Attitude as a Mediator between Sustainable Behaviour and Sustainable Knowledge: An Approximation through a Case Study in the Dominican Republic

Cándida María Domínguez-Valerio [1] , **Salvador Moral-Cuadra** [2,*] ,
Miguel Jesús Medina-Viruel [2] and **Francisco Orgaz-Agüera** [1]

[1] Universidad Tecnológica de Santiago, 51000 Santiago de los Caballeros, Dominican Republic;
candidadominguez1@docente.utesa.edu (C.M.D.-V.); franorgaz@utesa.edu (F.O.-A.)
[2] Department of Statistics, Econometrics, Operational Research, Business Organization and Applied
Economics, University of Cordoba, 14071 Córdoba, Spain; mjmedina@uco.es
[*] Correspondence: salvador.moral@uco.es

check for updates

Abstract: The current ongoing globalisation shows an increasing amount of issues regarding sustainability, which is to be addressed from the very first stages. In this sense, different variables have been measured in the form of a survey in order to learn about the behaviour, attitude and knowledge of high school students in the Dominican Republic regarding sustainability, using a methodology based on structural equations through the SmartPls (v. 3.2.8) program. Among the main deductions, a mediation between their knowledge and behaviour towards sustainable development is to be highlighted.

1. Introduction

Globalisation is a process of interaction and integration between the people, industry and governments of different nations, which is backed by information technologies. This process produces effects on the environment, culture, political systems, development and economic prosperity, as well as on the well-being of people who make up societies around the world (Baylis et al. 2017). It has led some authors (Aziz et al. 2012; Asan et al. 2014; De Leeuw et al. 2014; Tucker and Izadpanahi 2017; Al-Naqbi and Alshannag 2018) to ponder over the importance of measuring variables such as the behaviour, attitude and knowledge of students toward sustainable development.

The theoretical approach of this study is marked by the theory of sustainable development (CMMAD 1988). Sustainable development refers to the satisfaction of current needs without compromising the ability of future generations to meet their own (WCED 1987). This approach focuses on three vertices: economic, social and environmental (Linnanen and Panapanaan 2002). This approach implies that a sustainable economic system must produce goods and services on a continuous basis to maintain levels of government and external debt, avoiding sectoral imbalances. A sustainable social system must contribute to distributive equity and to the adequate provision of social services, such as health or education, among others. For its part, an environmentally sustainable system must guarantee a basis of stable resources, avoiding the overexploitation of renewable resources and the depletion of non-renewable resources. Therefore, sustainable development represents the sum of the responsible behaviours of all economic, social and political actors (Palacios Florencio 2012). A significant example is the young people who have been developing global marches in favour of

climate and global warming, demanding that governments take immediate measures against climate change. In this sense, these climate protests, called "Fridays For Future" mobilised more than 1.6 million people worldwide in March 2019. This wave of youth protest climate mobilisation, led by Greta Thunberg, is illustrating a level of global attention that no other youth movement, previous, had received (Hagedorn et al. 2019; Wahlström et al. 2019).

Young people have the potential and technological possibilities to be the key drivers of smarter and more sustainable cities in Latin America and the Caribbean (OECD et al. 2016). Therefore, their perceptions regarding the three vertices of sustainable development must be analysed in order to establish strategies in secondary schools and to promote economic, social and environmental skills and abilities in a sustainable way. For example, if young people have more and better skills, and also have greater opportunities for entrepreneurship, they will boost inclusive economic growth in the region (OECD et al. 2016). In this sense, the Dominican Republic needs young people to promote the development of the regions through sustainable practices.

Among the studies that explored the behaviour, attitude and knowledge of students toward sustainable development, the study by Azapagic et al. (2005) stands out. These authors conducted a survey of undergraduate engineering students, residents in Australia, Brazil, France, Germany, Italy, Sweden, Thailand, United States, United Kingdom and Vietnam, with the purpose of examining their understanding of sustainable development. The study indicated that, although the students showed a low level of knowledge about sustainable development and significant knowledge gaps in terms of the economic and social aspects of sustainable development, they believed that it would be more important for future generations. In addition, the study found that students were relatively familiar with key environmental regulations, laws, and policies.

Based on the results of this research, it is intended to generate implications for sustainable growth in order to promote and undertake actions for sustainable development in secondary education, for these young people will have to face the challenges for the development of the country in the near future. This research encourages the reflection of students of secondary education institutes of the Dominican Republic in relation to the promotion of sustainability, encouraging favourable actions towards sustainable development (Borges et al. 2017). Education causes individuals to care more about social welfare and, consequently, behave in a more respectful way in favour of sustainable development (Meyer 2015). This study contributes to the need to perform this type of research among younger students (Al-Naqbi and Alshannag 2018).

There is, however, a lack of studies and scientific literature in the Dominican Republic on the different indicators that make up sustainable development in a country in full development. This shows how the few studies that exist focus especially on the environment, leaving the social and economic aspects aside. As for sustainable development, it is more studied in global environments and there is a greater amount of literature. Regarding studies on students' perception of sustainable development, no study is found in developing countries, including the Dominican Republic, and so the authors insist on the need to analyse aspects such as the behaviour, attitude and knowledge of the students of the country. Education plays an important role in sustainable development; therefore, it is not enough to provide education if it is not of quality and if it does not involve professional inclusion and, with it, integration into society (CEPAL 2013).

This research aims to analyse whether attitude is a mediating element between behaviour and sustainable knowledge. The research question that this study addresses is how the attitude towards sustainable development influences the relationship between students' knowledge about sustainability and their sustainable behaviour. This way, the mediating role of attitude will be determined. The results of this study will be useful for the managers and administrators of secondary schools and institutes of the Dominican Republic, encouraging them to develop strategies to improve the sustainable behaviour of the students. It will be useful for government officials as well, reinforcing the importance of sustainable development in future curricula. This study is relevant because, although there are authors (Michalos et al. 2011; Aziz et al. 2012) who have performed research on the variables of this

research, it is the first time, according to the authors of this research, that their relationship is studied in secondary school students located in developing countries, where there is a major problem in relation to sustainable development. In addition, it is the first time, according to the authors of this research, that a mediation study is carried out among the variables defined in this research.

