Individual-level characteristics of environmental sustainability among students in a higher education institution: the role of happiness and academic performance

Received 6 October 2020
Revised 24 February 2021
11 April 2021
24 April 2021
Accepted 29 April 2021

Biagio F. Giannetti
Post-Graduation Program on Production Engineering, Paulista University, São Paulo, Brazil

Luis Velazquez
Industrial Engineering Department, University of Sonora, Hermosillo, Mexico

Krystal M. Perkins
Department of Psychology, School of Natural and Social Sciences, Purchase College, SUNY, USA

Marisela Trillas-Ortiz
Sustainability Graduate Program, Industrial Engineering Department, University of Sonora, Hermosillo, Mexico

Carlos Anaya-Eredias
Industrial Engineering Department, University of Sonora, Hermosillo, Mexico

Feni Agostinho, Cecilia M.V.B. Almeida and Marcos Jose Alves Pinto
Post-Graduation Program on Production Engineering, Paulista University, São Paulo, Brazil, and

Nora Munguia
Sustainability Graduate Program, Industrial Engineering Department, University of Sonora, Hermosillo, Mexico

Abstract

Purpose – Students play an unequivocal role in sustainable universities as they are theorized to embody the mission of a sustainable university through a sustainable lifestyle and spread sustainability practices during their professional careers. Despite this, it is not well known how or why students come to embody a sustainable lifestyle. This study aims to better understand the relationship between happiness, academic achievement and sustainability behaviors among the student population in a Mexican higher education institution.

Design/methodology/approach – In a questionnaire study, engineering and psychology university students at a large public university in northwestern Mexico answered questions regarding their environmental sustainability behaviors, happiness and academic performance. A stratified random sampling technique was used to obtain the sample population that best represents the entire population. After chi-

International Journal of Sustainability in Higher Education

1467-6370
DOI 10.1108/IJSHE-10-2020-0368

square tests, it was confirmed that the three variables were independent of one another. Therefore, a series of correspondence analyses were conducted to examine clusters or patterns that could indicate relationships among the three variables.

Findings – The main finding from this work was that the happiest and most academically astute participants were only slightly environmentally sustainable or not sustainable at all. The lack of environmental sustainability in students from one of the most top-rank sustainable universities in Mexico does not align with previous sustainability reports. External factors to the university, such as cultural values and extreme weather conditions, may have influenced students' sustainability behaviors.

Research limitations/implications – As with any other questionnaire study, the provided data is subject to interpretation, judgment and bias. In addition, the environmental and happiness index used in this study are not free of criticizing, and some author had disputed its efficacy. Finally, this study's findings did not determine any causality or directionality between any of the latent variables. However, causality and directionally between environmental sustainability-happiness and happiness-academic performance have to be found in both directions.

Practical implications – Despite the unsustainability of students in this study, this study has several contributions. First, it provides an evaluation of a sustainable university from the perspectives and behaviors of students. The views of students as they relate to the complexities and visions of a sustainable university have remained relatively underexamined. Second, these analyses point to specific sustainability-oriented challenges and inadvertent barriers (e.g. extreme weather patterns) toward the embodiment of a sustainable lifestyle. These challenges and barriers suggest that sustainable universities need to address the dynamic changes inherent in sustainable development. Finally, this study indicates that the link between happiness, academic performance and sustainability may be more complicated and driven by cultural and structural barriers. The issue of barriers, as they relate to sustainability behaviors, is highly relevant and presents important opportunities and questions for future research.

Originality/value – This study provides an evaluation of a sustainable university from the perspectives and behaviors of students. Students' views as they relate to the complexities and visions of a sustainable university have remained relatively underexamined. Second, these analyses point to specific sustainability-oriented challenges and barriers as they relate to the embodiment of a sustainable lifestyle. These challenges and barriers suggest that sustainable universities need to address the dynamic changes inherent in sustainable development. Finally, this study indicates that the link between happiness, academic performance and sustainability may be more complicated and driven by cultural and structural barriers.

Keywords Environmental sustainability, Multivariate analysis, Happiness, Grade point average, Sustainable university

Paper type Research paper

1. Introduction

Sustainable university is a concept that was introduced into the scientific community in the early 21st century as higher education institutions were beginning to be seen as indispensable disseminators of the principles and practices of sustainability (Van Weenen, 2000; Lozano and Barreiro-Gen, 2019). Since then, it is commonplace to find extensive literature on sustainability university within the context of education, research and campus operations (Menon and Suresh, 2020). Different elements for a sustainable university have been noted in the literature, including policy, evaluation and sustainable curricular design (Lukman and Glavič, 2007; Van Weenen, 2000; Giannetti *et al.*, 2020) and a large number of papers examining the reduction of energy and material consumption in or by university campuses have been published (Almeida *et al.*, 2013; Oliveira *et al.*, 2018).

Unquestionably, a sustainable university's central mission is for students to embody a sustainable lifestyle (Aktas, 2015; Briggs *et al.*, 2019) and consider sustainable practices during their professional life. This purpose can be achieved through several means like role-playing games (Ely, 2018), community engagement (Eppinga *et al.*, 2020), natural resources management (Zepeda *et al.*, 2018), outreach and partnership (Munguia *et al.*, 2010) and fictive

situations (Österlind, 2018), among others. However, few studies have evaluated the effectiveness of such practices on sustainability behavior. In particular, it is not well known why, how or if students come to embody a sustainable lifestyle. A small subset of research within the broader population and student populations suggests that sustainability behaviors are distinctly psychological and motivational matters (Cloutier *et al.*, 2014; Mandliya *et al.*, 2020; Manoj *et al.*, 2020). Hence, in this paper, we aim to better understand the relationship between one aspect of psychological-happiness and motivational life-academic achievement on sustainability behaviors among students in a Mexican higher education institution, one of the world's top sustainable universities. The research presented in this paper is a very relevant issue in so far as it adds to a particular stock of knowledge rarely documented in the scientific literature on sustainable universities.

The next section provides an overview of the existing literature and major theoretical influences. Before turning to this, it will be important to clarify upfront our use of terminology. Our review draws from the literature on *sustainable development, environmental sustainability, sustainability* and related constructs (e.g. climate concern, environmental awareness, ecologically responsible behavior), as there is significant overlap in terms of goals and objectives. In particular, sustainability is thought of as a long-term target (e.g. a more sustainable world) and sustainable development refers to the processes to achieve sustainability (Mebratu, 1998). Likewise, environmental sustainability is theorized to be a dimension of sustainable development (Morelli, 2011). Although a holistic analysis of how different dimensions and aspects of sustainability is understood and taken up is an important theoretical question (Veenhoven, 2004 for a review), it is beyond the scope of this analysis. Our focus was on broader concerns, namely, whether and how students embody a *sustainable lifestyle*, which we believe, all of these constructs encapsulate.

Research on sustainable development is beginning to consider how an individual's happiness and the happiness of a community are related to a medley of sustainability behaviors. In settings such as cities and neighborhoods, empirical studies suggest that happiness matters for sustainability across a number of indices. This work has shown that sustainable development, as measured by the Green City Index, Economist Intelligence Unit (2011), Our Green Cities (2012) and the America's Top 50 Green Cities (Svoboda *et al.*, 2008), were all positively related to community-level happiness among members of four US cities as defined as the "lasting feeling of pleasure with more positive emotions than negatives one rooted in the communities in which humans reside" (Cloutier *et al.*, 2014, p. 2). Collectively, this aforementioned study suggests that community-level happiness is a good thing for sustainability, in such a way that behaving sustainably may make people happier in/about their communities or that people who are happy in/about their communities may be more invested in their communities and, in turn, are more likely to be involved in sustainability activities. Other more recent research has theorized more directly the relationship between community-level happiness and sustainable development. Cloutier and Pfeiffer's (2015) Sustainability Through Happiness Framework, for example, purports that *happiness visioning*, or the consideration of what a local happy community might look like and a *happiness profit inventory*, or neighborhood characteristics that contribute to the happiness of its residents, are key elements to cultivating sustainable development. These attempts to situate community-level happiness as a precursor to sustainability have led to encouraging developments, like the creation of several assessment tools to measure the integration of both concepts (Paralkar *et al.*, 2017; Pfeiffer and Cloutier, 2016; Souza *et al.*, 2019).

