavior has an indirect effect on happiness, mediated by study engagement, and then compared them. Based on the results of the comparison, Model 1 was chosen as the final model, and it was found that sustainable behavior has direct and indirect effects on happiness, mediated by study engagement. Additionally, this study explored the moderating effect of study engagement. The result showed that sustainable behavior and study engagement had significant effects on happiness; however, there was no significant association effect in this survey.

The results of the mediation analysis suggested that college students' sustainable behavior was positively associated with study engagement, and study engagement was positively associated with happiness. This result is consistent with Corral-Verdugo et al. [43] and Zelenski and Nisbet [51], who that reported a positive relationship between sustainable behavior and happiness, and Chambel and Curral [17], who examined the effect of students' engagement on happiness. In addition, the results correlate with Salanova et al. [31] and Howell [32], who argued that engagement requires self-control and autonomy. Sustainable behavior is deliberate and effective [4]. Study engagement is in a range of educationally purposeful activities [52]. These factors need both self-control and a positive perspective. Prior studies also demonstrated that people's happiness is under their control and motivation [53,54].

In the present study, study engagement was positively correlated with pro-environmental behavior, altruistic behavior, and fairness; altruistic behavior showed the highest correlation with study engagement. This provides partial support for the findings of Pekrun et al. [21], which identified positive relationships between gratitude, kind behavior, and study engagement. In the relationship between sustainable behavior and happiness, fairness showed the highest correlation with happiness.

The results of this study suggest that behavior management, such as sustainable behavior and engagement, influence the happiness of college students. This further suggests that students who have concern for society and others—who can control and regulate their behaviors for that purpose—can also be engaged and committed in an educational setting by controlling their behaviors. Sustainable behavior is to consider the well-being of future generations, moving beyond mere conservation of resources. Moreover, a sustainable behavior affects other sustainable behaviors, and, consequently, catalyzes entire sustainable behaviors and systems. Therefore, for a sustainable society and the future of humanity, it is important to teach an effective management of given resources, and cultivate minds and attitudes toward a concern for others.

Learners' happiness is associated with personal well-being, as well as academic success [55]. For this reason, happiness is an important issue for both individuals and society. Diener [27] argued that, in happiness, subjective judgment of how people feel about their lives is more important than the objective criteria. In that context, this study aimed to investigate sustainable behavior that requires learner's autonomic control and values in relation to educational settings and happiness. This study will contribute to an increase in understanding, and will make advances in a learner's well-being and life in a sustainable society.

Although the results of this study can provide significant implications for a learner's studies and well-being, and sustainable society, this study may have limitations due to inclusion of study participants from specific regions and age groups. Additionally, this paper may potentially have a weakness due to sample size. Although a minimum sample size of 200 is recommended for accurate parameter estimates [56], this research does not have a large enough sample size. Future studies should consider a broader sampling and socio-demographic characteristics. Additional exploration on antecedent and outcome variables of sustainable behavior and happiness is also necessary. Engaging in positive behavior boosts happiness by satisfying psychological needs, such as self-control and competence [18]. In addition, happy people perceive a high degree of control and exhibit environmental morals [57,58]. Therefore, happiness can be measured as possibly both dependent and independent variables. Both study outcomes make an important contribution to future research. These efforts are expected to enhance learners' awareness regarding the well-being of environment and society, and further lead to fostering a learning environment that emphasizes positive psychology.

Conflicts of Interest: The author declares no conflict of interest.

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