





Sustainability in higher education institutions and the effects on students' pro-environmental behavior

Sustentabilidade em instituições de ensino superior e o efeito no comportamento pró-ambiental dos estudantes

Sustentabilidad en las instituciones de enseñanza superior y los efectos en la conducta proambiental de los alumnos

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Abstract

Higher education institutions (HEI) are developing sustainability practices as part of their intervention. However, few studies have investigated how sustainability actions in HEIs affect the pro-environmental and green purchase behavior of university students. To this end, this study employed an empirical approach using a structural equation model to provide new empirical findings of 186 students in an HEI in southern Brazilian through quantitative research. The results showed that the HEI's sustainability actions positively affected the students' citizenship behavior, activist behavior, and environmental concern, and these pro-environmental behaviors impact their green purchasing behavior. This study contributes to advancing knowledge, demonstrating that the HEI's sustainability actions motivate students to develop pro-environmental behavior, generating more sustainable consumption.

Keywords: sustainability, environmental concern, citizenship behavior, activist behavior, green purchase.

Resumo

Instituições de ensino superior (IES) estão desenvolvendo práticas sustentáveis como parte de suas intervenções. Contudo, poucos estudos investigaram como ações de sustentabilidade em IES afetam o comportamento pró-ambiental e o comportamento de compra dos estudantes universitários. Para isso, este estudo empregou uma abordagem empírica utilizando modelagem de

equações estruturais para gerar novas evidências empíricas. Assim sendo, a partir de uma pesquisa quantitativa, coletou-se de uma amostra de 186 estudantes de uma IES do Sul do Brasil. Os resultados demonstram que as ações de sustentabilidade em IES afetam positivamente o comportamento cidadão dos estudantes, o comportamento ativista e as preocupações ambientais, compreendo que esses comportamentos pró-ambientais trazem impactos sobre a compra verde. Este estudo contribui para o avanço do conhecimento, demonstrando que as ações de sustentabilidade das IES motivam os estudantes no desenvolvimento de um comportamento pró-ambiental, gerando mais consumo sustentável.

Palavras-chave: sustentabilidade, preocupação ambiental, comportamento cidadão, comportamento ativista, compra verde.

Resumen

Las instituciones de enseñanza superior (IES) están desarrollando prácticas de sostenibilidad como parte de sus intervenciones. Sin embargo, pocos estudios investigaron cómo las acciones de sostenibilidad en las IES afectan la conducta de compra proambiental y verde de los estudiantes universitarios. Para tanto, este estudio utilizó un enfoque empírico usando un modelo de ecuaciones estructurales para ofrecer nuevas descubiertas empíricas de 186 estudiantes de una IES del Sur de Brasil por medio de investigación cuantitativa. Los resultados indicaron que las acciones de sostenibilidad de la IES afectaron positivamente la conducta de ciudadanía, conducta activista y preocupación ambiental de los alumnos, y estas conductas proambientales impactan su comportamiento de compra verde. Este estudio contribuye para el avance del conocimiento, demostrando que las acciones de sostenibilidad de la IES motivan los alumnos a desarrollar conductas proambientales, generando un consumo más sostenible.

Palabras clave: sostenibilidad, preocupación ambiental, conducta ciudadana, conducta activista, compra verde.

Education for sustainable development has been present in many official agendas of higher education institutions (HEI) for at least a decade (Velazquez, Munguia & Sanchez, 2005). Sustainable development has become humanity's primary concern in the face of a presumed unsustainable future, covering the liquidation of natural resources, the consequences of greenhouse effects, growing environmental degradation, and the essential need to provide basic sanitation for a constantly growing population (UN, 1997).

Since the 70s, several international meetings related to sustainability have discussed and presented the responsibilities of HEIs in education, policies, and practices of sustainability. One of the principles of the Halifax Declaration (1991) is that universities should "increase the capacity to teach and practice principles of sustainable development, increase environmental literacy, and improve the understanding of environmental ethics among professors, students, and the general public." This has led to the need for greater awareness of sustainable development by university students to prepare them to defend changes in behavior for a sustainable future (Kimanzi, 2019).

Aleixo, Azeiteiro and Leal (2018) reported that HEIs need to recognize their responsibilities in providing their students with skills to deal with problems related to sustainability for future well-being. Warken, Henn and da Rosa (2014) identified that HEIs have the role of preparing and sensitizing their collaborators, professors, and students to be engaged in this cause to maintain economic, social, environmental, and educational sustainability. Tormey et al. (2008) proposed that government officials should establish an educational system that encourages competencies and skills linked to sustainability to help students develop a critical sense of the context in which they live.