2. Theoretical Background

Attitudes are beliefs and feelings about an object that set consistent behaviour towards it (Fishbein and Ajzen 1974). According to Kaliyaperumal (2004), attitude focuses on feelings towards something and on predetermined opinions. For Vandamme (2009), attitude refers to how an individual feels. Lian et al. (2014) proposed that an attitude was an individual's internal intention towards an objective object and was the origin and preparation for a behaviour. Therefore, an attitude is a complex type of psychological process that includes the tendency to perception, emotion and behaviours and has lasting and consistent characteristics (Zheng et al. 2018).

On the other hand, knowledge refers to the facts and principles accumulated by humanity on a subject and can be objective or subjective (Tsaur et al. 2010). Objective knowledge refers to information stored in a person's brain—that is, how much a person really knows about a product, problem or object, while subjective knowledge is a self-assessment of the individual's own knowledge (Vicente-Molina et al. 2013). So, knowing things, facts, concepts and interrelations that can communicate verbally or stay in mental models is declarative knowledge, while procedural knowledge refers to the skills of knowing how to act (Tsaur et al. 2010). Huang and Shih (2009) suggested that having knowledge about sustainable aspects, especially environmental aspects, is related to understanding and concern regarding natural environments, and encourages greater responsibility on the part of an individual towards the sustainability of a place.

Behaviour, on the other hand, is the process of decision and action of the individuals that involves the evaluation, acquisition, use or disposition of goods and services (Loudon and Bitta 1993). It is the way a person behaves in a certain situation or in general. Individual behaviours studied in psychology indicate that individual activities can be observed or measured by instruments in a narrow sense of explanation (Zheng et al. 2018). From a generalised definition, they include not only explicit activities that can be directly observed or measured, but also internal psychological processes that can be predicted indirectly. Therefore, a behaviour is a type of generalisation term and its connotation includes all the activities of an individual (Zheng et al. 2018). In this context, favourable behaviour towards sustainability conditions the intention to participate in environmentally sustainable behaviours (De Leeuw et al. 2014).

Regarding the definition of environmental attitudes, several theoretical approaches and backgrounds have been used, but there are no definitions of clear and widely shared attitudes for sustainable development, and psychosocial variables have emerged as an important component in the literature (Biasutti and Frate 2017). Environmental attitude can be defined as a psychological tendency expressed through the evaluation of the natural environment with some level of preference (Vicente-Molina et al. 2013). The interest of investigating environmental attitudes derives from their potential influence on human behaviour (Rodríguez-Barreiro et al. 2013).

As Education for Sustainable Development (ESD) includes the environment, the economy, and society, learners must acquire basic knowledge of the natural sciences, humanities, and social sciences before they can understand the principles of ESD (McKeown et al. 2002). When appropriate knowledge and skills have been acquired, students can then make appropriate environmental decisions regarding their behaviour (Scott and Oulton 1998). In general, the objective of ESD is to improve students' knowledge and help them develop the skills necessary to participate in development issues (Kopnina 2012).

Education for sustainable development is crucial to improve or change students' ways of thinking and acting in order to create a viable socio-economic and environmental future for all (De Leeuw et al. 2014). In this sense, behaviour, attitude and knowledge of students towards sustainability have been

studied, although there are still doubts about the influence and relationship of these concepts with each other. According to Michalos et al. (2011), favourable attitudes towards sustainable development influence knowledge about sustainable development. For Aziz et al. (2012), basic knowledge about sustainable development has a strong correlation to the development and improvement of students' attitude towards sustainability. Asan et al. (2014) concluded that high school students tend to show more concern about environmental problems. On the other hand, De Leeuw et al. (2014) revealed that different behaviours towards sustainability condition the students' intention to participate in environmentally sustainable behaviours, compared to their intention to conduct socially sustainable behaviours. Borges et al. (2017) demonstrated that the students of the schools can promote sustainable development through their student organisations. Even Tucker and Izadpanahi (2017) identified how young people who attend sustainably designed elementary schools have more sustainable attitudes and behaviours.

Vicente-Molina et al. (2013) revealed that, in university, knowledge about sustainable development influences behaviour and attitude towards sustainability. Al-Naqbi and Alshannag (2018) revealed that students show a high level of understanding, very strong positive attitudes and moderate positive behaviour towards sustainable development. Dagiliūtė et al. (2018) found that only the sustainability of the campus and its information significantly determine the participation and behaviour of students in sustainable processes and actions. On the other hand, Molderez and Fonseca (2018) suggest, as a guarantee for the development of sustainability competencies, that teachers combine different learning activities or include a variety of features to promote as many competences as possible in order to improve the behaviours and attitudes of young people in favour of sustainable development. Hence the interest, from the socioeconomic level, in encouraging education that promotes the sustainable and socially responsible management of individuals and organisations: sustainable development is an important process to achieve human development in a prudent, connected, and safe way (Gladwin et al. 1995).

Shephard (2008) points out that students acquire their behaviour, attitude and knowledge regarding sustainability through their cognitive and affective domains of learning. According to the author, cognitive learning is more related to knowledge while the affective domain is related to values, attitudes, and behaviours. Students' knowledge about sustainable development and the environment is exemplified by their ability to identify concepts and behaviour patterns related to sustainability and environmental problems, as well as possible solutions to those problems (Laroche et al. 2001). An increase in student knowledge does not necessarily result in behavioural changes (Bartiaux 2008), and attitude is not a significant variable to explain pro-environmental behaviours (Vicente-Molina et al. 2013). The environmental attitude is a psychological predisposition that is articulated by evaluating the natural environment with a certain degree of favour or dislike (Milfont and Duckitt 2010). Although the relationship between behaviour, attitude and knowledge is not necessarily linear, some authors such as Sia et al. (1986) and Hsu (2004) suggest that individuals' environmental behaviours reflect their environmental knowledge. Vicente-Molina et al. (2013) concluded that knowledge is a necessary but not sufficient condition for pro-environmental behaviour, due to the presence of external factors that affect human behaviours.