Empirical research has also extended the question of the relationship between happiness and environmental sustainability when happiness is defined as an individual characteristic. For example, qualitative studies have established that sustainable consumption propels self-

fulfillment (Moisander and Pesonen, 2002) and purpose in life (Schösler *et al.*, 2013). Similarly, quantitative studies have consistently found a positive and significant relationship between sustainable consumption and subjective well-being (Brown and Kasser, 2005; Kasser, 2017, for a review) and social well-being (Prati *et al.*, 2016). Among a student sample, an initiative aimed at reducing energy on campus resulted in participants reporting more happiness as measured by the World Bank of Happiness Item bank (Veenhoven, 2010; Escobar-Tello and Bhamra, 2013). Specifically, participants' levels of happiness increased from the start to the end of the campus-wide energy initiative. These ideas that happiness is a good thing for environmental sustainability is related to O'Brien (2008) term "sustainable happiness," or the happiness that contributes to individual, community and/or global well-being without exploiting other people, the environment or future generations (p. 290).

Other research has suggested that different sustainability behaviors may be differently associated with happiness (Carrero *et al.*, 2020; Schmitt *et al.*, 2018). Using the British Household Panel Survey, for example, Ferrer-i-Carbonell and Gowdy (2007) have reported a positive relationship between environmental concern (e.g. concern about biodiversity) and subjective well-being, but a negative relationship with regard to concern about ozone pollution. Likewise, Carrero *et al.* (2020) examined the association between three dimensions of sustainable consumption: purchasing, simplifying and activism, and six markers of well-being among consumers. It was found that happiness was mainly derived from simplifying behaviors, whereas engaging in activism was associated with lower levels of psychological well-being. Some studies have also theorized that happiness and well-being may undermine sustainability, such that happiness or the motivation to be happy maybe a driver to accumulate and consume more and that sustainability could potentially be a source of stress and anxiety (Valor *et al.*, 2018). In one of the most classic pieces of work on the topic, Ruut Veenhoven (2004) presented a systematic review of the assumed effects of sustainable consumption on happiness as defined as well-being and quality of life. This work's major contribution was that individual possession of consumer goods and energy consumption were positively related to happiness. This underscores a recent qualitative analysis of online blogs, forums and websites that found that people high in materialistic values sought happiness through extrinsic climate unfriendly sources (Lee and Ahn, 2016). Similarly, materialism as a personal value has been related to purchased-evoked happiness (Duan, 2020). Furthermore, at the macro level, Veenhoven (2004) reports that happiness is higher in nations that consume the most and do so in an unsustainable manner. Somewhat in line with these ideas, a recent analysis of the 2013 China General Social Survey found that community-level pollution and environmental degradation via socioeconomic development was positively associated with the self-reported happiness (SRHP) of high-income groups (Gu *et al.*, 2017). Thus, materialism, consumption and attaching happiness to extrinsic sources appear to be a constraint to environmental engagement as well as to environmental learning behavior (Manoj *et al.*, 2020).

In addition to the potential benefits of happiness on improving sustainability beliefs and behaviors, the impact of academic performance and related constructs is also being researched. Early studies suggest that the belief in climate change is stronger among people who have more scientific literacy, though scientific literate individuals are not the most concerned about climate change (Corner, 2012). Scholars have also considered the question of how education, more generally, is related to environmental sustainability. The consensus of this literature is that education does positively affect pro-climate change beliefs, but that this effect has decreased over time. Likewise, this effect is smaller or disappears as a function of ideology, especially in places where climate change is a polarized issue, like the

USA (Hamilton, 2011; Hornsey *et al.*, 2016). In particular, right-wing ideology and aligning with the far-right attenuates education's positive effects (Czarnek *et al.*, 2021).

Little attention, however, has been paid to student samples. A few exceptions include data from the Programme of International Student Assessment, which is a cross-national study involving 54,000 students in 72 Organization of Economic Development (OECD) and partner countries. A recent study reported that scientific literacy had the most significant association with students' awareness of greenhouse gases (Oliver and Adkins, 2020). However, the findings from a study of United Arab Emirates University (UAEU) students' understanding, beliefs and behaviors toward education for sustainable development showed no significant differences among students on the basis of their academic level and GPA scores (Al-Naqbi and Alshannag, 2018). These contrasting findings suggest that more research needs to be done as it remains to be seen whether literacy, academic level or grade point average is associated with sustainability.

Taken together (see Table 1 for a summary of key papers), students play an unequivocal role in sustainable universities as they are theorized to embody the mission of a sustainable university through a sustainable lifestyle and spread sustainability practices during their professional careers. Despite this, it is not well known how or why students come to embody a sustainable lifestyle. Our review suggests that sustainability behaviors appear to be distinctly psychological and motivational matters among the general population, though the previous research is somewhat mixed. In the present study, we aim to better understand the relationship between happiness, academic achievement and sustainability behaviors among the student population in a Mexican higher education institution. Furthermore, unlike the previous literature that has tended to investigate these relationships at a macro level, our study is one of the few studies that explores and brings this discussion to the level of the individual. In particular, we were first interested in whether, and in what ways, happiness and academic achievement are associated with sustainability behaviors. Because the literature on happiness and sustainability and academic achievement in the student and general populations are somewhat inconclusive, we examined these issues more exploratatively instead of formulating specific hypothesized predictions. Nonetheless, we believe our study will help understand student populations and leverage points to action to sustainable universities.

2. Methods

2.1 Design

In a questionnaire study available in Appendix 1, Engineering and Psychology university students at a large public university in northwestern Mexico answered questions regarding the key theoretical variables: environmental sustainability, happiness and academic performance. A stratified random sampling technique was used to obtain the sample population that best represents the entire population. The whole population ($N = 3{,}392$) was divided into four different subgroups (information systems engineering, industrial and systems engineering, mechatronics engineering and psychology undergraduate students), and participants were randomly selected proportionally from the different subgroups.

In statistics and mathematics, the curse of dimensionality means that it is not possible to numerically optimize functions of many variables by exhaustively searching a discretized search space, owing to the combinatorial explosion of parameters to explore (Vong *et al.*, 2019). To minimize the curse of dimensionality, the sample size was drawn using the empirical ratio $n/p > 10$ (Peña, 2002), where n is the sample *size*, and p is the number of questions in the questionnaire. Given that p was 21, 210 would be an appropriate sample size. However, considering the law of large numbers and a larger sample yields more

Source	Purpose/aim	Sample	Measure of independent variable	Measure of dependent variable	Main findings
Cloutier *et al.* (2014)		n = 192 US cities	US Sustainability Development Indices: Green City Index, Economist Intelligence Unit (2011), Our Green Cities (2012), Popular Science US City Rankings and SustainLane Green City Rankings	Community-level happiness using Gallup Healthways Well-being index (2012)	Positive correlation between sustainable development and community-level happiness
Moisander and Pesonen (2002)	Investigated the ways in which ecologically oriented citizens engage in resistance towards western, materialistic consumption culture		N/A	N/A	Sustainable consumption drove self-fulfillment
Schösler *et al.* (2013)	Investigate the choice for organic food	Cultural historical analysis of organic food movement and in-depths interviews with organic consumers in the Netherlands	N/A	N/A	Consumption of organic food related to and derives from a positive purpose in life
Brown and Kasser (2005)	Examined the compatibility between subjective well-being (SWB) and ecologically responsible behavior (ERB)	Study 1: n = 206 adolescents Study 2: n = 286 adults	Study 1: Ecologically responsible behavior frequency of ten item positive environmental behaviors Study 2: Ecological Footprint Questionnaire (EFQ, Dholakia and	Study 1: one item subjective well-being question: "How would you say you are feeling these days?" on a five-point scale Study 2: Diener (1984) subjective well-being questions and 15-item Temporal	Positive relationship between SWB and ERB across both studies

Table 1.
Summary of key papers on happiness, academic performance and sustainable consumption

(*continued*)

Source	Purpose/aim	Sample	Measure of independent variable	Measure of dependent variable	Main findings
			Wackernagel, 1999)	Satisfaction with Life Scale (Pavot *et al.*, 1998)	
Prati *et al.* (2016)	Examined the directionality of the association between social well-being and sense of community	n = 298 Italian undergraduate and master students	Pro-environmental behavior (energy conservation behavior) (Markle, 2013)	Social well-being, Italian version of the social well-being scale (Cicognani *et al.*, 2008; Keyes, 1998)	Bidirectional relationship between conservation behavior and social well-being
Escobar-Tello and Bhamra (2013)	Examined a campus initiative aimed at reducing energy (SLEUTH) set for the UK at a university and the role of happiness in higher education sustainable development	Students living in residence halls at Loughborough University; 354 bedrooms	Five-item attitudes toward sustainable lifestyles and toward campus initiative questionnaire	Two closed-ended happiness questions from The World Database of Happiness item's bank (Veenhoven, 2002)	Participants reported more happiness from the beginning to the end of the initiative
Ferrer-i-Carbonell and Gowdy (2007)	Investigated the relationship between subjective measures of well-being and individual environmental attitudes	British Household Survey from 1996: n = 10,000 adults (16+) from 5,000 households	Two environmental attitudes questions	Life satisfaction (well-being)	Positive relationship between concern about biodiversity and subjective well-being, but a negative relationship with concern about ozone pollution
Carrero *et al.* (2020)	Examined the association between three dimensions of sustainable consumption: purchasing, simplifying and activism and well-being	n = 453 students from a Spanish University	Ten-item sustainable consumption scale (measure developed by authors)	Spanish translation of the Psychological Well-Being Scale – EBP – (Diaz *et al.*, 2006)	Happiness was associated with simplifying behaviors; engaging in activism was associated with lower levels of psychological well-being
Schmitt *et al.* (2018)	Examined how performing a variety of pro-environmental behaviors (PEBs)	n = 1,120 Canadian and 1,000 US consumers in a web panel	39 pro-environmental activities	Life satisfaction (Satisfaction with Life Scale, Diener *et al.*, 1985)	All but two were positively correlated with life satisfaction. Pro-

(*continued*)

Table 1.