Moreover, HEIs have been developing sustainability practices as part of their intervention (Aleixo et al., 2018), and part of HEIs have become a reference in environmentally sustainable practices, contributing to training their students and sustainable development as these actions have become a guideline of the institutions (Rohrich & Takahashi, 2019). These practices can be perceived from the perspective of the communication, teaching, and research strategies for sustainable development (Santini et al., 2016). In fact, HEI actions focused on sustainability help develop students' knowledge, enabling them to acquire new skills, attitudes, and behaviors necessary to face social and environmental challenges (Aleixo et al., 2018; Santini et al., 2016). Lee et al. (2014) noted that greater awareness and attitude towards the environment comes from personal values and beliefs; these values interfere in beliefs regarding sustainability and in purchasing products that are less harmful to the planet. Higher environmental education is not a tool to change individuals' actions in a purely instrumental way but instead is a way to promote personal growth and critical thinking (Suárez-Perales et al., 2021, p. 11). We expanded past findings by investigating students of a private HEIs (Akhtar et al., 2022).

Although numerous studies have highlighted the importance of HEIs in sustainability actions and their impact on society as a whole, few studies have examined sustainability actions implemented by these institutions and their impact on students' pro-environmental behavior (Lee et al., 2014). More quantitative research is necessary to development role of HEIs in sustainability (Tapia-Fonllem et al., 2017). Therefore, this study sought to identify how sustainability actions in HEIs impact students' pro-environmental behavior (environmental concern, citizenship behavior, and activist

behavior) and how these perceptions lead to students' green purchase behavior. By empirically testing a model based on structural equations, we hope this study will provide further evidence to the body of knowledge on sustainability in HEIs and expand our understanding of different types of pro-environmental behavior. In addition, it is believed that the students' beliefs and values can be affected by their HEI's perception of sustainability. More research is needed to explain how sustainability actions in HEIs impact students' pro-environmental behavior (Dasgupta & Pawar, 2020).

The following section presents the constructs used in the study, indicating definitions and research hypotheses and the research model to be tested. The methodological procedures used are then detailed, followed by the descriptive results, and testing the hypotheses. Lastly, the discussion of the results, academic and managerial contributions, and limitations are presented.

Sustainability in higher education institutions

Sustainability has become a global concern, addressing social, survival, public policy, and peace issues (UN, 1997). In this bias, HEIs play a crucial role in this new configuration, breaking barriers of innovation and the lack of planning, environmental commitment, applicability and continuity of actions, and resistance to change and sustainability in the academic environment by creating initiatives to minimize borders and move towards a sustainable future (Ávila et al., 2019).

Universities can have a significant impact on the creation of the Sustainable Development Goals and the advancement of sustainability (Zamora-Polo & Sánchez-Martín, 2019, p. 11). The extent of the challenge in incorporating sustainability into higher education, however, will depend on HEIs creating academic curricula that incorporate sustainability and guarantee that students acquire the knowledge, values, and abilities necessary to collaborate with others to enhance the social and environmental conditions. (Velazquez et al., 2005).

The majority of university curricula are created to give students a progressively limited perspective of subjects, careers, and occupations while emphasizing specialization, knowledge, and abilities (Leal Filho et al., 2016). A curriculum encompassing sustainability education requires a broader approach than just subject knowledge; it should prepare students to live sustainably, both in the personal and professional spheres, and enable them to develop a deeper understanding of the interactions and consequences of their actions and decisions (Barth & Rieckmann, 2012; Leal Filho et al., 2016). Many of sustainability programs were created around world over last years (Brundiers et al., 2021). After considering the aforementioned, it is reasonable to conclude that including a discussion of sustainability in university curricula may have positive effects on the economy (job opportunities), the environment (sustainable resource use), and society (better quality of life) that extend beyond the lives of students enrolled in the program (Leal Filho et al., 2016). Furthermore, these sustainability initiatives impact the career development of students who must increasingly adapt to global demands in which sustainable development has become a priority and no longer an option (Leal Filho et al., 2016).

In this vein, there is a notable global increase in concern for education geared towards sustainable initiatives, evidenced by the expanding scientific output in this field extending beyond authors from developed countries (Hallinger & Chatpinyakoo, 2019). In addition to fostering individual development in students and future professionals in the job market, the incorporation of sustainability approaches in Higher Education Institutions (HEIs) also yields indirect benefits, such as economic growth and the promotion of sustainable lifestyles (Findler et al., 2019).