Considering the discussed above, the following hypotheses are proposed:

Hypothesis 1 (H1). *Knowledge about sustainable development has a positive relationship with behaviour towards sustainable development.*

Hypothesis 2 (H2). *The attitude towards sustainable development positively mediates the relationship between knowledge about sustainable development and behaviour towards sustainable development.*

In this way, the study model is presented in the following figure (Figure 1).
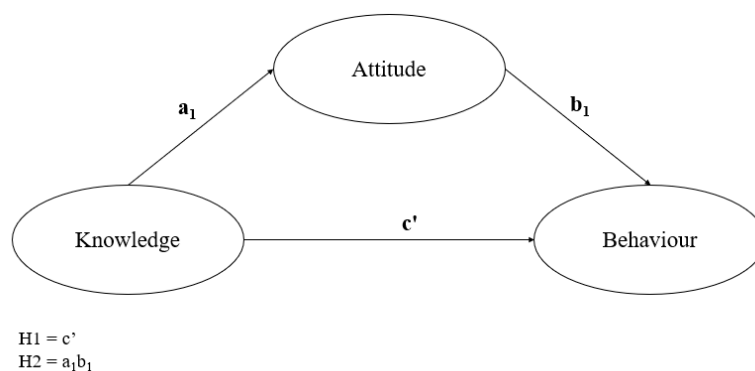
Figure 1. Structural model.

3. Methodology

The population that has been studied in this research is the students of the Mexico Polytechnic Institute, located in the Dominican city of Santiago de los Caballeros. The aforementioned educational centre has 1611 secondary school students divided into different itineraries: Accounting and Finance, Electricity, Electronics, Nursing, Computer Science and Mechatronics.

The survey collection period was between August and October 2018, obtaining a total of 780 surveys, with 741 valid surveys. The result has a sample error of ±2.5% at a confidence level of 95.5%. Regarding the questionnaire, it is structured in 5 clearly differentiated parts: the first one deals with knowledge about sustainable development; the second, with the attitude towards sustainable development; the third part considers the behaviour towards sustainable development; the fourth section deals with the intention to participate in sustainable development processes. Finally, sociodemographic data were addressed in the fifth section. The first four sections of the survey are measured through 5-point Likert scales (from 1: Strongly disagree to 5: Strongly agree), while the last section of the survey used open answer questions.

The questionnaire was prepared using previous studies (Michalos et al. 2011, 2012; Zsóka et al. 2013; Asan et al. 2014; Michalos et al. 2014; Biasutti and Frate 2017; Al-Naqbi and Alshannag 2018; Dagiliūtė et al. 2018), thus ensuring its validity. In this way, all the items referring to the variables of this research (attitude about sustainable development, knowledge about sustainable development and behaviour in favour of sustainable development) were extracted from these studies and subsequently adapted to the context of this research: students of secondary education located in a developing country, where there are strong negative impacts of socio-economic and environmental nature. The statistical program SPSS 24.0 was used for tabulation and prior debugging of items, using the Cronbach alpha to check the previous reliability, and eliminating those items with a total-corrected element lower than 0.3 (Norussis 1993). No items had to be removed, obtaining a final Cronbach alpha of 0.827, a level accepted by the scientific literature (Black and Porter 1996).

The development of the research was carried out through the program of structural equations based on partial least squares (PLS) Smart PLS 3.2.8. This program has been selected to validate the model because, currently, it is accepted in the scientific literature, especially in studies similar to this and published in high-impact journals (Hair et al. 2016; Henseler et al. 2016; Moral-Cuadra et al. 2019). The partial least squares method is a structural model based on variance (Roldán and Sánchez-Franco 2012), which has been used mainly due to the characteristics of the different constructs that make up the model, denominating these as compounds. The use of this technique is recommended when it comes to a compound-based model (Becker et al. 2013; Henseler et al. 2014; Sarstedt et al. 2016). The compounds present in the model have been modeled as Mode B compounds (Attitude towards sustainable development) and Mode A (Knowledge about sustainable development and Behaviour towards sustainable development).

Henseler et al. (2016) established three differentiated stages: the first is where the goodness of global adjustment is addressed, through the Standardised Root Mean Square Residual (SRMR), although

several authors do not suggest this initial test (Rigdon et al. 2017). In a second stage, the measurement model is approached, differentiating between the aforementioned Mode A compounds and Mode B compounds (Richter et al. 2016). Finally, the third stage analyses the structural model, carrying out the hypothesis contrast and the analysis of the coefficient of determination (R^2) (Henseler et al. 2009).

4. Results and Discussion

4.1. Sociodemographic Profile of the Sample

Of the total sample collected and validated (741 surveys), 37.9% turned out to be men, while 62.1% were women. A total of 98.6% of the cases were of Dominican nationality, with an age range between 18 and 20 years in more than two-quarters of the total sample (68.8%). Of the total number of students, 41.1% said they completed high school in the Accounting and Finance itinerary, the second and third most studied being Electronic and Computer Science—both with 15% each. Regarding the family nucleus, 55.5% declared belonging to a family between 2 and 4 people (including the respondent) or 5 or more people (43.3%). In addition, 82.9% declare that they were not working while enrolled in high school studies.

4.2. Measures

The minimum measures required within the different phases that make up the model analysis are shown in Table 1 (Henseler et al. 2009; Henseler et al. 2015; Hair et al. 2017).

Table 1. Model minimum requirement values.

Model Fit	Standards
Approximate model fit Standardised Root Mean Square Residual (SRMR)	<0.08
Composite Mode A	**Standards**
Individual Reliability Loadings Communality	≥0.707 ≥0.5
Internal consistency reliability Dijkstra–Henseler's (ϱA) Rho_A Dillon–Goldstein's (ϱC) composite reliability Cronbach's alpha	>0.7
Convergent validity Average Variance Extracted (AVE)	>0.5
Discriminant validity Heterotrait-Monotrait	<0.85
Composite Mode B	**Standards**
Multicollinearity Variance Inflation Factor (VIF)	<3.3
Weights Significance (bootstrap)	P.lim < 0.05

The values shown in the previous table refer to the minimum values required for each of the analyses carried out in the valuation of the global model and in the valuation of the measurement model to be correct.

