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Measuring tourism and environmental sciences students' attitudes towards sustainable tourism

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1. Introduction

Tourism is recognized for its positive effects on the economy (Balaguer & Cantavella-Jordá, 2002; Min, Roh, & Bak, 2016). It contributes to the trade balance and tax revenues, drives employment and boosts entrepreneurship (Williams & Lew, 2015). Notwithstanding, the continued acceleration of tourism in recent years led more scholars to underline the drawbacks of tourism growth (Gibson, 2019; Gössling, 2002; Gössling & Scott, 2018; Saarinen, 2018; Satta, Spinelli, & Parola, 2019). The current debate about tourism is raising new questions on the sustainability of tourism and the limits to its growth, stressing the compelling need to balance its economic, social and environmental impacts (Blazquez-Salom, Blanco-Romero, Vera-Rebollo, & Ivars-Baidal, 2019; Capocchi, Vallone, Amaduzzi & Pierotti, 2019; Panzer-Krause, 2019). A clearer perception of the need to move away from “growth fetishism” and to evolve into a ‘strong’ sustainability paradigm in tourism is emerging (Higgins-Desbiolles, 2018; Higgins-Desbiolles, Carnicelli, Krolikowski, Wijesinghe, & Boluk, 2019). Education for sustainability is considered critical in this change (Boyle, Wilson, & Dimmock, 2015; Gössling & Scott, 2018). As students will become leaders and decision makers in the future, they need to acquire specific skills and competences. Therefore, callings for the creation of tailored training programmes are being geared towards this goal. However, despite sustainability having been deemed a critical topic in tourism studies for decades (Butler, 1999; Hardy, Beeton, & Pearson, 2002), there are still inconsistent views on sustainable tourism which are reflected across the education system and in *curricula* (Bramwell, Higham, Lane, & Miller, 2017; Thomas, 2009; Wang, Huyton, Gao, & Ayres, 2010). Several recent studies have sought to explore these issues by investigating the extent to which sustainability is embedded in tourism higher education (Wilson & von der Heide, 2013; Boyle et al., 2015; Cotterell, Hales, Arcodia, & Ferreira, 2019). These studies focused primarily on education, examining tourism *curricula* and the views of teaching staff. In this paper, the other side of the teaching-learning binomial is explored, based on students' views on sustainability. The purpose is to ascertain whether different attitudes towards sustainability are found among tourism and environmental sciences students. Academic environmental sciences programmes are keen to develop awareness of sustainable development (Silverman & Silverman, 2003). Hence, environmental sciences students serve as appropriate comparison groups as further explained in section 3. Our intention is to unveil whether both groups of students share the same paradigm of sustainability or, on the contrary, due to their specific training, tourism students are more driven towards tourism economic benefits and environmental sciences students more concerned with environmental issues. To this end, a sustainable attitude questionnaire was

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applied to students from both courses in the Minho region, Portugal. Based on the results obtained, strategic decisions can be made, precisely on what specific topics should be further addressed during their academic programmes. The methodology advanced in this paper may be replicated at a later stage for different regions.

2. Literature review

2.1. *The need for a paradigm shift in tourism*

Until the recent Covid-19 pandemic, worldwide tourism was growing at an ever-increasing rate. According to the World Tourism Barometer (UNWTO, 2019), the 1.4 billion mark of international tourist arrivals was attained two years ahead of its forecast, issued in 2010. Although for some academics, commentators and politicians this is a source of enthusiasm and a quick return to high growth rates is desired, others argue that these developments are subsidiary to an unsustainable growth model, worn out by exaggerated consumption, depletion of natural resources and social inequalities that may be seen as forms of structural violence to humans and non-humans (Büscher & Fletcher, 2017; Fletcher, 2018). In the presence of a failure of the “triple bottom” framework, in which companies should commit to focus on social and environmental concerns just as they do on profits, the priority given in the past to growth and to the economic benefits of tourism is now giving rise to a greater concern for equity and environmental protection (Higgins-Desbiolles et al., 2019). Thus, a paradigm shift is necessary, so that future generations can acknowledge the consequences of human actions on the planet and treat it with more respect, incorporating good practices grounded on social and environmental values (Fang et al., 2018; Jamal & Camargo, 2014; Matteucci & Gnoth, 2017; Veiga, Santos, Águas, & Santos, 2018).

It is often wrongly stated that, when compared to other polluting industries, tourism is “a smokeless industry”, meaning that it can bring maximum benefits with a relatively small impact on society (Mowforth & Munt, 2015). This simply expressed discourse has made it all too easy for the entire industry, residents and regional governments to bolster boundless tourism development and to overlook possible threats to the environment. There are many examples of tourism destinations that have grown uncontrollably, damaging important cultural sites and even natural heritage (Seraphin, Sheeran, & Pilato, 2018; Wang, Du, Li, He, & Xu, 2019). This outcome has long been deemed to be neither environmentally sustainable nor economically viable, and it is making space for polarized pro and anti-tourism discourses (Olya, Shahmirzdi, & Alipour, 2017).

Notwithstanding growing evidence that new hopeful tourism perspectives are emerging (Pritchard, Morgan, & Ateljevic, 2011), other stakeholders, such as public institutions and residents, are concerned with the authenticity of tourism sustainability. In fact, “eco-consciousness” concepts are being used as business assets or vehicles by companies to gain competitive advantages, thus leading a number of authors to claim that sustainable development is more of a dream than a reality (Grundey, 2008). As a result, decision making policies still need to take a different path to the prior sad examples of uncommitted social responsibility, which continue to promote tourism growth despite the ecological and social limits of living on a finite planet (Higgins-Desbiolles, 2018). To change that route, planning and management should focus on environmental and cultural issues so as to reduce adverse economic and social effects. To pave the way for sustainable development in tourism, global voices must align with mutual interests and collaborate towards shared success, instead of fiercely competing (Leung, Xue, & Wen, 2019).