Green purchase behavior

In a scenario of scarcity and destruction of natural resources, climate change and pollution, people are becoming increasingly aware of environmental issues, which attracts greater attention from consumers and makes the green purchasing behavior relevant (Kautish et al., 2019; Liobikienė & Bernatoniene, 2017). Green Marketing considers that the company makes exchanges easier and generates consumer satisfaction by reducing the impacts on the environment (Liobikienė & Bernatoniene, 2017), so green consumption takes into account buying situations that will generate less impact on the environment and positive consequences in the environment and in society in the long run (Kamalanon et al., 2022). Awareness of environmental issues is a determining factor to green purchasing behavior (Naz et al., 2020), and so is the University (Harring & Jagers, 2017; Mohiuddin et al., 2018).

Hypothesis development

Environmental concern

As sustainable development expands globally, universities must move forward to overcome obstacles to implementing goals and initiatives. At the same time, universities must seize opportunities to collaborate through innovation in teaching, research, and action to achieve sustainable development goals (Ávila et al., 2019). When the subject of environmental concern is discussed in the educational sphere (e.g., HEIs), this can be perceived as a general attitude towards the environment that reflects the extent to which students are concerned about threats to these settings (Lee et al., 2014; Soltani et al., 2019).

Consumers concerned about the environment are more likely to engage in pro-environmental behavior such as purchasing green products, good citizenship behavior, and participate in activist behavior (Ishaswini & Datta, 2011). Students' environmental awareness at universities encourages more sustainable behavior due to concern for future generations (Soltani et al., 2019).

Universities lack advances in favor of sustainable actions despite the broad debate on the subject. Furthermore, the academic environment must take advantage of opportunities to cooperate through innovation in teaching, research, and actions to achieve sustainable development goals and deal with concerns regarding environmental actions (Ávila et al., 2019). Value is a general basis for forming attitudes and beliefs and generally indirectly affects behavior through a more specific attitude towards a particular topic or idea (e.g., attitude towards environmental protection) (Lee et al., 2014).

Higher education institutions must integrate programs to educate students on the importance of sustainable development (Kimanzi, 2019). The degree of knowledge of students from HEIs in sustainability issues and purchasing green products establishes a level of concern with sustainability issues; in this sense, it is essential to study their lifestyles and reflections on sustainability matters since they are interested in learning more about sustainability (Kimanzi, 2019).

In this perspective, the product to be purchased is an auxiliary tool in expressing environmental concern, and significant value needs foster greater green purchase intention and willingness to pay. These attitudes become notable when the need for social approval motivates a greater purchase intention. Individuals seeking to purchase green have a social identification and concern for the environment. This behavior is often questioned if it can affect whether the interest in purchasing ecologically correct products leads to action or remains in the desire (Gotlieb, 2019).

H1: HEI sustainability actions have a positive effect on students' environmental concerns.

H2: Students' environmental concerns have a positive effect on green purchase behavior.

Citizenship behavior

While green purchasing corresponds to a behavior focused on purchasing sustainable products, good citizenship behavior consists of a series of attitudes and social actions (Lee et al., 2014). In a broader perspective, citizenship behavior portrays individuals' willingness to apply voluntary behavior to create value from firm (Gong & Yi, 2021).

Lee et al. (2014), citizenship behavior is more closely aligned with a direct impact on environmental preservation or protection than green purchasing behavior since it typically arises from business procedures and practices used by manufacturers rather than from customer conduct. According to the authors, a salient feature that sets apart green buying behavior from citizenship conduct is its underlying motivations. While both individual and group factors influence green purchasing behavior, collective factors are frequently the main driving force behind good citizenship actions. Because it involves personal expense or sacrifice and has a more objective goal, it seems that the hegemony of citizenship activity is the most active and successful type of pro-environmental conduct.

H3: HEI sustainability actions have a positive effect on students' citizenship behavior.

H4: Students' citizenship behavior has a positive effect on green purchase behavior.

Activist behavior

Activism is often portrayed as an effort by individuals or groups to confront injustice or champion a cause - be it social, political, or environmental - and produce social change. Environmental activist behavior is the closest form of collective thinking, given the involvement of public actions, including communicating with government representatives to address environmental concerns and support an environmental organization (Lee et al., 2014). Therefore, environmental activist behavior is regularly incisive in a collaborative environment with others of shared ideologies about environmental protection (Lee et al., 2014).