Source	Purpose/aim	Sample	Measure of independent variable	Measure of dependent variable	Main findings
	predicted life satisfaction				environmental behaviors that involved social interaction, that were easily observed and that involved direct costs present a stronger relationship with happiness.
Valor *et al.* (2018)	Examined how sustainable consumers cope with distress in an especially challenging environment	n = 25 people who defined themselves as sustainable consumers	N/A	N/A	Sustainability was a source of stress and anxiety
Gu *et al.* (2017)	Investigated the impact of socio-economic development and environmental degradation on self-reported health (SRH) and self-reported happiness (SRHP)	2013 China General Social Survey data	Economic degradation via community-level pollution	Self-reported happiness	Community-level pollution via socioeconomic development was positively associated with the self-reported happiness (SRP) among high income groups
Duan (2020)	Examined whether materialism increases purchase-evoked happiness	Student sample (n = 112) and an Amazon Mechanical Turk sample (n = 207)	Materialism (developed by authors)	Purchase-evoked happiness (developed by authors)	Materialism as a personal value was related to purchased-evoked happiness
Hamilton (2011)	Investigated the role of education and political orientation on public concern about climate change	Random sample telephone surveys in New Hampshire (n = 541) and Michigan (n = 1,008) in 2008	Two global warming questions taken from 2008 Gallup Poll	One item education question: What is the highest grade in school, or level of education that you've completed and got credit for?	Education had a positive effect on pro-climate change beliefs, but this effect decreased as a function of political orientation
Czarnek *et al.* (2021)	Analyzed the effects of education and	Analysis of several international	Pro-climate change beliefs	Education	Education had positive effects on pro-climate

(*continued*)

Table 1.

Source	Purpose/aim	Sample	Measure of independent variable	Measure of dependent variable	Main findings
	political ideology across 64 countries	surveys – European Social Survey, World Value Survey, N = 100,000			change beliefs in developing countries; in developed countries, right-wing ideology attenuates (but does not reverse) the positive effects of education
Oliver and Adkins (2020)	Investigated how well-informed students are on the issue of climate change	Programme of International Student Assessment (PISA), a cross-national study involving 540,000 students in 72 OECD and partner countries	Country-level environmental data, the 2017 total greenhouse gas emissions to examine student's knowledge of greenhouse gases in their respective country	Questionnaire explored student school performance and broad attitudes toward the study of science and scientific issues	Scientific literacy had the most significant association with students' awareness of greenhouse gases
Al-Naqbi and Alshannag (2018)	Examined students' knowledge, attitudes and behaviors toward education for sustainable development as a function of education and other demographics	United Arab Emirates University (UAEU) students: n = 823	21 item measuring students' knowledge about SD, 15 item attitudes toward SD, 34 item measuring behaviors about SD chosen from the work of Meyer (2004) and Michalos *et al.* (2012)	Academic level and GPA collected	There were no significant differences among students on the basis of their academic levels and GPA scores on

Table 1.

accurate results, about 10% of the universe was used (n = 355): 49 from information system engineering, 116 from industrial and systems engineering, 89 from mechatronics engineering and 101 from psychology. The study protocol was approved by the University's Human Ethics Committee (CEI-UNISON 19/2019).

2.2 Participants

Of all the 355 participants, about 58% were male and 42% were female. In total 28% of the sample was freshman, 26.5% sophomore, 22.0% junior and 23.3% are senior. Most (60%) participants were about 20 years old, and participants' ages ranged from 17 to 36 years old.

2.3 Variable descriptions

2.3.1 Environmental sustainability. This study relies on the ecological footprint (EP) index as an environmental sustainability measure, described by Rees and Wackernagel (1996) and Monfreda *et al.* (2004). The EP index is a convenient accounting framework to measure the ecological impact of humanity owing to the consumption of resources and the assimilation of wastes generated under the predominant management and production practices in any given year. The EP measures the extent of human's current demand on the planet's bio productive capacity for a given year by taking into consideration the following six activities:

- growing crops for food, animal feed, fiber, oil and rubber;
- grazing animals for meat, hides, wool and milk;
- harvesting timber for wood, fiber and fuel;
- marine and freshwater for fishing;
- accommodating infrastructure for housing, transportation, industrial production and hydro-electric power; and
- burning fossil fuel (Wackernagel *et al.*, 2002).

The index delivers results in standardized units called global hectares that represent an equal amount of biological productivity. One global hectare is equal to 1 ha with productivity equal to the average productivity of the 11.4 billion bioproductive hectares. Under this perspective, students were classified as "environmentally very sustainable" if their EP ranged between 0 and 0.49, "environmentally sustainable" if their EP index ranged from 0.5 to 1, "environmentally slightly unsustainable" if their EP index ranged from 1 to 1.5 and "environmentally unsustainable" if their EP index was higher than 1.5.

For the present study, participants responses to 11 questions (Appendix 1) regarding consumption of meat, fish, vegetables, fruits, dairy products, means of transportation, distance from university to home, paper consumption, electricity consumption, residential area and the number of persons occupying the house were used as the measure of EP [equation (1)]:

$$EF = \left(\frac{P}{Y_N} * YF * EQF\right)/BC \tag{1}$$

where:

P = annual amount consumed of a product (t/year), according to Appendix 2;

Y_N = the national average income referring to consumption (t/ha/year), according to Table A2;

YF = the annual factor of the difference between national productivity and the world average within a given land use category, as shown in Table A1;

EQF = equivalence factor that weighs different types of land based on their inherent capacity to produce useful human biological resources in relation to the average global productivity in all types of land used (gha/ha), as shown in Table A1; and

BC = the biocapacity of a given area to supply a demand in gha (Table A1).

The calculation of the EP relates to the consumption of resources as available in Appendices 1 and 2, except for the "carbon" category, which uses a different calculation approach [Equation (2)], accounting for the student's transport to the university and the electricity consumed in their homes. This differentiated approach was suggested as more accurate by Mancini *et al.* (2016).

$$EF_{carb} = \frac{P_C * (S_{ocean})}{Y_w} * EQF \text{ where } Y_w = \frac{AFCS}{0.27} \quad (2)$$

where:

P_c: the annual global anthropogenic emissions of carbon dioxide (tCO_2/yr). This amount is identified with the responses to the questionnaire in Appendix 1 regarding the transport and use of electricity. The consumption factors for these responses are shown in Appendix 2;

S_{ocean}: the fraction (0.72) of the anthropogenic CO_2 emission sequestered by the ocean in a given year. The data from Khatiwala *et al.* (2009) are currently used by the National Footprint Accounts and the fraction of capture for the year 2010 was 28% (Lazarus *et al.*, 2014; Borucke *et al.*, 2013);

Y_w: the annual rate of carbon dioxide sequestration per hectare of the world's average forest;

EQS : the equivalence factor used to weight forest areas; and

AFCS : 0.73 tC/ha is the average carbon sequestration of forests (Mancini *et al.*, 2016); 0.27 : tC/tCO_2 represents the portion of C in the CO_2 molecule and is used to convert tons of carbon into tons of carbon dioxide.

The carbon footprint is calculated separately, considering the emission factors for a given mode of transport multiplied by their respective routes. Electricity emissions refer only to the student, as informed in the questionnaire. These two emissions are added to the paper consumption footprint that also uses the biocapacity of the forest area. The Mexican Yn values for the year 2020 were extracted from the FAO for the national production of "P" consumption. The YF, EQF and land use were extracted from the published data of the Global Footprint Network (GFN) (2016). Thus, the EP of students considers the national production characteristics adjusted worldwide and global biocapacity.