This need for an urgent attitude change has been the subject of an ongoing debate for several years, given the considerable deterioration of natural resources. The concept of “sustainable tourism” has been ambiguous since its start and that may explain the little progress made over the last 30 years. The confusion raised from the conflicting definitions and capacity to distinguish if it means a specific form of tourism or an imperative for tourism development (Butler, 1999). Later came the shift from sustainability to responsibility in tourism, which emphasized the ability of individualization, in the sense that tourism providers and their customers could make a positive difference through their attitudes and actions (Sin, 2014). Recently, scholars are stressing the need to rethink the current economic growth ideology and include the social and environmental needs in development and to revisit analyses of human-environment relations, environmental justice, regional development and carrying capacities (Blazquez-Salom et al., 2019; Higgins-Desbiolles, 2018; Saarinen, 2018). In this respect, scientific research always played an important role and still need to feel more empowered, since these views are not always politically fashionable nor usually supported by neoliberal governances (Saarinen, 2018).

For several years, tourism scholars have pointed to the importance of sustainable tourism. From 1990 to 2012, over 5000 papers on this topic were published around the world (Buckley, 2012). Ruhanen, Weiler, Moyle & McLennan (2015) conducted a bibliometric analysis to understand the trends and patterns in sustainable tourism research. Despite some limitations recognized in the proper study, like the fact that only the four highest-ranked journals in the field of tourism were selected and authors from the United Kingdom, Australia, USA, Canada and New Zealand together accounted for 71% of the 493 papers included in the analysis, the study pointed out interesting and insightful information. The results showed that, although subjects remained constant over time, had started to mature and shifted from definitional and conceptual papers to studies in which theory was applied through empirical research. Since then, new studies started using tourism students, so that conclusions may be used as precursors to develop education and training programmes to increase understanding and knowledge of sustainable tourism (Cárdenas, Byrd, & Duffy, 2015; Horng, Hsu, & Tsai, 2019; Liu, Horng, Chou, & Huang, 2017).

2.2. *Education for sustainable tourism: “weak” vs. “strong” sustainability*

Although the term “sustainability” has more ancient roots, the term “sustainable tourism” first emerged as a result of the discussions from the report *Our common future* (Butler, 1999) and is now part of the sustainable development agenda of the United Nations

(United Nations, 2018). In 1987, the Brundtland report defined sustainable development as a concept that should meet the needs of the present without compromising the ability of future generations (UN World Commission on Environment and Development, 1987). Hence, a transformation in education for sustainability was acknowledged (Hales & Jennings, 2017). The “future generations” idea shifted the paradigm towards sustainable development and it became widely recognized that students were key stakeholders. In 2005, UNESCO proclaimed the years 2005–2014 as the decade of Education for Sustainable Development. In theory, international organizations have defined policies to be developed in various areas of society to protect future generations’ interests, as recommended by the Brundtland report. The question to ask now is how these policies have been implemented in university *curricula* and what problems have arisen from such implementation.

Numerous publicly funded educational projects in the field of sustainable tourism have been developed in the last twenty years (Bramwell, 2002, 2003; Moscardo, 2016). However, more focus has been placed on “which and whether” universities or schools have been teaching these topics rather than “what and how” is being taught (Camargo & Gretzel, 2017). For instance, an Australian study with 31 in-depth interviews with university lecturers revealed marked ideological differences in how sustainable tourism was taught, showing that teachers with a strong sustainability perspective influenced more transformative behaviours (Boyle et al., 2015). Furthermore, little to no attention was being given to which competences students had and how they felt about sustainable tourism and environmental education before and after the courses (Camargo & Gretzel, 2017). This is relevant to determine whether there is a need for more awareness of sustainability in tourism academic courses and the teaching of specific topics within the scope of their programmes (Miller, Boluk, & Johnson, 2019). In recent years, concepts such as strong and weak sustainability have gained a grounded theory space in tourism studies, mostly related to educational and sustainable tourism (Cotterell, Benckendorff, & Zehrer, 2017; Cotterell, Hales, et al., 2019). Education in tourism is facing a dilemma on how sustainability and economic degrowth can be taught in tourism *curricula*, as most schools are mainly economic or business oriented (Wilson & von der Heide, 2013). Applying the Anthropocene concept to tourism studies (Gren & Huijbens, 2016; Mostafanezhad & Norum, 2019) may be a simple way of understanding sustainability issues, but it may also act as the “glue” to begin implementing a commitment to teach strong sustainability. Critical thinking, systematic thinking and integrated *curricula* may lead to systemic knowledge and ethical practice for tourism students (Cotterell, Ferreira, Hales, & Arcodia, 2019; Cotterell, Hales, et al., 2019).

To state that sustainable tourism is one of the main goals of tourism policy makers is nowadays a truism (Hall, 2019). Considering this commonplace, the over commitment to tourism and the 2030 agenda should not be a problem in tourism courses. However, state of the art theory on environmental education is still reflecting on the “urgency” to teach “strong sustainability”, which includes the sensitization and awareness towards environmental issues. Co-transformative learning and reflection on anthropocentric perspectives (Beever, 2018) are being requested as distinct approaches to tourism studies (Pritchard et al., 2011). In Turkey, an educational method was used to understand students’ limitations beforehand to subsequently design the academic programme according to their specific needs. The effectiveness of the programme, which was specifically geared towards leadership in sustainable development, was measured with pre- and post-surveys, and the results documented a change in intercultural communication, global knowledge and political voice (Hatipoglu, Ertuna, & Sasidharan, 2014). In Latin America, where tourism causes severe negative impacts, which can only be prevented through the sustainability knowledge of future generations, a different study was conducted. The objective was to understand what tourism students thought about sustainable tourism and, based on the collected data, to develop new teaching methods. The students were aware of the importance of sustainable tourism, but revealed limited knowledge of sustainability principles and technical aspects (Camargo & Gretzel, 2017). In Portugal, where tourism is experiencing rapid growth, to our knowledge, no study of this kind has been conducted before. The more similar is a study conducted by Vareiro, Cristina Remoaldo, and Cadima Ribeiro (2012), who looked at residents’ perceptions about the impacts of tourism development at its initial stage in the Minho region. As for new research suggestions, the authors recommended the development of more in-depth and stratified studies in this population. Therefore, the decision for our study was to analyse a sub-set of residents in the Minho region with a special interest in these matters: tourism students.