There is a need to understand the motivational factors of activist behavior to better address educational interventions and actions within HEIs designed to provoke activism. Another perception is activism as a tool for pro-environmental behavior, that is, when it is used as actions to protect or conserve the environment, including the desire to be part of an environmental organization or environmental cause (Fung & Adams, 2017).

From the paradigms developed on the subject, activism provides a sense of citizenship in people, along with the idea that they are connected to other people with similar feelings, given the fact that we are in a growing world with large-scale environmental problems in which activism is seen as a method of creating change (Reysen & Hackett, 2019). Given this scenario, Fung and Adams (2017) demonstrated that cultural factors also play an essential role in environmental activist behavior in the same way as being surrounded by people who share the same values and concerns. Thus, attending these groups may result in knowledge and information about environmental concerns since environmental organizations are crucial in effecting social and large-scale impacts.

Lee et al. (2014) reported that previous studies had examined different types of behavior to instrumentalize the concept of environmental activism. These examples of activism include participating in environmental groups, engaging in political action, active involvement in environmental organizations, and the potential for political or managerial

influence. The authors believed that activism is concerned with actions that aim to make considerable changes at the institutional level through political processes and not at the individual level, thereby addressing a more collective way of behavioral solutions to environmental problems.

By contextualizing an approach in educational institutions, Fung and Adams (2017) found that on university campuses, where there is a variety of student demographics, it can be assumed that activism occurs in the face of conflicting demands for work time, school, extracurricular activities, health and fitness, social relationships, and other considerations. In fact, there are important lessons that strengthen environmental activism on the part of students within institutions.

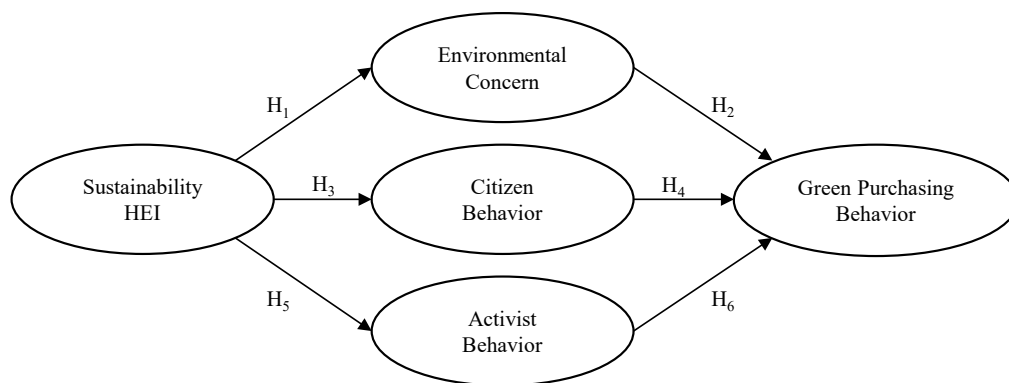
H5: HEI sustainability actions have a positive effect on students' activist behavior.

H6: Students' activist behavior has a positive effect on green purchasing behavior.

Figure 1 shows the hypothetical theoretical model.

Figure 1

Theoretical model



Method

Data collection and sample

The data were collected by contacting and inviting undergraduate students from a university in Rio Grande do Sul State (southern Brazil) to participate. A previous version of the questionnaire was tested in a similar group of students with experience in sustainability, who were asked to provide feedback about the clarity, comprehensiveness, adequacy, content validity, and legibility of the scale items, as well as screening questions and orientations.

A different strategy was employed for data collection, which first began by sending an email with instructions and a link to answer the questionnaire. A mailing list provided by the university was used, and the second strategy adopted consisted of a traditional paper-and-pencil survey among students in classes. Both samples were checked, and no significant differences or response biases were observed between groups.

To determine the sample size, we employed G*Power 3.1.9 software, utilizing the latent variable with the highest number of predictors, which, in this case, is green purchase influenced by three distinct constructs (Ringle et al., 2014). The minimum sample size required for testing a partial least squares structural equations model (PLS-SEM) should exceed 77 observations based on this criterion. Consequently, the chosen sample of 186 participants is deemed satisfactory. This cohort comprised predominantly undergraduate students (76.3%), with 45.7% in their fourth year of study (Table I). Most participants fell within the age range of 17 to 26 (66.1%). Described as a nonprobability and convenience sample (Malhotra, 2020), this method is considered the least expensive and time-consuming, with accessible, easily measurable, and cooperative sampling units (Malhotra, 2020, p. 363).