4.3. Assessment of the Global Model

This model presents an excellent approximate goodness of fit, since the value of the SRMR (Standardised root mean square residual) has a value of 0.039, complying with the minimum standards described above.

4.4. Valuation of the Measurement Model

For Mode A composites, the reliability and validity analysis will be carried out through the analysis of individual reliability (factorial loads and commonality) and internal consistency (Rho_A of Dijkstra–Henseler, Dillon–Goldstein composite reliability, convergent validity through of the AVE, and finally, discriminant validity via Heterotrait–Monotrait ratio) (Table 2). Regarding Mode B composites, the tests related to the verification of the existence of multicollinearity (VIF) as well as the significance of the weights of the different observable variables that make up the Mode B composites of the model (Table 3) are applicable.

The results obtained in the previous analysis confirm the existence of good reliability—both individually and internally—of the measurement model. In this way, all loads have been found to be above the minimum reference value except for two loads associated with the behaviour construct (B14 = 0.662 and B15 = 0.699), although it was decided to keep them in the model because their maintenance in it did not make it worse and helped to obtain a good level of internal consistency of the measurement model, besides being significant. In relation to internal consistency, the values associated with the Mode A compound of knowledge yield excellent values, although the second of the Mode A compounds, behaviour, has an associated Dijkstra–Henseler Rho_A value of 0.698, although it is very close at the minimum reference value, which does not mean damage when assessing the internal consistency of the measurement model. Regarding discriminant validity, it has excellent values, well below 0.85 (Heterotrait-Monotrait $_{\text{KNOWLEDGE-BEHAVIOUR}}$ = 0.283).

Table 2. Validity and reliability of the measurement model. Composite Mode A.

	Weights (*t*-Value)	Loads (*t*-Value)	Rho_A	ρc	AVE	HTMT	(B)
Knowledge (K)			0.709	0.820	0.533	(B)	
Education for sustainable development emphasises respect for human rights.	0.341 *** (15.313)	0.742 *** (21.692)				(K)	0.283
Environmental protection is necessary for sustainable development.	0.322 *** (14.535)	0.727 *** (20.697)					
Sustainable development requires using renewable resources as much as possible.	0.371 *** (11.631)	0.718 *** (22.048)					
Sustainable development results in a fair distribution of goods and services to all people around the world.	0.335 *** (12.597)	0.734 *** (19.398)					
Behaviour (B)			0.698	0.809	0.515		
As far as possible, I buy local products.	0.412 *** (8.257)	0.764 *** (19.718)					
Decreased water consumption.	0.355 *** (7.394)	0.742 *** (18.300)					
I recycle some of the things I use.	0.298 *** (4.757)	0.662 *** (11.199)					
I help reduce pollution.	0.321 *** (6.215)	0.699 *** (15.275)					

* $p < 0.05$; ** $p < 0.01$; *** $p > 0.001$ (student's *t* (4999) one tail). T (0.05; 4999) = 1.645; *t* (0.01; 4999) = 2.327; *t* (0.001; 4999) = 3.092. n/a: Not applicable. AVE: Average Variance Extracted.

Table 3. Validity and reliability of the measurement model. Composite Mode B.

Attitude (A)	Pesos	*t*-Value	VIF	Loads	*t*-Value
Everyone should receive an education that teaches the knowledge, perspectives, values, issues and skills for sustainable living in a community.	0.199 *	2.277	1.453	0.623 ***	9.226
The current generation must ensure that the next generation inherits a community at least as healthy, diverse and productive as it is today.	0.154 **	2.917	1.214	0.495 ***	9.258
The overuse of our natural resources is a serious threat to the health and well-being of future generations.	0.168 **	2.575	1.219	0.465 ***	7.179
We need stricter laws and regulations to protect the environment.	0.101 *	1.743	1.376	0.538 ***	8.782
Poverty alleviation is an important theme in education for sustainable development.	−0.006	0.112	1.265	0.396 ***	6.539
The teaching of sustainability principles should be integrated into the curriculum in all disciplines and at all levels of schooling.	0.12 *	2.071	1.302	0.484 ***	8.449
Taxes on polluters should be increased to pay for damage to communities and the environment.	0.037	0.695	1.237	0.425 ***	7.18
Men and women should have equal access to all types of education and employment.	0.021	0.382	1.302	0.425 ***	7.057
Finding ways to reduce poverty is important.	0.057	0.883	1.389	0.52 ***	8.61
Governments and communities should adopt sustainable development as a national priority.	0.124 *	1.697	1.427	0.577 ***	9.946
As long as resources are available, using more than we need now does not threaten the health and well-being of future generations.	−0.063	1.265	1.326	−0.091 ***	1.553
It is okay to use as much water as we want, as long as it is available.	−0.068	1.281	1.285	−0.244 ***	4.153
Environmental education helps solve problems.	0.041	0.712	1.244	0.376 ***	5.488
By protecting nature, we protect ourselves and future generations.	0.177 **	2.565	1.623	0.665 ***	11.443
Nature is our treasure and should be everyone's business.	0.155 *	1.984	1.768	0.669 ***	10.751
The protection of the environment and people's quality of life are directly related.	0.078	1.407	1.476	0.581 ***	11.1
Environmental protection is more important than industrial growth.	0.108 *	1.894	1.173	0.421 ***	7.094
Society should further promote equal opportunities for men and women.	0.066	1.114	1.404	0.52 ***	8.532
Teachers in the school should promote the connection between local and global problems.	0.025	0.507	1.342	0.364 ***	6.305
Schools should adopt sustainable development as a national priority.	0.128 **	2.096	1.508	0.563 ***	10.255
The school includes aspects of sustainability in the curricula.	0.097 *	1.925	1.122	0.213 ***	3.146

* $p < 0.05$; ** $p < 0.01$; *** $p > 0.001$(student's *t* (4999) one tail). *T* (0.05; 4999) = 1.645; *t* (0.01; 4999) = 2.327; *t* (0.001; 4999) = 3.092. n/a: Not applicable.

As for the Mode B compound, the associated weights are not significant in the great majority, although they have remained in the model because the elimination of some of these weights would imply the elimination of a part of the compound, also eliminating a part of the variance explained in

the formation of said construct (Roberts and Thatcher 2009). No significant multicollinearity problems are observed (all VIFs have values below 3.3).