As stated by Colomer et al. (2012), the “zero” phase to obtain positive changes in learning is by getting feedback from students. In the case of this research, the information collected may help define skills and competences that tourism students need to acquire, as they will be the real-life planners and managers of sustainable tourism projects in the future. Based on findings, academic programmes may be adapted to bring about environmental conscience and stimulate an everyday career conduct in accordance with sustainable values. Instead of simply evaluating factual concepts, such as sustainable goals or principles, results from these types of studies aim to shed light upon students’ mindsets and sense of sustainability. Jernsand (2019) goes even further and suggests “living labs” with students to innovate and co-create new sustainable tourism ideas. Her findings show that social inclusion and environmental responsibility are enhanced by these opportunities in real life settings, in addition that relationships among private, public and civil society partners are deepened. Moreover, new knowledge is created and the workforce becomes educated on the importance of sustainability.

3. Research design and methodology

3.1. Research question and hypothesis

Although in Portugal sustainable tourism is a common topic in the media, it is not a specific subject in most tourism academic courses. Additionally, tourism students’ attitudes towards sustainable tourism are not measured or compared with different educational backgrounds. Considering this information and regarding the afore-mentioned issue and theoretical considerations, the research question for this study is as follows: “Do tourism students have different attitudes towards sustainable tourism when compared to

students from environmental sciences?”. The interest in comparing tourism and environmental sciences students relates to the importance of developing a strong commitment of tourism students towards environmental sustainability. As previously stated in the introduction and literature review sections, there are certain functions performed by the environment that cannot be duplicated by humans or capital and this needs to be acknowledged. This notion becomes even clearer when both courses’ academic programmes are compared. Although the concept of sustainable tourism is certainly explored in a diffuse and transversal way in some subjects, like “Social responsibility and tourism” or “Cultural heritage”, the three-year tourism academic course does not have any concrete subject related to sustainability. Most disciplines relate to “economics”, “mathematics”, “negotiation”, “statistics” or “marketing” (Escola Superior de Hotelaria e Turismo - Instituto Politécnico Cavado e Ave, 2015). As for the environmental sciences courses, they aim to train professionals with skills in waste management, environmental re-qualification, environmental impact studies, the planning of natural spaces, environmental monitoring, information systems, education, and information in the environmental area. The three-year academic programme has several subjects related to the environment and sustainability: “ecology”, “climatology”, “environment and society”, “control of air pollution”, “biodiversity”, “environmental politics and sustainable development”, “spatial planning”, “conservation and recovery of ecosystems”, among others (Instituto Politécnico de Viana do Castelo, 2014; Universidade do Minho, 2015). Hence, if the assumption for this study is that tourism academic programmes should be concerned with teaching “strong sustainability” values, environmental sciences students serve as appropriate comparison groups.

Still regarding the research question, it can also be discussed that measuring “actions” would be more important than measuring “attitudes”. However, the first only emerge from the second. Wong, Afandi, Ramachandran, Kunasekaran, and Chan (2018) conceptualized a framework to understand how pro-environmental behaviour is manifested. Initially, positive beliefs are at the core, which is why families and primary schools are crucial players in the early stages of life. Later, a disposition for a behaviour intention emerges, based on attitudes, norms, and competences. At this stage, universities need to assume its important role in educating towards a more environmentally responsible world (Arraiza et al., 2018). In the case of students, they are still learning. They are not at a stage where they have power in decision making and are able to take appropriate “actions” in tourism planning. Today’s students will be tomorrow’s future leaders of companies or political institutions and will be responsible for decision-making. That is why their current “attitudes” need to be measured and improved through awareness and knowledge. Only with change of “attitudes”, adequate “actions” will be guaranteed in the future.

As a result, the purpose of this research project is to perform an experimental analysis to identify the items upon which tourism students and environmental sciences students agree or disagree, by means of a Sustainable Tourism Attitude Questionnaire. The null (H_0) and alternative hypothesis (H_1) stand for the following:

- H0.** – There are no significant differences in the Sustainable Tourism Attitude Questionnaire between the tourism group and the environmental sciences group.
- H1.** – There are significant differences in the Sustainable Tourism Attitude Questionnaire between the tourism group and the environmental sciences group.

3.2. The survey

The sustainable tourism attitude survey (SUS-TAS), previously designed by Choi and Sirakaya (2005), to measure residents’ attitudes towards sustainable tourism was adapted and applied in this study. SUS-TAS is recognized as a reliable and validated instrument to measure host communities in the process of sustainable tourism development and planning. It is frequently used in studies with similar purposes (Hsu, Chen, Nyaupane, & Lin, 2020; Ribeiro, Pinto, Silva, & Woosnam, 2018; Wang, 2019; Yu, Chancellor, & Cole, 2011). The final questionnaire consisted of a 44-item list with seven subscales measuring the seven key components of sustainable tourism: perceived social costs; environmental sustainability; long-term planning; perceived economic benefits; community-centred economy; ensuring visitor satisfaction and maximizing community participation. According to the results of the exploratory factor analysis presented by the authors, the construction strongly supported internal consistency and multidimensionality.

Consent for the translation and use of the Choi and Sirakaya (2005) Sustainable Tourism Attitude questionnaire was obtained via email from the authors. The literary dimension was translated to European Portuguese by an English teacher and the conceptual dimension by a sustainable tourism academic professor, both Portuguese and fluent in English. A bilingual individual then corrected any inconsistencies and the first translated version was obtained. A pre-test was conducted with 30 students to confirm understanding of the items after cognitive debriefing. As the variables are not measurable on a quantitative scale, the answers were presented as an ordinal Likert scale with eleven items (0-“Totally Disagree” to 10-“Totally Agree”), as suggested by Marôco (2018) to increase the variance and use them as scale variables.