2.3.2 Happiness. The happiness measure derived from Alves-Pinto and Giannetti (2019) comprised a set of nine questions about self-declared happiness, safety on campus, the offering of recreational and cultural activities, feeling lonely in school, relationship with colleagues and teachers, the offering of volunteer activities, intentions to continue being a student, academic training, preparation for a professional carrier and preparation for being a change agent. Each question comprised four choices, where A means the least favorable answer and D the most favorable in terms of happiness. We calculated a happiness index (HI) based on the following equation:

$$HI = 1 - (\text{total of items answered with A or B/total of items in the happiness section}) \quad (3)$$

A value from 0 to 0.49 was labeled under the category of do not feel happy. A value from 0.50 to 0.74 was labeled as somewhat happy. A value from 0.75 to 0.99 was labeled happy and a HI of 1 was labeled as very happy. The categories were constructed in a focus group with the participation of four senior sustainability researchers.

2.3.3 Academic performance (grade point average). The academic performance in this university is a numerical grading system where the cutoff to pass the course is 60 points out of 100. Academic performance was an open-ended question and classified as the following: from 90 to 100 – very good; from 80 to 89 – good; from 70 to 79 – regular; and from 0 to 69 – poor, although there were no GPA below 60. The categories were constructed in a focus group with the participation of six full professors. Only 293 students responded to the GPA question.

2.4 Procedures

After being randomly selected, participants met individually with a research team member in an empty classroom. Participants were first presented with an informed consent form, which provided participants with a brief background of the study. After agreeing to participate, participants were asked a series of demographic questions, including age, gender, degree program and year in school. Next, participants completed nine questions related to their happiness and general well-being in their respective bachelor's degrees. Finally, participants responded to measures of environmental sustainability.

2.5 Data analysis

First, a series of chi-square tests for independence were conducted to examine the relationship between our main theoretical variables: happiness, academic performance and sustainability. However, the assumption of the test, that no cell should have an expected value of less than 1, was not met. Therefore, it was not possible to use the chi-squared test to evaluate the associations between happiness, academic performance and sustainability. As an alternative, the theorem of Wilks offers an asymptotic distribution of the log-likelihood ratio statistic that parallels the chi-squared distribution. The test statistic is as follows:

$$G^2 = 2\sum_{i,j,k} f_{i,j,k} \ \ log\left(\frac{f_{i,j,k}}{e_{i,j,k}}\right)$$

The observed value is 48.3026 and the G^2test is 0.6929; hence, the null hypothesis was not rejected. These results suggest that happiness, academic performance and sustainability are not related.

A second chi-square test for independence for two categorical variables was conducted under the assumption that the null hypothesis that the two categorical variables are independent. The results indicated the following:

- the null hypothesis for the HI and academic performance is not rejected;
- the null hypothesis for the HI and sustainability is not rejected; and
- the null hypothesis for sustainability and academic performance is not rejected.

As a conclusion, it was confirmed that the three variables were independent of one another. Despite the non-existence of relationships, a series of correspondence analyses were conducted to examine the existence of clusters or patterns that could indicate relationships among the three variables. In particular, three correspondence analyses were conducted as follows:

(1) between happiness and sustainability;
(2) between happiness and academic performance; and
(3) between sustainability and academic performance.

For each correspondence analysis, a two-way contingency table and a biplot were reported. According to Rencher (2002), a biplot is a two-dimensional representation of a data matrix Y showing a point for each of the n observation vectors (rows of Y) along with a point for each of the p variables (columns of Y).

3. Results

Descriptive information regarding the key theoretical variables is presented in Table 2. As can be seen, most students are happy or very happy and in good academic standing. However, most students indicated that they are unsustainable or slightly sustainable.

3.1 Happiness and academic performance

Table 3 shows the joint relative frequencies between the happiness and academic performance variables. About a quarter of students (0.2457) are happy and have good academic performance. The share of those who are happy and have very good academic performance is 0.1195. Taken in aggregate, nearly a third (0.3106) of students feel very happy and have good or very good academic performance.

A bivariate scatter plot is reported in Figure 1. Four patterns emerged, indicating groups of students that share specificities. The first group shows those who are happy, somewhat happy or do not feel happy and have poor academic performance. The second group is represented by those who are very happy and got good academic performance. The third recognized pattern involves those who have a regular academic performance regardless of how happy they feel. The fourth group is those who have very good academic performance regardless of how happy they are.

3.2 Happiness and environmental sustainability

Table 4 presents the joint relative frequencies between the happiness and environmental sustainability variables. As can be seen, there is a negative relationship between sustainability and happiness. Almost six in ten students (0.6246) that feel happy or very happy are also unsustainable or slightly sustainable. Moreover, very few students are very sustainable.

The bivariate scatter plots, as seen in Figure 2, helped to reveal four patterns among the happiness and environmental sustainability variables. One pattern is those who are

Table 2. Overall frequencies of happiness, academic performance and environmental sustainability

Variables	Response			
Environmental sustainability	Unsustainable	Slightly sustainable	Sustainable	Very sustainable
	42.25%	34.65%	21.97%	1.13%
Happiness index	Not happy	Somewhat happy	Happy	Very happy
	5.92%	16.34%	43.66%	34.08%
Academic performance	Poor	Regular	Good	Very good
	0.68%	13.31%	51.88%	34.13%

Table 3. Joint relative frequencies between happiness and academic performance

	Academic performance				
Items	Poor (A)	Regular (B)	Good (C)	Very good (D)	Total
Happiness index					
Do not feel happy (A)	0	0.0137	0.0239	0.0239	0.0068
Somewhat happy (B)	0	0.0307	0.0751	0.0614	0.1656
Happy (C)	0.0034	0.0512	0.2457	0.1195	0.4198
Very happy (D)	0.0034	0.0375	0.1741	0.1365	0.3515
Total	0.0068	0.1331	0.5188	0.3413	1

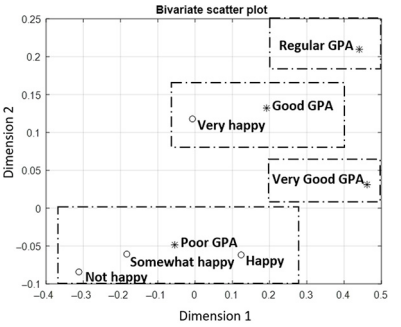


Figure 1.
Bivariate scatter plots between happiness and academic performance

Notes: Asterisks indicate the GPA and small circles happiness. The dashed-line squares are a visual reference to identify groups of students that share specificities

Table 4.
Joint relative frequencies between happiness and sustainability

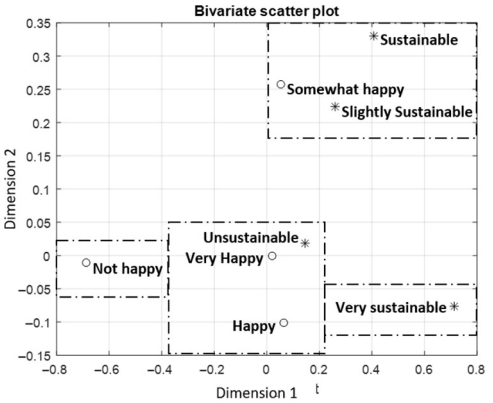
Items	Sustainability classification: Unsustainable (A)	Slightly sustainable (B)	Sustainable (C)	Very sustainable (D)	Total
Happiness index					
Do not feel happy (A)	0.0137	0.0239	0.0171	0.0068	0.0614
Somewhat happy (B)	0.0410	0.0785	0.0478	0	*0.1672*
Happy (C)	*0.1536*	*0.1877*	0.0717	0.00689	*0.4198*
Very happy (D)	*0.0990*	*0.1843*	0.0614	0.0068	*0.3515*
Total	*0.3072*	*0.4744*	*0.1980*	0.0205	1

sustainable and slightly sustainable and are somewhat happy. Another pattern formed is those who are not happy regardless of their level of sustainability. Another group is those who feel very sustainable regardless of their HI level. Finally, the last pattern is those students that are very happy or happy but are unsustainable.

3.3 Academic performance and environmental sustainability

Table 5 presents the joint relative frequencies between academic performance and environmental sustainability. Like happiness and sustainability, the majority of students who have good or very good academic performance were also unsustainable or slightly sustainable. The joint relative frequency of this combination of students is 0.6699. In contrast, the combination of those who have good academic performance and are sustainable is 0.1160.