4.5. Assessment of the Structural Model

Through mediation, the existence of an intermediate variable through which an effect is transmitted from an antecedent variable to an endogenous variable will be considered (Aguinis et al. 2017). The angular characteristic of the mediating effect refers to the fact that a third variable takes an intermediate role between the relationships between dependent and independent variables (Cepeda et al. 2018). In the model presented here, and before addressing the results of the existence or not of a mediating variable, the attitude towards sustainable development is the one that has the role of a link between dependent and independent variables.

The process of determining mediating variables is carried out through two distinct phases (Nitzl et al. 2016), determining the significance of the indirect effects in the first of these phases through a bootstrap of 5000 sub-samples and through confidence intervals, a non-parametric test, since it is not required to start from an initial assumption of normality variable (Chin 2010) (Table 4). In this sense, reference authors such as Hayes and Scharkow (2013) establish the bias-corrected confidence intervals as the best way to detect mediating effects. In the second phase, we proceed to determine what type of effect or mediation exists, distinguishing total mediation, complementary partial mediation or competitive partial mediation, direct effect or no effect (Nitzl et al. 2016) (Table 5).

One way to detect the existence or not of total or partial mediation is with the Variance Accounted For (VAF), placing a mediation close to zero if the value of the VAF is less than 20%, partial mediation if it is between 20% and 80%, and total mediation if it is higher than 80% (Hair et al. 2016) (Table 5).

Table 4. Summary of mediating effects.

Total Effect of Knowledge on Behaviour		Direct Effect of Knowledge on Behaviour			Indirect Effects of Knowledge on Behaviour			
Coeff.	*t*-value		Coeff.	*t*-value		Point estim.	Bootstrap 95% CI	VAF
							Percentile / Bias Corrected	
0.203 ***	4.796	H1: c′	0.039 NS	0.802	H2: a1b1	0.164	[0.114; 0.246] [0.076; 0.209]	80.78%

* $p < 0.05$; ** $p < 0.01$; *** $p > 0.001$(student's *t* (4999) one tail). T (0.05; 4999) = 1.645; *t* (0.01; 4999) = 2.327; *t* (0.001; 4999) = 3.092. NS: Not significant.

Table 5. Effects on endogenous variables.

	Direct Effect	*t*-Value	Percentile Bootstrap (95%) CI	Explained Variance	f2 (*t*-Value)
Attitude ($R^2 = 0.395$; $Q^2 = 0.079$) a1: Knowledge	0.649	19.553	[0.588; 0.695]	39.5%	0.654 (5.333)
Behaviour (R2 = 0.080; $Q^2 = 0.036$) b1: Attitude c′: Knowledge	0.253 0.039	4.280 0.802	[0.180;0.373] [−0.063;0.120]	7.08% 0.915%	0.042 (1.871) 0.001 (0.378)

*$p < 0.05$; ** $p < 0.01$; *** $p > 0.001$(student's *t* (4999) one tail). T (0.05; 4999) = 1.645; *t* (0.01; 4999) = 2.327; *t* (0.001; 4999) = 3.092. n/a: Not applicable.

Considering the results obtained in the previous tables, it is evident that knowledge about sustainable development does not influence behaviour towards sustainable development, thus denying Hypothesis 1. In this sense, and following the aforementioned, it can be observed how the variable

attitude towards sustainable development acts as a mediating variable, being its total mediation between the other two variables (knowledge towards sustainable development and behaviour towards sustainable development) since it yields a VAF of 80.78%. Therefore, Hypothesis 2 would be fully supported.

It should be noted, therefore, that knowledge towards sustainable development per se does not positively influence existing behaviours towards sustainable development. However, it is through the attitude towards sustainable development when the influence of knowledge about sustainable development positively influences behaviours towards sustainable development.

As a result of the above, it can be emphasised how the knowledge variable explains 39.5% of the variance of the attitude variable, being the predictive power of the attitude variable of 0.395 (coefficient of determination (R^2) = 0.395), when considered as a moderate predictive power (Chin 1998).

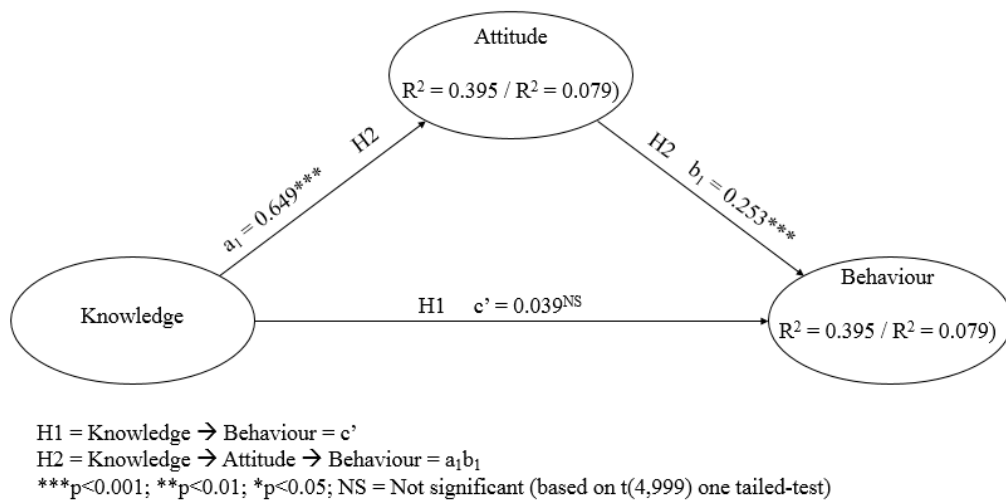The final model is presented in the following figure (Figure 2).

H1 = Knowledge → Behaviour = c'
H2 = Knowledge → Attitude → Behaviour = a_1b_1
***$p<0.001$; **$p<0.01$; *$p<0.05$; NS = Not significant (based on t(4,999) one tailed-test)

Figure 2. Final structural model.