As the original questionnaire contained 44 items organized in seven factors, and was validated for the American population, a reduction in size and its validation for the Portuguese population were recommended. Thus, an exploratory factor analysis (EFA) on the correlation matrix was performed, with the extraction of factors by the principal components method followed by a varimax rotation to ascertain whether the original items saturated on the same factors as the original questionnaire. Table 1 presents the results of the EFA. According to Marôco (2018), the Kaiser-Meyer-Olkin (KMO) measure for sample adequacy is considered “Good” for extracted factors 1, 2, 3, 4, 5, 6 and 7, “Medium” for Factor 8 and “Mediocre” for Factor 9. The Bartlett’s test of sphericity rejected the null hypothesis for all the analysis ($p < 0.001$). The component plots in rotated space showed the existence of two new factors besides the original questionnaire for item 6, as well as for items 16 and 17. Due to low communalities, items 11 (0.169), 24 (0.124) and 44 (0.305) were removed. Nine factors were extracted with an Eigenvalue (E_v) > 1 (explained variance for each factor is presented in

Table 1
Results of the exploratory factor analysis (EFA).

Original scale	Items	KMO	Bartlett's test of sphericity	Communalities	Items excluded (C. <0,5)	Factors extracted	Eigenvalue	Variance Explained (%)	Goodness of Fit Index
Perceived social costs	1–8	0.821	p < 0.001	Near or >0.5	–	2	F1: 3.428 F2: 1.025	F1: 42.853% F2: 12,810%	0.966 (Very good)
Environmental conservation	9–17	0.865	p<0.001	>0.5	Item 11 (0.169)	2	F1: 4.400 F2: 1.137	F1: 54.497% F2: 14.207%	0.9397 (Good)
Tourism long term planning	18–24	0.841	p < 0.001	Near or >0.5	Item 24 (0.124)	1	F1: 3.224	F1: 53.733%	0.937 (Good)
Perceived economic benefits	25–31	0.898	p<0.001	>0.5	–	1	F1: 4.338	F1: 61.977%	0.963 (Very good)
Community-centred economy	32–36	0.881	p<0.001	>0.5	–	1	F1: 3.478	F1: 69.559%	0.969 (Very good)
Ensuring visitors' satisfaction	37–40	0.769	p<0.001	>0.5	–	1	F1: 2.764	F1: 69.094%	0.986 (Very good)
Maximizing community participation	41–44	0.626	p<0.001	>0.5	Item 44 (0.305)	1	F1: 2.238	F1: 74.59%	0.985 (Very good)

Table 2
Extracted factors and transformed variables.

Factor	Transformed computed variables
Perceived social costs	$\widehat{Fator}_1 = (-0.055 \times V_1 + 0.137 \times V_2 + 0.335 \times V_3 + 0.329 \times V_4 + 0.060 \times V_5 - 0.300 \times V_6 + 0.231 \times V_7 + 0.354 \times V_8) / 3.428$
Fast growth	$\widehat{Fator}_2 = (0.386 \times V_1 + 0.161 \times V_2 - 0.112 \times V_3 - 0.093 \times V_4 + 0.292 \times V_5 + 0.646 \times V_6 + 0.019 \times V_7 - 0.229 \times V_8) / 1.025$
Environmental conservation	$\widehat{Fator}_3 = (0.314 \times V_9 + 0.081 \times V_{10} + 0.232 \times V_{12} + 0.246 \times V_{13} + 0.174 \times V_{14} + 0.248 \times V_{15} - 0.141 \times V_{16} - 0.179 \times V_{17}) / 4.400$
Environmental responsibility	$\widehat{Fator}_4 = (-0.259 \times V_9 + 0.233 \times V_{10} - 0.047 \times V_{12} - 0.058 \times V_{13} + 0.084 \times V_{14} - 0.059 \times V_{15} - 0.502 \times V_{16} + 0.595 \times V_{17}) / 1.137$
Tourism long term planning	$\widehat{Fator}_5 = (0.200 \times V_{18} + 0.237 \times V_{19} + 0.232 \times V_{20} + 0.224 \times V_{21} + 0.256 \times V_{22} + 0.211 \times V_{23}) / 3.224$
Perceived economic benefits	$\widehat{Fator}_6 = (0.170 \times V_{25} + 0.178 \times V_{26} + 0.192 \times V_{27} + 0.188 \times V_{28} + 0.193 \times V_{29} + 0.182 \times V_{30} + 0.164 \times V_{31}) / 4.338$
Community-centred economy	$\widehat{Fator}_7 = (0.233 \times V_{32} + 0.249 \times V_{33} + 0.249 \times V_{34} + 0.229 \times V_{35} + 0.239 \times V_{36}) / 3.478$
Ensuring visitors' satisfaction	$\widehat{Fator}_8 = (0.305 \times V_{37} + 0.293 \times V_{38} + 0.307 \times V_{39} + 0.296 \times V_{40}) / 2.764$
Maximizing community participation	$\widehat{Fator}_9 = (0.411 \times V_{41} + 0.416 \times V_{42} + 0.323 \times V_{43}) / 2.238$

Table 1) and the transformed computed new variables are presented in Table 2. The constructions are in line with the following formula and are based on the component score coefficient matrix:

$$\widehat{Fator}_1 = \frac{(\pm \lambda_{(1i)} \times V_{1i} \pm \lambda_{(2i)} \times V_{2i} \pm \lambda_{(ni)} \times V_{ni})}{E_v}$$

$\lambda_{(i)}$ - component score
 V_i - corresponding item

The quality of the adjustment of the extracted factorial model was assessed with the Goodness of Fit Index, obtained manually with the formula $GFI = 1 - 0.5(e)^2$, using the non-redundant residuals displayed in the reproduced correlations table. The fit was considered either good (>0.9) or very good (>0.95) for all calculations (Table 1).