Measurements

The questionnaire was designed based on the previous literature to establish the reliability and validity of the data collection instrument. Each construct was measured using multiple items; the measurements are summarized in Table 2. Sustainability in HEIs (SHEIs) was measured by adopting a scale from Santini et al. (2016) composed of four dimensions: sustainable communication (4 items), sustainable strategies and policies (4 items), sustainable education and learning practices (3 items), and practices for creating sustainable knowledge (4 items); environmental concern (4 items) and citizenship behavior (4 items), activist behavior (3 items) based on Dunlap et al. (2000), and green purchasing behavior (6 items) were adapted from Karp (2016) and Mostafa (2007). The constructs were translated from English

into Portuguese by two specialists and adapted to the context. Everything was measured using a five-point Likert scale ranging from “I totally disagree” (1) to “I totally agree” (5). The measurements used herein are listed in Table I.

Table I

Descriptive Analysis

	Number	Percent
Course		
Undergraduate	142	76.3
Graduate	39	23.7
Semester		
1-3	56	30.1
4-6	31	16.7
7-10	85	45.7
Missing	14	7.5
Age group		
17-26	123	66.1
27-36	34	18.3
> 37	15	8.1
Missing	14	7.5
Income		
\$ 0 - \$ 1874	99	53.2
\$ 1875 - \$ 3748	47	25.3
\$ 3749 - \$ 9370	28	15.1
\$ 9371 - \$ 18740	7	3.8
\$ > 18741	1	0.5
Missing	4	2.2

Notes: \$ = Brazilian real

Data analysis

To test the hypotheses of the research model, data analysis was carried out using the partial least squares (PLS) method based on structural equation modeling (SEM). The PLS simultaneously allows the reliability and validity of the measures of theoretical constructs (structural model) to be assessed and the relationships between these constructs (measured model) to be estimated (Hair et al., 2016). The PLS-SEM is the most appropriate technique for this study according to the criteria established by Roldán and Sánchez-Franco (2012): *i*) where the sample ($n = 186$) is small, the PLS technique must be applied when the number of observations is below 250 cases; *ii*) the objective of the study is predicting the dependent variables, and *iii*) the research model is considerably complex according to the type of relationship in the hypotheses (first- and second-order). This study used the SmartPLS 2.0 software for the PLS analysis.

Results

The theoretical model based on PLS-SEM is analyzed and interpreted in two phases: *i*) evaluating the reliability and validity of the measurement model and *ii*) testing the hypotheses through the structural model. This sequence ensures that the measures of the constructs are valid and reliable before attempting to conclude the relationships between the constructs (Roldán & Sánchez-Franco, 2012). Before that, a preliminary analysis was performed to check the assumptions of linearity: *i*) common method bias test, *ii*) heteroscedasticity and multicollinearity verification, and *iii*) data normality test.

To check that there was no bias that could have distorted the results, the common method bias test was run (Chang et al., 2010). The Harman single-factor test was used to determine whether response bias would be present if a single component could account for the majority of the variance in the model. (Chang et al., 2010). The first unrotated factor captured only 32.19% of the variance in data; the first factor did not capture most of the variance, thereby proving that the data does not suffer from common method bias.

The Koenker and Breusch-Pagan tests were run to look for any potential heteroscedasticity issues. In both tests, there were no values below 0.050 (Breusch-Pagan and Koenker test; p -value = 0.943), then the null hypothesis of heteroskedasticity is rejected and homoskedasticity assumed (Koenker, 1981). The variance inflation factor (VIF) test

was used to confirm that the independent variables did not exhibit multicollinearity and that there was no correlation between them (Hair et al., 2018). The results showed VIF values below 10 and tolerance below 0.1, demonstrating the absence of multicollinearity (HEI sustainability dimensions, VIF = 1.652-2.244, tolerance = 0.446-0.605; environmental concern, VIF = 1.251, tolerance = 0.799; good citizenship behavior, VIF = 1.785, tolerance = 0.560; activist behavior, VIF = 1.513, tolerance = 0.661).

To check data normality, we applied the Kolmogorov-Smirnov and Shapiro-Wilk tests. Hair et al. (2014) propose that the p-value needs to be higher than 0.05 in order to display the indicators. All variables' p-values were significant, indicating that the data presented here are not normal.

Measurement model

Based on the assumptions of Hair et al., 2019 yet concise, overview of the considerations and metrics required for partial least squares structural equation modeling (PLS-SEM, the analysis begins by verifying the standardized loadings and identified that only one item had a value below 0.700 (Table II). We chose to keep this item since it did not affect the value of the extracted variance and composite reliability (Hair et al., 2014). In a second step, the reliability of the data was tested, and all items reached satisfactory levels over 0.827 for composite reliability and 0.804 for Cronbach's Alpha. In addition, these latent variables reach convergent validity because their measures of average variance extracted (AVE) exceeded 0.500 (Fornell & Larcker, 1981).