Figure 3 reports the bivariate scatter plots for the sustainability and academic performance latent variables. There were four patterns identified. The first pattern is those who are sustainable and have a very good academic performance. The second pattern is those who have poor academic performance, regardless of their sustainability level. The third pattern formed are those who have a regular or good academic performance and are



Notes: Asterisks indicate sustainability and small circles GPA. The dashed-line squares are a visual reference to identify groups of students that share specificities

Figure 2.
Bivariate scatter plots of the happiness indexes and sustainability

Items	Unsustainable (A)	Slightly sustainable (B)	Sustainable (C)	Very sustainable (D)	Total
		Sustainability classification			
Academic performance					
Poor (A)	0.0034	0	0.0034	0	0.0668
Regular (B)	0.0341	0.0751	0.0205	0.0034	**0.1331**
Good (C)	**0.1536**	**0.2433**	**0.1160**	0.0068	**0.5188**
Very good (D)	**0.1160**	**0.1570**	0.0580	0.0102	**0.3413**
Total	0.3072	0.4744	0.1980	0.0205	1

Table 5.
Joint relative frequencies between academic performance and sustainability

slightly sustainable. The fourth pattern formed are those who are sustainable and unsustainable regardless of their academic performance.

4. Analysis

Students play an unequivocal role in sustainable universities as they are theorized to embody the mission of a sustainable university. Despite this, it is not well known how or why students come to embody a sustainable lifestyle. The purpose of this paper is to better understand the relationship between two individual-level characteristics-happiness and academic performance on environmental sustainability behaviors among students in a Mexican higher education institution. It was found that students in good academic standing and were happy were also not very sustainable. This share of students accounts for almost six in ten students or nearly 60%. These results somewhat align with previous research that has found no link between happiness and sustainability (Carrero *et al.*, 2020) and academic performance and sustainability (Al-Naqbi and Alshannag, 2018). These findings have implications for higher education institutions when fostering sustainability. In particular, the results do not align with the sustainability practices of this Mexican higher education

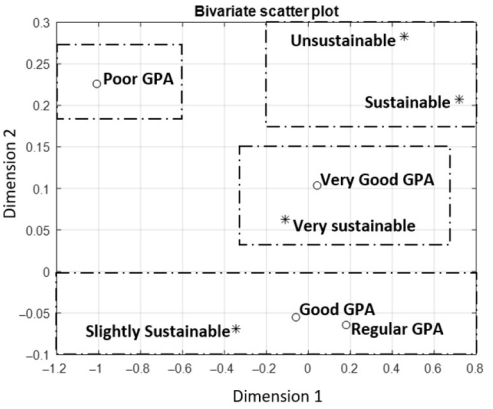


Figure 3.
Bivariate scatter plots between academic performance and sustainability

Notes: Asterisks indicate sustainability and small circles GPA. The dashed-line squares are a visual reference to identify groups of students that share specificities

institution which used to hold the ISO 14000 international standard certification, is currently among the world's top sustainable universities in the world and nearly the top five sustainable universities in Mexico as certified by the UI Greenmetric World University Ranking (2019). Likewise, a previous university report from the same university indicated that sustainability awareness within the university improved, as evidenced by daily activities. Still, the evidence reported in this research shows that this is not the case. Even with all institutional activities aimed at educating students and making them change their behavior related to the consumption of goods, the results show that these activities are not yet affecting. Then, why did students report being slightly sustainable or not sustainable at all?

One of the critical factors for determining the environmental unsustainability of most of the students was their impact on land use and biodiversity owing to livestock production with high resource consumption, waste output and greenhouse gas emissions (Capper, 2013). Mexico's dietary patterns are traditionally associated with sociodemographic characteristics (Pérez-Tepayo *et al.*, 2020). The country is the seventh largest livestock producer and the fifth largest consumer of beef in the world with a per capita consumption of 69 kg of meat per year (Consejo Mexicano de la Carne, 2019), and the high consumption of meat, chicken and pork (16.5 kg per capita) is habitual in the area where this study was conducted (Hernandez, 2020).

The consumption of energy may also be related to the unsustainability behaviors of the students in this study. The students participating in the study live in a state that is considered one of the largest electricity consumers in Mexico because of the extreme weather conditions. As the residential demand is one of the highest in the state (Copenhagen Center on Energy Efficiency, 2019) because of the severe weather patterns, it may be difficult to impossible for students to behave sustainably.

There are some limitations that constitute opportunities for future research. First, as with any other questionnaire study, the data is subject to the participant's interpretation and judgment. Additionally, the research design used does not allow us to make any claims about causation or directionality. The only way to truly examine whether sustainability,

happiness and GPA have causal effects is through random assignment and experimentally manipulating happiness or GPA. In addition, our measure of happiness included questions about self-declared happiness, feelings of safety on campus, preparation for a professional career, among others, and are likely measuring different constructs. Thus, future research might ideally use comprehensive, and ideally, factor analyzed measures of happiness and use procedures that can determine the causality and directionality of these variables. Overall, future research should continue to unpack the psychological and motivational characteristics of sustainability behaviors.

Despite the unsustainability of student's in this study, this study has several contributions. First, it provides an evaluation of a sustainable university from the perspectives and behaviors of students. The views of students as they relate to the complexities and visions of a sustainable university have remained relatively underexamined. Second, these analyses point to specific sustainability-oriented challenges and inadvertent barriers (e.g. extreme weather patterns) toward the embodiment of a sustainable lifestyle. These challenges and barriers suggest that sustainable universities need to address the dynamic changes inherent in sustainable development. Finally, our study indicates that the link between happiness, academic performance and sustainability may be more complicated and driven by cultural and structural barriers. The issue of barriers, as they relate to sustainability behaviors, is highly relevant and presents important opportunities and questions for future research.

5. Conclusions

The main finding from this work was that the happiest and most academically astute participants were also only slightly environmentally sustainable or not sustainable at all. The lack of environmental sustainability in students from one of the most sustainability top-ranked in Mexico and the world does not fit with previous sustainability reports. External factors to the university, such as cultural values related to meat consumption and extreme weather conditions, may create sustainability barriers. We hope that future research will further examine the role of cultural values and broader obstacles to sustainability. Therefore, the main practical contribution is that this research can strengthen the sustainability initiatives in higher education institutions.

References

Aktas, C.B. (2015), "Reflections on interdisciplinary sustainability research with undergraduate students", *International Journal of Sustainability in Higher Education*, Vol. 16 No. 3, pp. 354-366, doi: 10.1108/IJSHE-11-2013-0153.

Almeida, C.M.V.B., Santos, A.P.Z., Bonilla, S.H., Giannetti, B.F. and Huisingh, D. (2013), "The roles, perspectives and limitations of environmental accounting in higher educational institutions: an emergy synthesis study of the engineering programme at the Paulista University in Brazil", *Journal of Cleaner Production*, Vol. 52, pp. 380-391, doi: 10.1016/j.jclepro.2013.03.008.

Al-Naqbi, A.K. and Alshannag, Q. (2018), "The status of education for sustainable development and sustainability knowledge, attitudes, and behaviors of U.A.E. University students", *International Journal of Sustainability in Higher Education*, Vol. 19 No. 3, pp. 566-588, doi: 10.1108/IJSHE-06-2017-0091.

Alves-Pinto, M.J., Jr and Giannetti, B.F. (2019), "Sustainable universities: a comparison of the ecological footprint, happiness and academic performance among students of different courses", in Walter Leal Filho, U.B. (Eds), *Sustainability on University Campuses: Learning, Skills Building and Best Practices*, Springer, pp. 209-225, available at: www.springer.com/gp/book/9783030158637.

Borucke, M., Moore, D., Cranston, G., Gracey, K., Iha, K., Larson, J., Lazarus, E., Morales, J.C., Wackernagel, M. and Galli, A. (2013), "Accounting for demand and supply of the biosphere's

regenerative capacity: the national footprint accounts' underlying methodology and framework", *Ecological Indicators*, Vol. 24, pp. 518-533, doi: 10.1016/j.ecolind.2012.08.005.

Briggs, S.J., Robinson, Z.P., Hadley, R.L. and Pedersen, R.L. (2019), "The importance of university, students and students' union partnerships in student-led projects: a case study", *International Journal of Sustainability in Higher Education*, Vol. 20 No. 8, pp. 1409-1427, doi: 10.1108/IJSHE-01-2019-0050.

Brown, K.W. and Kasser, T. (2005), "Are psychological and ecological well-being compatible? The role of values, mindfulness, and lifestyle", *Social Indicators Research*, Vol. 74 No. 2, pp. 336-349, doi: 10.1007/s11205-004-8207-88.

Capper, J.L. (2013), "Should we reject animal source foods to save the planet? A review of the sustainability of global livestock production", *South African Journal of Animal Science*, Vol. 43 No. 3, pp. 233-246, doi: 10.4314/sajas.v43i3.1.