3.3. Statistical analysis

The statistical software SPSS (version 24) was used to perform the descriptive analysis of the variables, their graphical representations, as well as the statistical tests. As for hypothesis testing for each factor, Kolmogorov-Smirnov tests ($n > 50$) were used to test normality of the dependent variables. Homoscedasticity was tested with Levene's test. When equal variances were assumed, the test results were read on the first the line of the t-test output. If the equal variances were not assumed, the test results were read on the second line (Welch's t-student test). Independently of the normality results, due to the large sample size ($n > 30$), the central limit theorem could be assumed and a two-tailed t-test parametric test could be performed all hypotheses. Nevertheless, when normality was

rejected ($p < 0.05$), and due to the presence of several outliers in the interpretation of the boxplots, a two-tailed Mann-Whitney non-parametric test was used. When normality was retained and a t-test was performed, Cohen's d was calculated for the effect size. When Mann-Whitney tests were used, the effect size was measured with the formula suggested by Rosenthal (1991):

$$r = \frac{Z}{\sqrt{n}}$$

Interpretation of effect sizes was based on the following values, as suggested by Cohen (1992, 1988) and Field (2009):

Effect size	Cohen's d	r
Very large	>1.0	–
Large	[0.5;1.0]	0.5
Medium	[0.2;0.5]	0.3
Small	≤0.2	0.1

3.4. Sample and data collection

Regarding the sample size, estimation was obtained through power analysis, given that this approach is based on statistical theory (Hair, Black, Badin & Anderson, 2005; M. M. Hill & Hill, 2009). Ideally, the value of the effect size should be based in accordance with the theory that supports the study (Kürschner & Günther, 2012). However, when theory makes no reference to this value, it is possible to use the suggestions presented by Cohen (1988). Based on these assumptions, the software G-Power® (Erdfelder, FAul, Buchner, & Lang, 2009) was used to pre determine the sample size for a two-tailed t-student parametric test for two independent groups. To obtain a test power $(1-\beta) \geq 0.8$ with an α error probability = 0.05 and a medium effect size (Cohen's $d = 0,5$), the minimum recommended sample size is 128 participants (64 in each group).

Data was obtained from a randomly assigned sample of 130 students (margin of error 3,83% for a 95% confidence level) from three higher education institutions in the Minho region: Viana do Castelo Polytechnic Institute ($n = 19, 14.6\%$), Cávado and Ave Polytechnic Institute ($n = 66, 50.8\%$) and Minho University ($n = 45, 34.6\%$). Group 1 and Group 2 were equally distributed and incorporated tourism ($n = 66, 50.8\%$) and environmental sciences ($n = 64, 49.2\%$) students, respectively. The answers to the questionnaires were obtained in person during the month of May 2019, just at the end of the second semester, while students were in class. The inclusion criteria were students who had concluded at least two semesters. The initial count was 135. To avoid confounding factors, students who were not resident in the Minho region were excluded ($n = 5$). 58.5% were female ($n = 76$) and 41.5% were male ($n = 54$). The mean age for all respondents was 22.4 years (Standard Error of the Mean (SEM): 0.48). As for the sub-group analysis, 21 of the tourism students were male ($n = 31.8\%$) and 68.2% were female ($n = 45$). They had a mean age of 23.2 years (SEM:0.89). Students from Environmental Sciences had a mean age of 21.6 years (SEM:0.35), 31 were male (48.4%) and 33 were female (51.6%). As different ages in both groups could be a confounding factor, it is important to state that no statistically significant differences were found between the ages of both groups (Mann-Whitney $U = 1975, p = 0.520$).

Table 3
Hypothesis testing results, significance and effect size calculations.

Factor	Normality (Significance of the Kolmogorov-Smirnov test)	Hypothesis test and significance (p-value)	Decision	Mean Ranks A) Environmental sciences group B) Tourism group	Effect size
F1 - Perceived social costs	$p < 0.05$	Mann-Whitney $U = 3.023, p = 0.003$	Reject the null hypothesis	A) 74.35 B) 56.92	$r = -0.23$ (small to medium)
F2 - Fast growth	$p > 0.05$	t-student $t (128) = 0.268, p = 0.789$	Retain the null hypothesis	Mean Difference Between Groups: 0.11202	$d = 0.047$ (small)
F3 - Environmental conservation	$p < 0.001$	Mann-Whitney $U = 1661,500, p = 0.025$	Reject the null hypothesis	A) 72.54 B) 58.67	$r = -0.19$ (small)
F4 - Environmental responsibility	$p < 0.001$	Mann-Whitney $U = 1524,500, p = 0.03$	Reject the null hypothesis	A) 56.32 B) 74.40	$r = -0.25$ (medium)
F5 - Tourism long term planning	$p < 0.001$	Mann-Whitney $U = 1527,000, p = 0.004$	Reject the null hypothesis	A) 56.36 B) 74.36	$r = -0.25$ (medium)
F6 - Perceived economic benefits	$p < 0.001$	Mann-Whitney $U = 1435,500, p = 0.001$	Reject the null hypothesis	A) 54.93 B) 75.75	$r = -0.28$ (medium)
F7 - Community centred economy	$p < 0.05$	Mann-Whitney $U = 1539,500, p = 0.006$	Reject the null hypothesis	A) 56.55 B) 74.17	$r = -0.24$ (small to medium)
F8 - Ensuring visitors' satisfaction	$p < 0.001$	Mann-Whitney $U = 2015,500, p = 0.649$	Retain the null hypothesis	A) 63.99 B) 66.96	$r = -0.04$ (small)
F9 - Maximizing community participation	$p < 0.001$	Mann-Whitney $U = 1649,000, p = 0.028$	Reject the null hypothesis	A) 58.27 B) 72.52	$r = -0.19$ (small)