5. Conclusions

The globalisation process, as part of the interaction and integration between people, industry and governments of different nations, is causing people to consider the analysis and measurement of variables such as behaviours, attitudes, and knowledge towards sustainable development. Given the definition of sustainable development, student knowledge about the different dimensions that occupy sustainable development becomes vital, so that in the future sustainability in the world is not jeopardised, and this has to be internalised from the earliest stages.

The above was one of the reasons for conducting an analysis of the behaviour, attitude and knowledge about sustainable development for students of an institute in Santiago de los Caballeros (Dominican Republic).

The limited literature on the perception of students focused on sustainable development means that there will be a wide horizon where it is possible to provide significant and enlightening results on the involvement or not of students in relation to this issue.

The present research indicates the absence of an influence of knowledge on sustainable development and behaviour towards sustainable development, which contradicts other studies that supported this positive influence of knowledge on behaviour towards sustainable development (Vicente-Molina et al. 2013). On the other hand, the positive influence of knowledge on sustainable development in relation to the attitude towards sustainable development, and of the latter on behaviour towards sustainable development, has been evidenced, refuting previous studies (Aziz et al. 2012; Al-Naqbi and Alshannag 2018). Therefore, attitude towards sustainable development acts as a mediating variable between knowledge about sustainable development and behaviour towards

sustainable development, resulting in a total mediation, following the results obtained in the previous analysis. This means that, although knowledge about sustainable development and behaviour towards sustainability is high on the part of the student, it is vital to improve their attitudes towards sustainable development, because it can influence, in the long term, the final behaviour of a person.

It is also worth highlighting the growing and dominant concern of students in relation to environmentally focused problems (Asan et al. 2014), which were the aspects that had more importance and significance throughout the analysis.

Schools, colleges and/or institutes have to take into account the results obtained in this study, mainly because students appreciate the teaching of the principles of sustainability in all subjects at all levels of education. On the other hand, the government and public administrations must implement policies and strategies so that future generations inherit a community as productive and diverse as the current one, where gender equality and access to education in all its fields prevail. In this way, sustainable development must be considered a national priority, implementing strategies at all levels of training. Regarding this, teachers play a decisive role, and they should promote the interconnection of existing problems at different scales as well as inculcating a critical spirit in the students.

The present study has been planned from the view of the students, not taking into consideration the other interest groups with a role in the problem of education for sustainable development, such as teaching staff or management teams. This study was carried out at certain time points, which was more appropriate than conducting a more longitudinal study covering more interest groups or stakeholders, which can be applied in future lines of research.

It is also noted that the data that has been collected and analysed belong to the same educational centre: Mexico Polytechnic Institute. In this regard, it would be interesting to extend the questionnaire to other institutes and/or high schools for the correct generalisation of data. Therefore, as future research lines, the extension of this study to other interest groups is proposed, along a more extensive timeline and expanding and diversifying the sample among more institutes in the city (Santiago de los Caballeros) or the country.

Author Contributions: Conceptualization, F.O.-A. and C.M.D.-V.; methodology, S.M.-C.; software, S.M.-C.; validation, S.M.-C. and F.O.-A.; formal analysis, F.O.A. and S.M.-C.; investigation, S.M.-C. and M.J.M.-V.; data curation, S.M.-C.; writing—original draft preparation, F.O.-A. and M.J.M.-V.; writing—review and editing, F.O.A. and C.M.D.-V.; visualization, M.J.M.-V.; supervision, C.M.D.-V.; project administration, F.O.-A.

References

Aguinis, Herman, Ravi S. Ramani, and Nawaf Alabduljader. 2017. What you see is what you get? Enhancing methodological transparency in management research. *Academy of Management Annals* 12: 1–28. [CrossRef]

Al-Naqbi, Ali Khalfan, and Qasim Alshannag. 2018. The status of education for sustainable development and sustainability knowledge, attitudes, and behaviors of UAE University students. *International Journal of Sustainability in Higher Education* 19: 566–88. [CrossRef]

Asan, Idrizi, Mile S. Srbinovski, and Jozuni Ibraim. 2014. Attitudes of Macedonian High School Students towards the Environment. *Procedia-Social and Behavioral Sciences* 159: 636–42. [CrossRef]

Azapagic, Adisa, Slobodan Perdan, and David Shallcross. 2005. How much do engineering students know about sustainable development? The findings of an international survey and possible implications for the engineering curriculum. *European Journal of Engineering Education* 30: 1–19. [CrossRef]

Aziz, Abdul Aziz, Sharipah N.S. Sheikh, Khairiyah M. Yusof, Amirmudin Udin, and Jamaludim M. Yatim. 2012. Developing a structural model of assessing students' knowledge-attitudes towards sustainability. *Procedia-Social and Behavioral Sciences* 56: 513–22. [CrossRef]

Bartiaux, Françoise. 2008. Does environmental information overcome practice compartmentalisation and change consumers' behaviours? *Journal of Cleaner Production* 16: 1170–80. [CrossRef]

Baylis, John, Owens Patricia, and Smith Steve, eds. 2017. *The Globalization of World Politics: An Introduction to International Relations*. London: Oxford University Press.

Becker, Jan-Michael, Arun Rai, and Edward Rigdon. 2013. Predictive validity and formative measurement in structural equation modeling: Embracing practical relevance. Paper presented at 34th International Conference on Information Systems, Milan, Italia, December 15–18.

Biasutti, Michele, and Sara Frate. 2017. A validity and reliability study of the attitudes toward sustainable development scale. *Environmental Education Research* 23: 214–30. [CrossRef]

Black, Simon A., and Leslie J. Porter. 1996. Identification of the critical factors of TQM. *Decision Science* 27: 1–21. [CrossRef]

Borges, Julio César, Luciana Cezarino, Tamiris Capellaro, Otávia T. Muniz, Delton L. Unglaub, and Adriana Cristina Caldana. 2017. Student organizations and communities of practice: Actions for the 2030 agenda for sustainable development. *The International Journal of Management Education* 15: 172–82. [CrossRef]

CEPAL. 2013. *Estrategias de Desarrollo bajo en Carbono en Megaciudades de América Latina*. Santiago de Chile: Comisión Económica para América Latina y el Caribe.

Cepeda, Gabriel, Christian Nitzl, and José Luis Roldán. 2018. *Mediation Analyses in Partial Least Squares Structural Equation Modeling: Guidelines and Empirical Examples*. Cham: Springer, Capítulo 8.