Table II

Outer model

Variable	Loadings
Sustainable communication (SC) CR = 0.890 AVE = 0.671 α = 0.836	
My university's communication should focus on sustainability.	0.837
Investing in communication that preaches sustainability is fundamental for a university.	0.846
Students will have a better view of the market if the university invests in communication associated with the environment.	0.742
I think it is important that my university's communications work with environmental issues.	0.847
Sustainable strategies and policies (SSP) CR = 0.884 AVE = 0.657 α = 0.827	
I think it is right for a university to have strategies oriented towards the environment.	0.861
A company's mission and vision must contain values for the environment.	0.789
The strategic planning of a university must be concerned with society.	0.838
The university must be concerned with the societies around it.	0.798
Sustainable education and learning practices (SELP) CR = 0.886 AVE = 0.722 α = 0.804	
What is taught in my course must address issues associated with the environment.	0.870
Teachers should use examples associated with the environment.	0.904
In the teaching plans, there must be content focused on social problems.	0.769
Practices for creating sustainable knowledge (PCSK) CR = 0.887 AVE = 0.662 α = 0.829	
My university should encourage research associated with the environment.	0.807
My university must generate sustainable development for neighboring communities.	0.794
The quality of a university can be associated with its ability to help the environment.	0.791
It is important that students at my university carry out projects aimed at sustainability.	0.860
Environmental concern (EC) CR = 0.889 AVE = 0.668 α = 0.833	
Humans are severely abusing the environment.	0.818
If things continue on their present course, we will soon experience a major ecological catastrophe.	0.894
The balance of nature is very delicate and easily upset.	0.808
Despite our special abilities, humans are still subject to the laws of nature.	0.742
Citizenship behavior (CB) CR = 0.827 AVE = 0.546 α = 0.727	
I plan to reduce the use of aerosol spray cans.	0.750
I plan to recycle cans, bottles, and papers.	0.723
I plan to keep the surrounding environment clean.	0.688
I plan to vote for a candidate or referendum that supports environmental protection.	0.792

Activist behavior (AB)	CR = 0.910 AVE = 0.771 α = 0.885
I plan to contribute money to an environmental group.	0.871
I plan to write a letter/email to a congressman/government official about the environment.	0.879
I am considering supporting an environmental group.	0.884
Green purchasing (GP)	CR = 0.933 AVE = 0.699 α = 0.914
I am considering purchasing products that are less environmentally harmful.	0.846
I am considering purchasing organically grown produce.	0.820
I am planning to purchase products made by an eco-friendly business.	0.879
I am considering buying a green version of a product.	0.881
I am considering switching to a different brand for ecological reasons.	0.846
I plan to avoid purchasing foods containing chemicals such as preservatives.	0.738

Note: CR = composite reliability; AVE = average variance extracted; α = Cronbach's alpha; R² = coefficient of determination.

The next step was to achieve the discriminant validity of the constructs. There was no correlation greater than the square root value of the AVE (Table II); in this case, we confirmed the discriminant validity at the construct level. Another criterion indicated by Hair et al. (2014) to test the discriminant validity is using indicator cross-loading; the value of cross-loading indicators on the assigned constructs is higher than all loading in the other constructs. This criterion is complementary to Fornell; Larcker (1981) since it is considered less robust (Hair et al., 2014); the discriminant validity was also obtained through this criterion (Table III).

Table III

Discriminant analysis

Constructs	M	SD	1	2	3	4	5	6	7	8
1 – SC	4.35	0.601	0.819							
2 – SSP	4.64	0.444	0.548	0.810						
3 – PCSK	4.29	0.628	0.554	0.515	0.813					
4 – SELP	4.17	0.705	0.614	0.438	0.648	0.849				
5 – AB	2.75	0.989	0.266	0.149	0.391	0.301	0.878			
6 – CB	4.01	0.699	0.383	0.389	0.520	0.400	0.550	0.739		
7 – EC	4.53	0.568	0.315	0.387	0.343	0.304	0.171	0.367	0.817	
8 – GP	3.92	0.815	0.326	0.373	0.519	0.376	0.460	0.563	0.317	0.836

Note: M = mean; SD = standard deviations; the square root of the AVE (in bold) is shown diagonally; the correlation coefficients are shown below the diagonal.