4. Results

The results for hypothesis testing are available in Table 3. Overall, the null hypothesis was rejected for seven of the nine variables (factors) under study. Only “F2 – Fast growth” ($t(128) = 0.268, p = 0.789, d = 0.047$) and “F8 - Ensuring visitors’ satisfaction” (Mann-Whitney $U = 2015,500, p = 0.649, r = -0.04$) did not present statistically significant differences between the two groups. This means that both groups agree that tourism is growing too rapidly in the Minho region, although both groups recognize that ensuring visitors’ satisfaction is important. As for the seven factors that presented significant differences, environmental sciences students were more sensitive towards topics related to “Perceived social costs” (Mann-Whitney $U = 3.023, p = 0.003, r = -0.23$) and “Environmental conservation” (Mann-Whitney $U = 1661,500, p = 0.025, r = -0.19$). According to the questionnaire items of these factors, it is possible to conclude that, when compared to the tourism students, the environmental sciences students expressed greater annoyance towards the overcrowded tourism in their community and reported that this affected their quality of life. Additionally, they claimed not to feel welcome in local tourism establishments. In their opinion, this overuse of resources deteriorates the quality of the environment and all stakeholders should agree on positive environmental ethics. On the other hand, the environmental sciences students placed greater emphasis on the importance of protecting natural diversity in the present and in the future. As for the tourism students, “Environmental responsibility” (Mann-Whitney $U = 1524,500, p = 0.03, r = -0.25$), “Tourism long term planning” (Mann-Whitney $U = 1527,000, p = 0.004, r = -0.25$), “Perceived economic benefits” (Mann-Whitney $U = 1435,500, p = 0.001, r = -0.28$) “Community-centred economy” (Mann-Whitney $U = 1539,500, p = 0.006, r = -0.24$) and “Maximizing community participation” (Mann-Whitney $U = 1649,000, p = 0.028, r = -0.19$) were more important subjects than for the environmental sciences students. Besides scoring higher in items that pointed to the need for well-coordinated planning and the importance of a long-term view for tourism development, the tourism students were also in favour of regulatory environmental standards to reduce the negative impacts of tourism. They also see the tourism industry as a strong and diversified economic contributor to the community and local governments, meaning that community residents should receive a fair share of the generated benefits. Additionally, they agree more that full participation of the community in decision making is an indicator of success.

To create a model to better explain the results in what concerns the differences between students from each course, the analysed variables (factors) were added to the sustainable development triangle (Fig. 1). Each factor is placed in a position where it can represent its tendency in-between spectrums. As the name of the variables indicate, “Environmental conservation” and “Environmental responsibility” are closer to the “Environment/Planet” vertices and “Perceived economic benefits” on top of the “Economic/Profit” vertices. Between these two “Tourism long term planning” should be closer to the “Environment/Planet” and “Fast growth” to the “Economic/Profit” vertices. As for the “Social/People” vertices, “Maximizing community participation” and “Perceived social costs” are the variables that should be closer, followed by “Community centred economy”. “Ensuring visitor’s satisfaction” is closer to the “Economic/Profit” vertices. It is interesting to notice that none of the studied factors of the Sustainable Tourism Attitude Questionnaire pointed to a connection between the “Social/People” and “Environmental/Planet” sides of the triangle. All the factors are interpreted between the “Economic/Profit” and “Social/People” or “Economic/Profit” and “Environmental/Planet” vertices, which are later seen differently depending on students’ background. Environmental sciences students lean more towards a “strong sustainability” concept, while tourism students do not yet appear to be aware of the importance of environment conservation and are more focused on economic outcomes. As for the social dimension, it is worth noting that the tourism students consider primarily the benefits that tourism can bring to the community whereas environmental sciences students perceive this as a burden and the effects of over tourism as worrisome. “Sustainability literacy” seems to be the factor that is missing at the bottom of the sustainable development triangle/triple

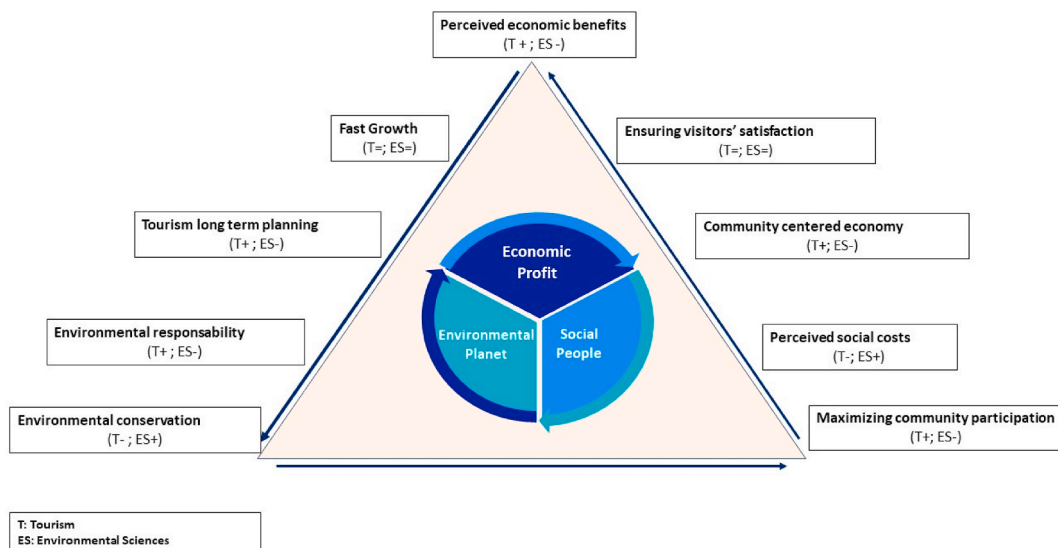


Fig. 1. Sustainable development triangle.

bottom line framework between the “Environmental/Planet” and “Social/People” vertices. What else can unite the “Social” and the “Environment” vertices than teaching people on how to take care of natural resources and protect them? Education for ecological and sustainability literacy seems to be the missing factor that contributes to the instability and imbalance of the sustainable development triangle/triple bottom line framework. This shows that traditional teaching in tourism as it is, depending on the will and interest of teachers and with a major concentration of academic subjects with economic importance, will make “weak sustainability” concepts prevail. Only structured design-based curriculums with courses 100% dedicated to teaching environmental protection and tourism impacts will lead to “strong sustainability” concepts. With appropriate education to make students perceive social costs and the importance of environmental conservation, tourism may reach its full potential in the upcoming years and finally become the tool so many researchers have been pointing out to share the ideal of sustainable development (Butler, 1999; Saarinen, 2018). The truth is that research evidence indicates that tourism students are often graduating without these skills. This means that educators are not successfully cultivating the learners’ capabilities to think critically and solve complex problems related to sustainability nor they are adequately engaging the ways to students make sense of these concepts (Cotterell, Ferreira, et al., 2019). Based on the results of the present study, it can be concluded that a way to appropriately educate tourism students in these matters is to absorb ideas from these environmental sciences courses’ programmes and their teachers.