Chin, Wynne W. 1998. The Partial Least Squares Approach to Structural Equation Modeling. In *Modern Methods for Business Research*. Edited by George Marcoulides. Mahwah: Lawrence Erlbaum Associates Publisher, pp. 295–336.

Chin, Wynne W. 2010. How to write up and report PLS analyses. In *Springer Handbooks of Computational Statistics Series: Vol. II. Handbook of Partial Least Squares: Concepts, Methods and Applications*. Edited by Vincenzo Esposito Vinzi, Wynne W. Chin, Jörg Henseler and Huiwen Wang. Heidelberg, Dordrecht, London and New York: Springer, pp. 655–90.

CMMAD. 1988. *Nuestro Futuro Común*. Madrid: Comisión Mundial del Medio Ambiente y del Desarrollo.

Dagiliūtė, Renata, Genovaite Liobikienė, and Audrone Minelgaitė. 2018. Sustainability at universities: students' perceptions from green and non-green universities. *Journal of Cleaner Production* 181: 473–82. [CrossRef]

De Leeuw, Astrid, Pierre Valois, and Rita C. Seixas. 2014. Understanding high school students' attitude, social norm, perceived control and beliefs to develop educational interventions on sustainable development. *Procedia-Social and Behavioral Sciences* 143: 1200–9. [CrossRef]

Fishbein, Martin, and Icek Ajzen. 1974. Attitudes towards objects as predictors of single and multiple behavioral criteria. *Psychological Review* 81: 59–74. [CrossRef]

Gladwin, Thomas N., James J. Kennelly, and Tara-Shelomith Krause. 1995. Shifting paradigms for sustainable development: Implications for management theory and research. *Academy of Management Review* 20: 874–907. [CrossRef]

Hagedorn, Gregor, Thomas Loew, Sonia I. Seneviratne, Wolfgang Lucht, Marie-Luise Beck, Janina Hesse, Reto Knutti, Quaschning Volker, Schleimer Jan-Hendrik, Mattauch Linus, and et al. 2019. The concerns of the young protesters are justified: A statement by Scientists for Future concerning the protests for more climate protection. *GAIA-Ecological Perspectives for Science and Society* 28: 79–87. [CrossRef]

Hair, Joseph F., Carole Hollingsworth, Adriane Randolph, and Alain Yee Chong. 2016. An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management & Data Systems* 117: 442–58. [CrossRef]

Hair, Joseph F, G. Tomas Hult, Christian Ringle, and Marko Sarstedt. 2017. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, 2nd ed. Thousand Oaks: SAGE Publications.

Hayes, Andrew F., and Michael Scharkow. 2013. The relative Trustworthiness of inferential tests of the indirect effect in statistical mediation analysis: Does method really matter? *Psychological Science* 24: 1–10. [CrossRef] [PubMed]

Henseler, Jörg, Christian Ringle, and Rudolph R. Sinkovics. 2009. The use of Partial Least Squares Path Modeling in International Marketing. *Advances in International Marketing* 20: 277–319. [CrossRef]

Henseler, Jörg, Theo Dijkstra, Marko Sarstedt, Christian Ringle, Adamantios Diamantopoulos, Detmar W. Straub, David Ketchen Jr., Joseph Hair, G. Tomas Hult, and Roger Calantone. 2014. Common beliefs and reality about partial least squares: Comments on Rönkkö & Evermann (2013). *Organizational Research Methods* 17: 182–209. [CrossRef]

Henseler, Jörg, Christian Ringle, and Marko Sarstedt. 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science* 43: 115–35. [CrossRef]

Henseler, Jörg, Geoffrey Hubona, and Pauline Ash Ray. 2016. Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management & Data Systems* 116: 2–20.

Hsu, Shih-Jang. 2004. The effects of an environmental education program on responsible environmental behavior and associated environmental literacy variables in Taiwanese college students. *The Journal of Environmental Education* 35: 37–48. [CrossRef]

Huang, Po-Shin, and Li-Hsing Shih. 2009. Effective environmental management through environmental knowledge management. *International Journal of Environmental Science & Technology* 6: 35–50.

Kaliyaperumal, Karunamoorthi. 2004. Guideline for conducting a knowledge, attitude and practice (KAP) study. *AECS Illumination* 4: 7–9.

Kopnina, Helen. 2012. Education for sustainable development (ESD): The turn away from 'environment' in environmental education? *Environmental Education Research* 18: 699–717. [CrossRef]

Laroche, Michel, Jasmin Bergeron, and Guido Barbaro-Forleo. 2001. Targeting consumers who are willing to pay more for environmentally friendly products. *Journal of Consumer Marketing* 18: 503–20. [CrossRef]

Lian, Jiunn-Woei, David C. Yen, and Yeng-Ting Wang. 2014. An exploratory study to understand the critical factors affecting the decision to adopt cloud computing in Taiwan hospital. *International Journal of Information Management* 34: 28–36. [CrossRef]

Linnanen, Lassi, and Virgilio Panapanaan. 2002. Roadmapping CSR in Finnish companies. *Helsinki University of Technology* 2: 27–28.

Loudon, David L., and Albert J. Della Bitta. 1993. *Consumer Behavior*. New York: McGraw.

McKeown, Rosalyn, Charles Hopkins, Regina Rizi, and Marianne Chrystalbridge. 2002. *Education for Sustainable Development Toolkit*. Knoxville: Energy, Environment and Resources Center, University of Tennessee.