Carrero, I., Valor, C. and Redondo, R. (2020), "Do all dimensions of sustainable consumption lead to psychological well-being? Empirical evidence from young consumers", *Journal of Agricultural and Environmental Ethics*, Vol. 33 No. 1, pp. 145-170, doi: 10.1007/s10806-019-09818-8

Cloutier, S. and Pfeiffer, D. (2015), "Sustainability through happiness: a framework for sustainable development", *Sustainable Development*, Vol. 23 No. 5, pp. 317-327, doi: 10.1002/sd.1593.

Cloutier, S., Larson, L. and Jambeck, J. (2014), "Are sustainable cities 'happy' cities? Associations between sustainable development and human well-being in urban areas of the United States", *Environment, Development and Sustainability*, Vol. 16 No. 3, pp. 633-647, doi: 10.1007/s10668-013-9499-0.

Consejo Mexicano de la Carne (2019), "Compendio estadístico [statistical compendium] 2019", available at: https://comecarne.org/compendio-estadistico-2019/ (accessed 25 July 2020)

Copenhagen Center on Energy Efficiency (2019), "Energy efficiency in buildings Sonora state, Mexico", available at: https://c2e2.unepdtu.org/wp-content/uploads/sites/3/2019/08/2019-08-bea-assessment-sonora.pdf (accessed 25 June 2020).

Corner, A. (2012), "Science literacy and climate views", *Nature Climate Change*, Vol. 2 No. 10, pp. 710-711, doi: 10.1038/nclimate1700.

Czarnek, G., Kossowska, M. and Szwed, P. (2021), "Right-wing ideology reduces the effects of education on climate change beliefs in more developed countries", *Nature Climate Change*, Vol. 11 No. 1, pp. 9-13, doi: 10.1038/s41558-020-00930-6.

Dholakia, R. and Wackernagel, M. (1999), "The ecological footprint questionnaire", *Redefining Progress*, San Francisco, CA.

Díaz, D., Rodríguez-Carvajal, R., Blanco, A., Moreno-Jiménez, B., Gallardo, I., Valle, C. and Dierendonck, D. (2006), "Adaptación española de las escalas de bienestar psicológico de Ryff [Spanish adaptation of Ryff's Psychological Well-being scales]", *Psicothema*, Vol. 18, pp. 572-577.

Duan, J. (2020), "Materialism and purchase-evoked happiness: a moderated mediation model of purchase type and purchase's impact on self", *Journal of Global Scholars of Marketing Science*, Vol. 30 No. 2, pp. 170-187, doi: 10.1080/21639159.2019.1700150.

Ely, A.V. (2018), "Experiential learning in 'innovation for sustainability': an evaluation of teaching and learning activities (TLAs) in an international masters course", *International Journal of Sustainability in Higher Education*, Vol. 19 No. 7, pp. 1204-1219, doi: 10.1108/IJSHE-08-2017-0141.

Eppinga, M.B., *et al.* (2020), "Putting sustainability research into practice on the university campus: an example from a Caribbean small island state", *International Journal of Sustainability in Higher Education*, Vol. 21 No. 1, pp. 54-75, doi: 10.1108/IJSHE-03-2019-0131.

Escobar-Tello, M.C. and Bhamra, T. (2013), "Happiness as a harmonising path for bringing higher education towards sustainability", *Environment, Development and Sustainability*, Vol. 15 No. 1, pp. 177-197, doi: 10.1007/s10668-012-9382-4.

Ferrer-I-Carbonell, A. and Gowdy, J.M. (2007), "Environmental degradation and happiness", *Ecological Economics*, Vol. 60 No. 3, pp. 509-516, doi: 10.1016/j.ecolecon.2005.12.005.

Food and Agriculture Organization of the United Nations (FAO) (2020), "F.A.O.S.T.A.T. Data", available at: www.fao.org/faostat/en/#data (accessed 20 October 2020).

Giannetti, B.F., *et al.* (2020), "Insights on the united nations sustainable development goals scope: are they aligned with a 'strong' sustainable development?", *Journal of Cleaner Production*, Vol. 252, doi: 10.1016/j.jclepro.2019.119574.

Global Footprint Network (GFN) (2016), "Free public data set", available at: www.footprintnetwork.org/licenses/public-data-package-free/ (accessed 22 August 2019).

Green City Index, Economist Intelligence Unit (2011), "U.S. and Canada green city index", available at: www.siemens.com/entry/cc/en/greencityindex.htm (accessed 15 September 2020)

Gu, L., *et al.* (2017), "Competing forces of socio-economic development and environmental degradation on health and happiness for different income groups in China", *International Journal of Health Services*, Vol. 47 No. 4, pp. 752-777, doi: 10.1177%2F0020731417725470.

Hamilton, L.C. (2011), "Education, politics and opinions about climate change evidence for interaction effects", *Climatic Change*, Vol. 104 No. 2, pp. 231-242, doi: 10.1007/s10584-010-9957-8.

Hernandez, Y. (2020), "Consumen sonorenses más carne de otros estados' [sonorans consume more meat from other states]", El Imparcial, available at: www.elimparcial.com/sonora/sonora/Consumen-sonorenses-mas-carne-de-otros-estados-20150501-0132.html (accessed 15 august 2020)

Hornsey, M.J., Harris, E.A., Bain, P.G. and Fielding, K.S. (2016), "Meta-analyses of the determinants and outcomes of belief in climate change", *Nature Climate Change*, Vol. 6 No. 6, pp. 622-626, doi: 10.1038/nclimate2943.

Kasser, T. (2017), "Living both well and sustainability: a review of the literature, with some reflections on future research, interventions and policy", *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, Vol. 375 No. 2095, pp. 1-13, doi: 10.1098/rsta.2016.0369.

Khatiwala, S., *et al.* (2009), "Reconstruction of the history of anthropogenic CO_2 concentrations in the ocean", *Nature*, Vol. 462 No. 7271, pp. 346-350, doi: 10.1038/nature08526.

Lazarus, E. *et al.* (2014), "Working guidebook to the national footprint accounts: 2014 edition", Global Footprint Network, Oakland, available at: www.footprintnetwork.org/content/images/article_uploads/NFA%202014%20Guidebook%207-14-14.pdf

Lee, M.S.W. and Ahn, C.S.Y. (2016), "Anti-consumption, materialism, and consumer well-being", *Journal of Consumer Affairs*, Vol. 50 No. 1, pp. 18-47, doi: 10.1111/joca.12089.

Lozano, R. and Barreiro-Gen, M. (2019), "Analysing the factors affecting the incorporation of sustainable development into European higher education institutions", *Sustainable Development*, Vol. 27 No. 5, pp. 965-975, doi: 10.1002/sd.1987.

Lukman, R. and Glavič, P. (2007), "What are the key elements of a sustainable university?", *Clean Technologies and Environmental Policy*, Vol. 9 No. 2, pp. 103-114, doi: 10.1007/s10098-006-0070-7.

Mancini, M.S., *et al.* (2016), "Ecological footprint: refining the carbon footprint calculation", *Ecological Indicators*, Vol. 61, pp. 390-403, doi: 10.1016/j.ecolind.2015.09.040.

Mandliya, A., *et al.* (2020), "What influences intention to purchase sustainable products? Impact of advertising and materialism", *International Journal of Productivity and Performance Management*, Vol. 69 No. 8, doi: 10.1108/IJPPM-12-2019-0591.

Manoj, M., *et al.* (2020), "Antecedents of environmental engagement and environmental learning behaviour", *Journal of Hospitality and Tourism, Ahead-of-Print*, doi: 10.1108/JHTI-01-2020-0001.

Mebratu, D. (1998), "Sustainability and sustainable development: historical and conceptual review'", *Environmental Impact Assessment Review*, Vol. 18 No. 6, pp. 493-520, doi: 10.1016/S0195-9255(98)00019-5.

Menon, S. and Suresh, M. (2020), "Synergizing education, research, campus operations, and community engagements towards sustainability in higher education: a literature review", *International Journal of Sustainability in Higher Education*, Vol. 21 No. 5, pp. 1015-1051, doi: 10.1108/IJSHE-03-2020-0089.

Moisander, J. and Pesonen, S. (2002), "Narratives of sustainable ways of living: constructing the self and the other as a green consumer", *Management Decision*, Vol. 40 No. 4, pp. 329-342, doi: 10.1108/00251740210426321.

Monfreda, C., *et al.* (2004), "Establishing national natural capital accounts based on detailed ecological footprint and biological capacity assessment", *Land Use Policy*, Vol. 21 No. 3, pp. 231-246, doi: 10.1016/j.landusepol.2003.10.009.

Morelli, J. (2011), "Environmental sustainability: a definition for environmental professionals", *Journal of Environmental Sustainability*, Vol. 1 No. 1, doi: 10.14448/jes.01.0002.