Brida et al. (2010) identified several clusters, based on the perceptions of tourism impacts: the “environmental supporters”, the “development supporters”; the “protectionists” and the “people who are ambivalent”. It could be said that, in the Minho region, environmental sciences students are “environmental supporters” or even “protectionists”, while tourism students are surely “development supporters”. None of these groups may be considered “ambivalent”. In the same way, these results can be adapted to the clusters presented by the Vareiro et al. (2012) study. Environmental sciences students would be part of the “Sceptical” cluster, whereas tourism students would be “Enthusiasts”. However, the “Moderately Optimistic” were the most firmly convinced of the benefits of tourism, but also had an over-average awareness of its negative impacts, which is a balanced cluster where none of these two groups fit. In the Minho region, where these results apply, there were 143 tourism accommodation establishments in 2010, which rose to 510 in 2017 (+72% in seven years) (Turismo de Portugal, 2018). The nights spent in such accommodation also increased during that time period from 753,189 in 2010 to 2,009,537 in 2017 (Turismo de Portugal, 2018). In 2017, 191 nights per 100 inhabitants were spent in the Minho region, including a high percentage of foreigners (Turismo de Portugal, 2018). These figures represent strong economic growth. However, the “magic triangle” of sustainable development must again be considered. Is this growth of 72% environmentally sustainable? What pressures does it put on ecosystems and local communities? All these are questions should also be part of the agenda of tourism managers and planners. The best opportunity to raise that awareness may be during their time as tourism students, something that, by the results here presented, is not currently taking place.

5. Discussion

All the above-mentioned results may help to define strategies for a more sustainable tourism in the future. The findings presented by this study uncovered that the three dimensions of sustainable development – economic, social and environmental - are not equally represented in students’ perceptions of sustainability issues. The results also show that there is a difference in the perception of sustainable development between environmental sciences and tourism students. Based on the concepts of strong and weak sustainability, it may be concluded that the group of students with an environmental sciences background reveals stronger environmental awareness and education than the tourism group. The underlying reason may be that, when analysing both *curricula*, the tourism course does not offer subjects specifically related to “sustainability”, leaving it to be taught transversally and dependent of the teachers’ views, while the environmental sciences course has several disciplines connected to this matter. This is the main reason why our study suggests that formal education activities concerning environmental issues must be implemented in tourism academic courses so that future tourism professionals, communities and stakeholders may acquire literacy on environmental topics and the excessive tourism impact. Instead of focusing the discourse solely on the negative consequences, education is the solution to progress from the “theoretical interest” into the direction of the “specific behaviour” (Badulescu et al., 2017). Garay, Font, and Pereira-Moliner (2017) developed a quantitative study in Catalonia to understand the relationship between information acquisition and sustainable behaviours. Their results suggested that tutelage in sustainability would be more successful in accomplishing conduct changes if the contents were adapted to the target audiences. This is one of the main points of our research. Based on the results obtained, tourism academic programmes should reinforce topics related to “Perceived social costs” and “Environmental conservation”, while environmental sciences academic programmes should see the tourism industry as having a considerable impact not only on the environment, but also on economic, social and cultural issues, which are not always negative. These results show that not only tourism courses can “learn” from environmental sciences, but the opposite is also true. New information can be provided by the academic programmes and bibliographical references from both courses. Furthermore, visiting lecturers with environmental sciences backgrounds could be invited to tourism classes or conferences and vice-versa. With appropriate and structured teaching, attitudes can be altered, and specific actions can afterwards take place. This was already shown by Hooi Ting and Chin Cheng (2017), who examined the pro-environmental behaviour outcome and change through student participation and guided learning in an ecotourism-education-based study setting. They collected 100 responses from students for whom ecotourism study trips were planned as part of their *curricula*. Their findings revealed that certain aspects like exposure to nature had significant positive effects on pro-environmental behaviours.

There is also scarcity of professional solutions to teach sustainable tourism (Arraiza et al., 2018) and it can become a lost battle unless academia and schools take a step forward and implement it as a mandatory subject. Even if time is limited due to scientific obligations in the courses’ *curricula*, there is always space for online and e-learning courses (Abbas, Jones, & Hussien, 2016) or other creative solutions. Liu et al. (2017) strengthened the usefulness of non-traditional educational methods to teach environmental

sustainability. They designed a creative problem-solving and a co-competition course to improve tourism and hospitality students' motivation and critical thinking. By freely being able to contribute with new ideas, frequent positive interactions between students were observed, and this means that they were focused on imagining and rationalizing the topic. Thomas (2009) also emphasized that classes should converge towards a "how to think" methodology, instead of a "what to think" form. Problem-based pedagogy has for a long time been seen as not only positive for students to have a hands-on experience, but also as beneficial for universities and trade with their work (Steinemann, 2003). In fact, common research projects between tourism and environmental sciences institutions could be of relevance. Firstly, this intersection between the two fields offers a practical field (tourism) where environmental sustainability is needed. Likewise, the social, cultural and economic nuances of the sector would be better understood by researchers and students with environmental sciences backgrounds. On the other hand, the creation of new knowledge in tourism would focus from the start on the environmental and social effects, instead of its more usual economic angle (Fullagar & Wilson, 2012; Liburd & Christensen, 2013; Stone, Duffy, Pinckney, & Templeton-Bradley, 2017).