Structural model

The structural model assessment estimated the path coefficients and their significance via the bootstrapping technique (5000 resamples) to generate standard errors and t-statistics. According to Hair et al. (2014), the explained variance (R²) of each endogenous variable and the path coefficients in the model must be verified. Therefore, we analyzed the relationship between the first- and second-order constructs and confirmed the structure of our model.

After the initial analysis, the relationship between the variables was tested, and the results are summarized in Table IV, confirming the hierarchical structure. Finally, all relationships are statistically significant (p < 0.05), confirming the proposed hypotheses. Furthermore, the results confirm that the structural model has satisfactory predictive relevance for the Q2 value variable above 0.000 for all constructs.

Table IV

Inner model results

	Relationship	β -value	t-value	p-value	R ²
2 nd order	SHEIs → SC	0.840	320.38	0.001	0.704
	SHEIs → SSP	0.763	210.09	0.001	0.582
	SHEIs → SELP	0.814	250.88	0.001	0.663
	SHEIs → PCSK	0.844	310.46	0.001	0.712
Hypothesis 1	SHEIs → EC	0.413	60.09	0.001	0.171
Hypothesis 2	EC → GP	0.135	20.13	0.050	0.365
Hypothesis 3	SHEIs → CB	0.522	80.52	0.001	0.273
Hypothesis 4	CB → GP	0.392	50.21	0.001	0.365
Hypothesis 5	SHEIs → AB	0.344	50.12	0.001	0.118
Hypothesis 6	AB → GP	0.221	30.18	0.001	0.365

Note: $p < 0.05 = t(0.05, 4999) = 1.645$; $p < 0.01 = t(0.01, 4999) = 2.327$; $p < 0.001. t(0.001, 4999) = 3.092$; $R^2 =$ coefficient of determination.

Hypotheses 1, 3, and 5 indicate that the HEI's sustainability affects the sustainable perceptions of students. In fact, the results indicate that the student's environmental concern ($\beta = 0.413$; $p < 0.001$), citizenship behavior ($\beta = 0.522$; $p < 0.001$), and activist behavior ($\beta = 0.344$; $p < 0.001$) are positively and significantly affected by HEI sustainability, confirming respective hypotheses. Confirming hypotheses 1, 3, and 5 reinforces the role of higher education institutions as cultivators of environmental awareness. HEI play a crucial role in engaging students in more sustainable behavior (Soltani et al., 2019). The findings align with theories of Rationalized Action and Planned Behavior, suggesting that knowledge fosters environmental concern and, consequently, the inclination toward pro-environmental attitudes and behaviors. (Suárez-Perales et al., 2021).

We identified that green purchase behavior was positively and significantly impacted by environmental participation ($\beta = 0.135$; $p < 0.05$), citizenship behavior ($\beta = 0.392$; $p < 0.001$), and activist behavior ($\beta = 0.221$; $p < 0.001$), thereby confirming hypotheses 2, 4, and 6, respectively. In addition, our research model appears to have an appropriate predictive power for the dependent variable (Table 4). Hence, green purchase behavior attains the explained variance (0.365) by the predictors. Confirmation of hypotheses 2, 4, and 6 supports the theoretical framework indicating that knowledge, concern, and awareness impact the consumer's environmental attitude, leading to green purchasing behavior (Zaremohzzabieh, Ismail, Ahrari & Abu Samah, 2021). Furthermore, it is observed that cognitive factors (e.g., environmental knowledge) and individual consumer characteristics (e.g., environmental concern) influence the intention to engage in green purchasing (Zhuang, Luo & Riaz 2021). The results of this study underscore the role of HEIs in cultivating environmental knowledge, thereby fostering heightened environmental concern among students.

Discussion

We aimed to identify how HEI sustainability practices affect students' pro-environmental behavior. The results showed that HEIs play a fundamental role in constructing sustainable behaviors and attitudes in students since the results revealed that sustainability in HEIs positively affects environmental concerns, citizenship behavior, and activist behavior, generating a more significant attitude and active role of students regarding sustainability. The results also showed that this greater attitude of the student influences the intention of green purchase behavior; HEIs' sustainability actions play a crucial role in shaping students' environmental awareness.

Theoretical contribution

This study significantly contributes to the theoretical landscape by unveiling the pivotal role of Higher Education Institutions (HEIs) in shaping student behavior and attitudes, particularly focusing on pro-environmental aspects. The theoretical implications emanate from the nuanced exploration of HEI initiatives and their profound impact on students' pro-environmental attitudes.