Meyer, Andrew. 2015. Does education increase pro-environmental behavior? Evidence from Europe. *Ecological Economics* 116: 108–21. [CrossRef]

Michalos, Alex C., Heather Creech, Christina McDonald, and P. Maurine Kahlke. 2011. Knowledge, attitudes and behaviours concerning education for sustainable development: Two exploratory studies. *Social Indicators Research* 100: 391–413. [CrossRef]

Michalos, Alex C., Heather Creech, Nathalie Swayze, P. Maurine Kahlke, Carolee Buckler, and Karen Rempel. 2012. Measuring knowledge, attitudes and behaviours concerning education for sustainable development among tenth grade students in Manitoba. *Social Indicators Research* 106: 213–38. [CrossRef]

Michalos, Alex C., P. Maurine Kahlke, Karen Rempel, Anu Lounatvuori, Anne MacDiarmid, Heather Creech, and Carolee Buckler. 2014. Progress in measuring knowledge, attitudes and behaviours concerning education for sustainable development among tenth grade students in Manitoba. *Social Indicators Research* 123: 303–36. [CrossRef]

Milfont, Taciano, and John Duckitt. 2010. The environmental attitudes inventory: A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology* 30: 80–94. [CrossRef]

Molderez, Ingrid, and Elsa Fonseca. 2018. The efficacy of real-world experiences and service learning for fostering competences for sustainable development in higher education. *Journal of Cleaner Production* 172: 4397–410. [CrossRef]

Moral-Cuadra, Salvador, Francisco Orgaz-Agüera, and Pablo M. Cañero-Morales. 2019. Attitude towards border tourism and its relationship with visitor satisfaction and loyalty. *GeoJournal of Tourism and Geosites* 25: 609–22. [CrossRef]

Nitzl, Christian, José Luis Roldán, and Gabriel Cepeda-Carrión. 2016. Mediation analysis in partial least squares path modeling: Helping researchers discuss more sophisticated models. *Industrial Management & Data Systems* 116: 1849–64.

Norussis, Marija J. 1993. *SPSS. Statistical Data Analysis*. Chicago: SPSS Inc.

OECD, CEPAL, and AF. 2016. *Perspectivas Económicas de América Latina 2017: Juventud, Competencias y Emprendimiento*. Paris: OECD Publishing.

Palacios Florencio, Beatriz. 2012. *El Efecto de la Percepción de la RC Sobre la Confianza y Lealtad del Turista en los Establecimientos Hoteleros*. Sevilla: Universidad de Sevilla.

Richter, Nicole F., Gabriel Cepeda, José Luis Roldán, and Christian Ringle. 2016. European management research using partial least squares structural equation modeling (PLS-SEM). *European Management Journal* 34: 589–97. [CrossRef]

Rigdon, Edward, Marko Sarstedt, and Christian Ringle. 2017. On comparing results from CB-SEM and PLS-SEM: Five perspectives and five recommendations. *Marketing: Journal on Research and Management* 39: 4–16. [CrossRef]

Roberts, Nicholas, and Jason Thatcher. 2009. Conceptualizing and testing formative constructs: Tutorial and annotated example. *ACM SIGMIS Database* 40: 9–39. [CrossRef]

Rodríguez-Barreiro, Luis M., Rosario Fernández-Manzanal, Luis M. Serra, José Carrasquer, María Murillo, María Morales, José M. Calvo, and Javier del Valle. 2013. Approach to a causal model between attitudes and environmental behaviour. A graduate case study. *Journal of Cleaner Production* 48: 116–25. [CrossRef]

Roldán, José Luis, and Manuel Jesús Sánchez-Franco. 2012. Variance-based structural equation modelling: Guidelines for using Partial Least Squares in information systems research. In *Research Methodologies, Innovations and Philosophies in Software Systems Engineering and Information Systems*. Edited by Manuel Mora, Ovsei Gelman, Annette Steenkamp and Mahesh Raisinghani. Hershey, PA: IGI Global, pp. 193–221.

Sarstedt, Marko, Joseph F. Hair, Christian Ringle, Kai O. Thiele, and Siegfried P. Gudergan. 2016. Estimation issues with PLS and CBSEM: Where the bias lies! *Journal of Business Research* 69: 3998–4010. [CrossRef]

Scott, William, and Chris Oulton. 1998. Environmental values education: An exploration of its role in the school curriculum. *Journal of Moral Education* 27: 209–24. [CrossRef]

Shephard, Kerry. 2008. Higher education for sustainability: Seeking affective learning outcomes. *International Journal of Sustainability in Higher Education* 9: 87–98. [CrossRef]

Sia, Archibald P., Harold R. Hungerford, and Audrey N. Tomera. 1986. Selected predictors of responsible environmental behavior: An analysis. *The Journal of Environmental Education* 17: 31–40. [CrossRef]

Tsaur, Sheng-Hshiung, Chang-Hua Yen, and Chia-Li Chen. 2010. Independent tourist knowledge and skills. *Annals of Tourism Research* 37: 1035–54. [CrossRef]

Tucker, Richard, and Parisa Izadpanahi. 2017. Live green, think green: Sustainable school architecture and children's environmental attitudes and behaviors. *Journal of Environmental Psychology* 51: 209–16. [CrossRef]

Vandamme, Ellen. 2009. *Concepts and Challenges in the Use of Knowledge-Attitude-Practice Surveys: Literature Review*. Antwerp: Department of Animal Health, Institute of Tropical Medicine.

Vicente-Molina, María Azucena, Ana Fernández-Sáinz, and Julen Izagirre-Olaizola. 2013. Environmental knowledge and other variables affecting pro-environmental behaviour: Comparison of university students from emerging and advanced countries. *Journal of Cleaner Production* 61: 130–38. [CrossRef]

Wahlström, Mattias, Piotr Kocyba, Michiel De Vydt, and Joost de Moor. 2019. Protest for a Future: Composition, Mobilization and Motives of the Participants in Fridays For Future Climate Protests on 15 March 2019 in 13 European Cities. Available online: http://eprints.keele.ac.uk/6536/1/Protest%20for%20a%20future_GCS%2015.03.19%20Descriptive%20Report-2.pdf (accessed on 12 August 2019).

WCED. 1987. *Our Common Future*. Oxford: World Commission on Environment and Development.

Zheng, Qiujin, Anxin Xu, Deji Kong, H. P. Deng, and Quiquan Lin. 2018. Correlation between the environmental knowledge, environmental attitude, and behavioral intention of tourists for ecotourism in China. *Applied Ecology and Environmental Research* 16: 51–62. [CrossRef]

Zsóka, Ágnes, Zsuzsanna Szerényi, Anna Széchy, and Tamás Kocsis. 2013. Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. *Journal of Cleaner Production* 48: 126–38. [CrossRef]