Still on this subject, it is also relevant to pinpoint that there are still contradictions in the scientific literature in what concerns how the tourism industry pays attention to these concepts. For instance, in a study conducted with tourism and hospitality employers, sustainable development was not seen as a key skill that affected the hiring of personnel. Moreover, the exact meaning was not always clear for managers (Ali, Murphy, & Nadkarni, 2018). In another study, seeking to categorize and prioritize sustainable management practices in UAE hotels, economic sustainability was a priority while environmental and social dimensions were ignored (Alameeri, Ajmal, Hussain, & Helo, 2018). These conclusions are rather serious since students have limited time and resources during their academic courses. Therefore, they will try to excel more in subjects that can guarantee employability in the future. As such, even if "strong sustainability" values are addressed in their academic programmes, there is the risk that students do not dedicate their short time to study environmental issues in depth.

On the other hand, other research papers are trying to demonstrate that a paradigm shift is occurring, at least from the tourism students' prospective view as future entrepreneurs. For instance, when interviewing tourism master students, Badulescu et al. (2017) found they had clear intentions in favour of protecting natural resources, employing locals and buying local products. Additionally, the idea of ecotourism is rather well accepted by new generations of tourists (Beaumont, 2011; Berezan et al., 2014) and tourism students are interested in deepening this idea (Fang et al., 2018). Furthermore, strong links are being suggested between the influence job satisfaction and sustainable environmental practices. For example, if employees perceive that their organization implements socially responsible activities, they become more satisfied with their jobs and display better performances at work (Gligor-Cimpoieru, Munteanu, Nitu-Antonie, Schneider, & Preda, 2017; Shin, Hur, & Kang, 2016).

This evident contradiction, in which some papers state that the importance of "sustainable tourism" is recognized and other papers that it is not, shows that the transversal model for teaching "sustainability" in academia is failing. Such different views in the same sector reveal that strong notions and competences about sustainable tourism are lacking. Of course, different world contexts and distinct destinations may lead to different views. However, just as pointed out by the results of this study, without structured *curricula* and a clear definition of which specific topics are needed to raise awareness on social and environmental issues, the concept of sustainable tourism will keep its ambiguity and the confusion observed since the start of its debate will endure.

This study has some limitations that deserve further discussion. Firstly, the conceptual translation to European Portuguese could be refined with a prior focus group. Although the Goodness of Fit Indexes indicate a good and very good quality of the factorial model extracted, the use of exploratory factor analysis techniques is recommended with twenty observations per manifested variable (Hill & Hill, 2009). Other scientific publications consider at least 50 observations and five observations per manifested variable (Science Direct, 2019). However, the factor analysis was not the main objective of this research, which was to test differences between the two groups. Hence, the sample size was correctly justified. Furthermore, stratification of the sample to interview third year students exclusively would be the indicated population to study. Nonetheless, in order to reach the pre-determined minimum sample size ($n = 128$) for a test power (reject H_0 when H_0 is false) of at least 0.8 (effect size: 0.5; $\alpha = 0.05$; $\beta = 0.2$), the inclusion criteria consisted of interviewing students who had completed at least two semesters.

With reference to future research suggestions based on the findings of this study, *a priori* sample size calculations to perform research on this topic should consider small to medium effect sizes from now on. Additionally, one of the main contributions of this study is the methodology replication (interval validity) in different contexts. To our knowledge, no study of this kind using students has previously been carried out in Portugal. These results only apply to the Minho region and may be different in other contexts. A qualitative discussion of the results, particularly the position of the studied factors within the sustainable development triangle, with specialists such as academic professors from both courses would also be interesting. Semi-structured interviews with professors from environmental sciences courses is also important to hear their opinion and experience about how they teach these concepts successfully. Finally, a new study design approach would be to follow-up these students and use them again as a paired sample to compare how they respond when already established as professionals in the tourism sector.

6. Conclusion

Sustainability is a mainstream topic in tourism research. Many scientific publications seek to identify the skills and competences that tourism students need to acquire since they will be the real-life planners and managers of sustainable tourism projects in the future. In fact, young individual leaders and gatekeepers are at the core of the political agenda since *Fridays for the future* and world climate strikes have unveiled people's concern about environmental problems. UNESCO is now debating on how the 2030 agenda can be implemented in higher education (UNESCO, 2016; GUNI, 2019). Withal, these challenges of implementation were already discussed in the initial Local Agenda 21 in 1992 (United Nations Sustainable Development, 1992), which shows the continuous importance and

theoretical difficulty of discussing these topics in the last 30 years. The environmental urgency in which the planet is living requires that all human activities move towards stronger and more ecocentric models of sustainability. This includes tourism because its uncontrollable growth and damaging of natural resources needs to be stopped. The importance of ecological literacy and the need for environmental education have been repeatedly recognized, as they are necessary to transfer knowledge to the tourism industry and to its consumers. Environmental sciences students were identified as an appropriate comparison group for strong sustainability values and the present study shows that tourism students have different attitudes towards sustainability when compared to them. This study suggests that tourism students continue to favour anthropocentric conceptions of sustainability, which favour the economy and the social over the environmental. This will perpetuate the unbalance of the sustainable development triangle, when applied to the tourism sector. A reason for that to happen, which is pointed out by this study, is related to the fact that academic disciplines concerning environmental matters are devalued in tourism academic courses and teaching. Thus, at the heart of specific actions that can take place and are easy to implement, a specific “Tourism and Sustainable Development” course should be created for tourism undergraduate students. In the scientific programme of this academic subject, topics like “Perceived social costs” must be reinforced. Additionally, specific courses about “Ecology”, where the environmental crisis and the necessity of “Environmental conservation” are taught, should also be introduced. Environmental sciences professors should be invited to lecture and creative ways of teaching using problem-based learning or nature field trips can be impactful. The idea of a transversal curriculum that only encourages sustainability literacy throughout the tourism teachers’ lens needs to be abandoned. To develop strong sustainability values in the next generations of tourism professionals, the world cannot solely depend on teachers that personally value these matters. It is necessary to structure academic *curricula* to specifically address those needs.

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Authors’ contributions

FA, EBH were responsible for the study design (research question and methods) and literature review. FA and JF collected the data. FA, JF and AF were responsible for the data analysis. Interpretation of the results and writing of the manuscript were performed by all authors, who read and approved the final manuscript.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jhlste.2020.100273>.

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