Munguia, N., *et al.* (2010), "Identifying pollution prevention opportunities in the Mexican auto refinishing industry", *Management of Environmental Quality: An International Journal*, Vol. 21 No. 3, pp. 324-335, doi: 10.1108/14777831011036885.

O'Brien, C. (2008), "Sustainable happiness: how happiness studies can contribute to a more sustainable future", *Canadian Psychology/Psychologie Canadienne*, Vol. 49 No. 4, pp. 289-295, doi: 10.1037/a0013235.

Oliveira, J.H., Giannetti, B.F., Agostinho, F. and Almeida, C.M.V.B. (2018), "Decision making under the environmental perspective: choosing between traditional and distance teaching courses", *Journal of Cleaner Production*, Vol. 172, pp. 4303-4313, doi: 10.1016/j.jclepro.2017.06.189.

Oliver, M. and Adkins, M. (2020), "Hot-headed students? Scientific literacy, perceptions and awareness of climate change in 15-year-old across 54 countries", *Energy Research and Social Science*, p. 70, doi: 10.1016/j.erss.2020.101641.

Österlind, E. (2018), "Drama in higher education for sustainability: work-based learning through fiction?", *Higher Education, Skills and Work-Based Learning*, Vol. 8 No. 3, pp. 337-352, doi: 10.1108/HESWBL-03-2018-0034.

Our Green Cities (2012), "Our green cities index", available at: www.ourgreencities.com/ (accessed 15 June 2020)

Paralkar, S., *et al.* (2017), "The sustainable neighborhoods for happiness (SNfH) decision tool: assessing neighborhood level sustainability and happiness", *Ecological Indicators*, Vol. 74, pp. 10-18.

Peña, D. (2002), "Análisis de datos multivariantes, [multivariate data analysis]", McGraw-Hill, Madrid, España, available at: www.academia.edu/6134000/Análisis_de_Datos_Multivariantes_Daniel_Peña?auto=download (accessed 15 June 2020).

Pérez-Tepayo, S., *et al.* (2020), "Trends in the dietary patterns of Mexican adults by sociodemographic characteristics", *Nutrition Journal*, Vol. 19 No. 1, pp. 1-11, doi: 10.1186/s12937-020-00568-2.

Pfeiffer, D. and Cloutier, S. (2016), "Planning for happy neighborhoods", *Journal of the American Planning Association*, Vol. 82 No. 3, pp. 267-280, doi: 10.1080/01944363.2016.1166347.

Prati, G., Albanesi, C. and Pietrantoni, L. (2016), "The reciprocal relationship between sense of community and social well-being: a cross-lagged panel analysis", *Social Indicators Research*, Vol. 127 No. 3, pp. 1321-1332, doi: 10.1007/s11205-015-1012-8.

Rees, W. and Wackernagel, M. (1996), "Urban ecological footprints: why cities cannot be sustainable-and why they are a key to sustainability", *Environmental Impact Assessment Review*, Vol. 16 No. 4-6, pp. 223-248, doi: 10.1016/S0195-9255(96)00022-4.

Rencher, A.C. (2002), *Methods of Multivariate Analysis Second Edition*, John Wiley and Sons, New York, NY.

Schmitt, M.T., Aknin, L.B., Axsen, J. and Shwom, R.L. (2018), "Unpacking the relationships between pro-environmental behavior, life satisfaction, and perceived ecological threat", *Ecological Economics*, Vol. 143, pp. 130-140, doi: 10.1016/j.ecolecon.2017.07.007.

Schösler, H., De Boer, J. and Boersema, J.J. (2013), "The organic food philosophy: a qualitative exploration of the practices, values, and beliefs of Dutch organic consumers within a cultural–historical frame", *Journal of Agricultural and Environmental Ethics*, Vol. 26 No. 2, pp. 439-460, doi: 10.1007/s10806-012-9392-0.

Souza, R.R., *et al.* (2019), "Calibration of a questionnaire for evaluation of happiness", *Journal of Environmental Accounting and Management*, Vol. 7 No. 4, pp. 449-462, doi: 10.5890/JEAM.2019.12.007.

Svoboda, E. *et al.* (2008), "America's top 50 green cities", Popular Science, available at: www.popsci.com/environment/article/2008-02/americas-50-greenest-cities/ (accessed 15 August 2020).

Valor, C., Antonetti, P. and Carrero, I. (2018), "Stressful sustainability: a hermeneutic analysis", *European Journal of Marketing*, Vol. 52 Nos 3/4, pp. 550-574, doi: 10.1108/EJM-12-2016-0712.

Van Weenen, H. (2000), "Towards a vision of a sustainable university", *International Journal of Sustainability in Higher Education*, Vol. 1 No. 1, pp. 20-34, doi: 10.1108/1467 630010307075.

Veenhoven, R. (2002), "World database of happiness, catalogue of correlates", Printout 10-1-1990. On going register held at Erasmus University Rotterdam, the Netherlands.

Veenhoven, R. (2004), "Sustainable consumption and happiness", pp. 1-32, available at: www.academia.edu/2975770/Sustainable_consumption_and_happiness (accessed 15 August 2020).

Veenhoven, R. (2010), "World database of happiness, item bank", Erasmus University Rotterdam, available at: worlddatabaseofhappiness.eur.nl/hap_nat/nat_fp.php?mode=1 (accessed 28 January 2021).

Vong, W.K., *et al.* (2019), "Do additional features help or hurt category learning? The curse of dimensionality in human learners", *Cognitive Science*, Vol. 43 No. 3, doi: 10.1111/cogs.12724.

Wackernagel, M., *et al.* (2002), "Tracking the ecological overshoot of the human economy", *Proceedings of the National Academy of Sciences of Sciences*, Vol. 99 No. 14, pp. 9266-9271, doi: 10.1073/pnas.142033699.

Zepeda, D.S., *et al.* (2018), "Sustainability strategies for coastal aquifers: a case study of the Hermosillo Coast aquifer", *Journal of Cleaner Production*, Vol. 195, pp. 1170-1182, doi: 10.1016/j.jclepro.2018.05.191.

Further reading

Membiela-Pollan, M., *et al.* (2019), "The inefficiency of the neoclassical paradigm in the promotion of subjective well-being and socioeconomic, and environmental sustainability: an empirical test for the Spanish case", *Sustainability*, Vol. 11 No. 7, pp. 1-14.

Appendix 1. Survey applied to students at Mexican university to know about their happiness, ecological footprint and academic degree

Instructions: We would like you to answer a series of questions about yourself. There are no right or wrong answers to any of these statements; we are interested in your honest reactions and opinions. Please read each statement carefully and respond accordingly. Please, answer the sociodemographic profile first at the top of the survey; then, you will have to answer multiple option questions related to happiness and ecological footprint, fill in just one answer. **ANSWER ALL QUESTIONS INDIVIDUALLY**.

Part I: Sociodemographic profile

University and campus:

Bachelor's degree/graduate program:

On a scale of 0 (zero) to 100 (one hundred), what number represents your average grade in the general course?

Year in the school: a) Freshmen, b) Sophmore, c) Junior, d) Senior

Gender: a. Female: b. Male: c. I do not want to answer

Age:

Part II: Happiness

(1) How would you rate your happiness level now?

- Not yet happy

- Somewhat happy
- Happy
- Very happy

(2) Inside the campus, do you feel safe?
- No
- A little
- Yes
- Much

(3) Does your school offer recreational and cultural activities?
- No, it doesn't.
- Offers few options.
- Offers is enough.
- It offers a lot of options.

(4) How often do you feel lonely in school?
- Always
- Most of the time
- Sometimes/rarely
- Never

(5) How would you rate your relationship with colleagues and teachers?
- Unsatisfactory
- Regular
- Good
- Great

(6) Does your school offer volunteer activities?
- No, it doesn't.
- Offers little
- Offers
- It offers a lot

(7) Do you intend to continue being a student of your bachelor degree?
- No, I don't.
- I intend, but I would make many changes.
- I intend to make few changes.
- I intend without changes.

(8) Do you think your academic training is preparing you for a professional carrier?
- No positive expectation
- Low expectation
- Normal expectation
- High expectation

(9) Has your bachelor's degree program prepared you to be a change agent for a more sustainable world?
- No, it doesn't.
- Poorly

- Yes, it allows.
- Yes, very much.