Our previous findings illuminated how HEI sustainability actions positively influence students' environmental concern, citizenship behavior, and activist behavior. Drawing on the insights of Lee et al. (2014) and constructing a comprehensive nomological network based on Santini et al.'s (2016) scale, we emphasized the multifaceted nature of HEI initiatives, encompassing sustainable communication, strategies, policies, education, learning, and knowledge creation practices. This expanded understanding aligns seamlessly with the works of Aleixo et al. (2018) and Warken et al. (2014), reinforcing the crucial role HEIs play in shaping various dimensions of students' pro-environmental attitudes.

Building upon this foundation, our current study takes a step further by demonstrating that these pro-environmental attitudes cultivated by HEIs significantly impact students' green purchase behavior. The study underscores the role of HEIs in cultivating environmental knowledge among students, fostering heightened environmental concern. This aligns with the broader theoretical understanding that educational institutions contribute significantly to shaping individuals' knowledge, attitudes, and behaviors. The findings emphasize the importance of HEIs in influencing students to adopt more sustainable practices, extending the theoretical understanding of the impact of educational environments on sustainability awareness.

This connection not only resonates with the findings of Rohrich and Takahashi (2019) but also extends our understanding to the international context. By highlighting that university students in developed countries exhibit higher green purchasing behavior compared to those in developing countries (e.g., Brazil, Mexico, and China, [Vicente-Molina et al., 2013]), we contribute valuable insights into regional disparities in sustainable consumer behavior. The identification of predictors in our present study adds granularity to our theoretical framework, providing a more nuanced understanding of the factors influencing green behavior.

The synergy between our previous and current results paints a comprehensive picture. HEIs, through their sustainability initiatives, not only shape pro-environmental attitudes but also channel these attitudes towards tangible behaviors, such as green purchasing. This cohesive narrative underscores the pivotal role of HEIs in instilling a holistic sense of sustainability among students, thereby contributing significantly to the theoretical discourse in this domain. The study's acknowledgment of the research model's appropriate predictive power for green purchase behavior provides insights into the interconnectedness of environmental concern, citizenship behavior, and activist behavior in influencing consumer attitudes. This contributes to the theoretical understanding of how various dimensions of pro-environmental behavior collectively contribute to green purchasing intentions.

Practical contributions

Implementing sustainable policies and practices in HEIs (by their board members) can raise awareness of pro-environmental attitudes in students (Tormey, Liddy, Maguire & McCloat, 2008), which can bring positive impacts to the entire society. Moreover, HEI board members should follow a holistic approach by implementing green and sustainable strategies that involve all stakeholders by creating new courses and projects orientated to this context. Universities can encourage their researchers to develop new studies in this area through exclusive funding; creating an investigation priority can increase the involvement of all stakeholders.

Another interesting point is that universities implementing a comprehensive agenda on sustainable issues for their students may provide a positive experience during the period in which the student is at university, given that these individuals undergo a significant transformation during their education. In fact, students acquire knowledge that is fundamental for their training, and therefore, when planning training that is more focused on environmental and sustainable issues, universities will also be helping society mitigate environmental problems in the medium to long term.

The results obtained in the study should encourage professors and HEIs managers in the implementation of projects and practices aimed at environmental awareness, focusing on a training focused on better resource management and sustainable innovation "that reconcile economic, Environmental, and Social Goals Innovation Activities" (Cillo, Petruzzelli, Ardito & Del Giudice, 2019).

Finally, by focusing on a sustainability-based training and consumers with greater green purchase intention, universities create new consumer market segments, which is focused and meets their primary needs, consuming products and services that generate less externalities to the environment.

Limitations and further studies

Despite the exciting findings presented herein, several limitations were found that must be addressed in future research. This study did not control the price variable for the real purchase intention, thus emphasizing the relevance of future studies in investigating how prices can affect the purchase intention of green products in students/consumers given that a predisposition to pay for something less harmful to the environment may have affected the relationships established herein. Secondly, this study employed a convenience sample, and data were collected from only one university. Therefore, new studies should investigate the sustainability orientation of the results presented here and be conducted with more representative population samples.

Thirdly, this study considered the HEI sustainability practices, and new research must analyze the role of how other institutions, including companies, religious groups, and sports associations, influence consumers or employees in more sustainable attitudes. Lastly, the initial model estimation results show that only 11 and 17% of the variances in environmental activist behavior and environmental concern are explained by HEI sustainability practices, and this may be an exciting search opportunity for new studies seeking to examine new antecedent variables to help better explain this pro-environmental behavior.

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