Part III: Ecological footprint

(10) How often do you eat meat during the week?
- I do not eat meat.
- Rarely (one serving per week)
- Occasionally (four or more servings per week)
- Often (two or more servings per day)

(11) How often do you eat fish during the week?
- I do not eat fish.
- Rarely (one serving per week)
- Occasionally (four or more servings per week)
- Often (two or more servings per day)

(12) How often do you eat vegetables during the week? (vegetables and greens)
- I do not eat vegetables.
- Rarely (one serving per week)
- Occasionally (four or more servings per week)
- Often (two or more servings per day)

(13) How often do you eat fruit during the week?
- I do not eat fruit.
- Rarely (one serving per week)
- Occasionally (four or more servings per week)
- Often (two or more servings per day)

(14) How often do you have dairy products during the week?
- Never
- Rarely (one serving per week)
- Occasionally (four or more servings per week)
- Often (two or more servings per day)

(15) Which means of transportation do you use the most on your way to school?
- Car
- Motorcycle
- Public transportation
- I do not use motorized means of transportation to come to school.

(16) How far is your university from your place?
- Up to 9 miles
- 10–28 miles

- More than 28 miles
- I live on campus.

(17) What is your paper consumption during the week? Consider any type of paper you use for writing or printing.

- Up to 20 sheets of paper
- 21–50 sheets of paper
- 51–100 sheets of paper
- More than 100 sheets of paper

(18) What is the area of your home?

- Small – up to 100 m^2
- Average – 101–200 m^2
- Large – 201–400 m^2
- Very large – more than 401 m^2

(19) How many people live in your home – including you?

- 1 person
- 2 persons
- 3 persons
- More than 3 people

(20) How would you rate your electricity consumption?

- Low
- Medium
- Normal
- High

Appendix 2

Table A1. YF, EQF and biocapacity indices used

Footprint area	YF (adimensional)	EQF (GHA/HA)	Biocapacity (GHA)
Cultivation	0.66	2.50	0.5
Pasture	0.79	0.46	0.2
Forests	0.66	1.28	0.7
Built area	0.66	2.50	0.1
Fishery	1.09	0.37	0.2
Carbon		1.28	

Source: (Global Footprint Network (GFN), 2016)

Consumption	Y_N (TON/H year)
Vegetables	8.52
Fruits	9.97
Meat	0.02
Milk and dairy products	0.15
Paper	7.31
Fish	0.04

Source: (Food and Agriculture Organization of the United Nations (FAO), 2020)

Table A2. Average national consumption

Appendix 3

Item	Coefficient	Unit
Meat	a) 0; b) 200; c) 1,000; d) 4,200	g
Fish	a) 0; b) 200; c) 1,000; d) 4,200	g
Vegetables	a) 0; b) 500; c) 9,500; d) 19,000	g
Fruits	a) 0; b) 500; c) 9,500; d) 19,000	g
Dairy products	a) 0; b) 750; c) 3,500; d) 7,000	g
Transportation	a) 0,19; b) 0,07; c) 0,16; d) 0	$kgCO_2$/person mile yr
Distance	a) 18.6; b) 55.9; c) 124.3; d) 0	mile
Paper	a) 90; b) 180; c) 240; d) 500	g
Area	a) 0.01; b) 0.02; c) 0.03; d) 0.06	ha
People in home	a) 1; b) 2; c) 3; d) 6	person
Electricity	a) 1.09; b) 1.64; c) 2.46; d) 3.68	$kgCO_2$/person yr

Table A3. Coefficients for converting the qualitative answers regarding consumption to quantitative values in the ecological footprint approach

About the authors

Prof Biagio F. Giannetti has Master and DSc degree by São Paulo University (USP). In 1992, he started his career at Paulista University (UNIP) as Associate Professor. Nowadays, he is Paulista University's Full Professor. At UNIP, he has coordinated courses of degree in engineering and currently holds the positions of Professor in the Graduate Program in Production Engineering (Master, Doctorate and Postdoctoral levels) and leader of the research activities at the Production and Environment Laboratory (LaProMA). Since 2016, he is a visiting professor of School of Environment of Beijing Normal University, in the National High-end Foreign Experts Recruitment Program in China. Prof Biagio founded the International Workshop on Advances in Cleaner Production and Advances in Cleaner Production Network and co-founded the Paulista Cleaner Production Roundtable. He has published more than 300 academic works – including books, papers and conferences – on production and environment. His H-Index on Scopus is 26 and his i10 index on Scholar Google is 63.

Dr Luis Velazquez is a senior sustainability researcher with over 28 years of experience as an Industrial Engineer. Dr Velazquez holds a doctoral degree in engineering science with a major in cleaner production and pollution prevention from the University of Massachusetts Lowell. He has been a sustainability research intern at several higher education institutions, such as the Center for Health and the Global Environment of the Harvard School of Public Health. Boston, USA; the Universidade Paulista. Sao Paulo, Brazil; Erasmus University, Rotterdam, Holland; and the University of Applied Sciences in Zittau/Gorlitz, Germany. He has conducted several investigations in the sustainability, cleaner production and pollution prevention fields as well as in the study of sustainable universities. Currently, he is a member of the Mexican National Research System, SNI 2. He has published several papers in refereed journals and offering several plenaries in international congresses.

Krystal M. Perkins is Associate Professor of Psychology at Purchase College, State University of New York, and an affiliated faculty member in the Critical Social/Personality Psychology Doctoral Program at the Graduate Center, City University of New York. In various projects, she has been interested in the ways in which members of non-dominant groups in society form, manage and negotiate their (ethnic, racial, national) identity in relation to other groups and the conditions under which critical consciousness can be documented. Her research also considers how high- and low-status groups negotiate intergroup interactions and on the "flagged and unflagged" rhetoric of nationalism, diversity and multiculturalism. The newest aspect of her research program considers the psychological dimensions of climate change and sustainability.

Miss Marisela Trillas-Ortiz hold a bachelor's degree in architecture and graduate of the sustainability master's degree at the University of Sonora. She was a sustainability research intern at the Paulista University and at Purchase College, State University of New York. Currently, she has been immersing on sustainability initiatives.

Professor Carlos Anaya-Eredias is Industrial Engineer with more than 35 years of expertise. He holds a master degree in system optimization for the Sonora Institute of Technology. Currently, he is ad scripted to the Industrial Engineering Department focusing on sustainability system optimization.

Professor Feni Agostinho has an engineering background with post-graduation in sustainability assessment of production systems. Since 2012, he is professor at Paulista University (UNIP), developing scientific research in the field of cleaner production with focus on quantifying the sustainability performance of production systems. His research topics are related to agricultural systems, urban metabolism, life-cycle assessment, emergy accounting and multicriteria approaches. Professor Feni Agostinho collaborates with several scientific journals as editor and/or reviewer, he is member of the executive council of the emergy society and has strong scientific relationship with international universities by developing projects and acting as visiting professor.

Cecilia M.V.B. Almeida has a degree in chemical engineering from the Universidade Presbiteriana Mackenzie and a PhD in chemistry (physics and chemistry) from the University of São Paulo (1999). Full Professor at Institute of Exact and Technological Sciences (ICET) and Post-Graduation Program in Production Engineering at Universidade Paulista since 2000. She develops research in Cleaner Production and Industrial Ecology, where concepts, tools and techniques are assessed for the calculation of environmental and sustainability indicators. She also works as a researcher at Laboratory of Production and Environment (LaPROMA) of the Paulista University, and is an active member of the Advances in Cleaner Production Network. From 2012 to 2016, she served as Subject and Executive Editor: Cleaner Production in Latin America, and since 2017 Cecilia is the Co-Editor-in-Chief of the *Journal of Cleaner Production* and Editor-in-Chief of *Cleaner and Responsible Consumption*.

Professor Marcos Jose Alves P. has bachelor's degree in Business Administration by Fundação de Ensino Octavio Bastos, a bachelor's degree in Admmistration by FATEC Mogi Mirim. A post-graduate degree in Production Engineering by Centro Universitario Internacional-Uninter. Pedagogy by Faculdade da Aldeia de Carapicuíba, master's degree in Production Engineering by Universidade Federal de São Carlos at Campus Sorocaba. And post-graduate studies in Teaching Higher Education by Faculdade da Aldeia de Carapicuíba. He is currently a regular PhD student in the post-graduate program in Production Engineering at the Universidade Paulista.

Dr Nora Munguia holds a doctoral degree from the University of Massachusetts Lowell in engineering science, the field of Cleaner Production and Pollution Prevention. She is a professor/researcher in sustainability issues at the University of Sonora, Mexico. She has conducted research studies on sustainability and education issues as well as on the occupational health and safety, cleaner production and pollution prevention fields. She has been a sustainability research intern at the Center for Health and the Global Environment of the Harvard School of Public Health, Boston, USA, and the Universidade Paulista. She belongs to the Mexican National Research System, SNI 2. She is the author of several sustainability articles published in refereed journals. Nora Munguia is the corresponding author and can be contacted at: nora.munguia@unison.mx