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Education for sustainable development and campus greening: the impact on students' energy saving attitudes and behaviours.

Abstract

The role of Higher Education (HE) in contributing to a sustainable future has been consistently highlighted in global policy documents. HE has a key role to play in: educating graduates who will live and manage more sustainably in the future; contributing to sustainable development through research; and reducing the environmental impact of estates and thus contributing to lower carbon emissions. In regard to the latter, initiatives led by the Estates function within institutions as part of campus greening, serve to reinforce for students that HE is responsive to environmental concerns and that behaviour change is important. Further, combined with integrating Education for Sustainability (EFS) within the curriculum, energy conservation projects in the extra-curricular sphere should ultimately contribute to behaviour change. However, very little research to date has evaluated whether EfS and energy conservation projects impact in this way on student behaviour. A supposition might be that the more effectively and comprehensively an institution addresses energy conservation in both the educational and extra-curricular spheres, the more likely it is that there will be a positive impact on behaviours.

This study explores that proposition by comparing students' energy-related attitudes and behaviours across three distinctly different institutions, two in the UK and one in Portugal. The two UK institutions have both championed EfS but with different approaches: one has acknowledged the need to integrate EfS with extra-curricular and co-curricular initiatives; the other has had less success with EfS and less integration between campus and curriculum. The Portuguese university has not developed a strategic approach in relation to sustainable development and has very little in the way of formal policies. Survey data from students at the three institutions is used to explore the similarities and differences between the student populations in terms of their energy-related attitudes, behaviours and particularly their perspectives on their institution's energy saving activities. The results demonstrate that there are significant differences between the students' responses and that these are likely to relate, in part, to the efforts, or lack of efforts made by each institution in particular areas. The conclusion suggests that there is value in combining EfS with extra-curricular initiatives but that this will require closer working relationships between academics and professional services staff within institutions. Future research might explore those factors that facilitate or inhibit such integrated ways of working. Robust measures for evaluating the extent to which

particular sustainability initiatives and approaches influence behaviour change, need to be developed.

Introduction

Universities have a crucial role to play in contributing to sustainable development through education, research and operations. Their graduates will be the leaders of the future (Martin & Jucker, 2009) with responsibility for the well-being of the planet; their research might contribute to sustainable solutions and approaches to mitigate climate change (White, 2013); their campuses should exemplify sustainable development through campus greening, energy conservation and carbon reduction, etc. (Winter & Cotton, 2012). Since "Agenda 21", the role of education in contributing to a sustainable society has been explicit but while some universities have evidenced substantial engagement, others have been slower to engage; for some it has been a case of 'business as usual', with little consideration of the role that education might play in developing a sustainable future.

This paper builds upon on-going work originating in the UK (Cotton et al., a & b, in press) that is seeking to explore the impact of universities' engagement with sustainable development on the perceptions, attitudes and behaviours of students; in this particular instance, the focus is specifically on energy conservation.

The supposition behind the research is that it might be anticipated that the more effectively an institution engages with sustainable development across all spheres (curriculum, campus and research), the more likely it is that there will eventually be some impact on students' behaviours in relation to energy conservation. This study explores whether there is any evidence for such a relationship, drawing on data collected from three institutions (two in the UK, one in Portugal; each institution represents different levels of engagement with sustainability and Education for Sustainability (EfS). This paper considers specifically students' perceptions in relation to energy conservation at their own institutions.

Literature Review

Sustainability and energy conservation in universities

Conserving energy and managing its use more carefully is an important response to climate change and concerns over 'peak oil'. Energy saving is not only an effective way of reducing carbon dioxide emissions but minimising usage also offers individuals and organisations economic benefits in terms of reduced overall utility costs. Such savings are undoubtedly important for universities where utility costs have risen considerably but are equally important in that, by demonstrating the sustainable management of the university's campus, they signify that the institution is taking environmental responsibility seriously, and is not advocating sustainability for students on the one hand, while ignoring its own responsibilities on the other. Campuses around the word have sought to implement environmental practices in order to save energy but also to reinforce the educative agenda for sustainability. "Campus Greening" activities have been considered as the most evident aspect of higher education's engagement with the sustainable development agenda: initiatives have been taken forward with greater vigour and often with greater success than EfS (Wals & Blewit 2010; Filho et al., 2015). Some institutions have also gone on to realise that the campus offers a useful site to showcase innovative approaches and methods in relation to sustainability projects (e.g. renewable energy installations, wind turbines, geothermal

projects, biomass production facilities, conservation retrofits, etc.) (Thomashow, 2014). Two of the most popular areas of campus greening are solid waste and energy management; demonstrating effective management of both exemplifies for students how principles of environmental conservation are applied in practice (Creighton, 1999).

Previous research has analysed the nature and frequency of conservation activities (including energy-saving behaviour), and the implications for public policy (Pickett, Kangun & Grove, 1995). Conservation activity can comprise a broad range of items: dispositional activity, recycling of non-durable goods and their packaging, preservation of resources and attitudes towards packaging. Pickett et al. found that the individuals less involved in such activities seemed to be less affected by pollution problems and less concerned with social problems. In a study that considered a sample of students from four countries (Germany, UK, Spain and Portugal), the results of Paço et al. (2013), showed that the English sample had the highest means for almost all conservation activities, apart from "saving water whilst washing dishes". In general, mean values were high for the questions on waste separation/recycling, energy conservation and water saving. However, Portuguese students presented the lowest mean for almost all items, being the group that recycles least, saves fewest resources and cares least about packaging. The study indicated that there may be some differences between the conservation activities undertaken in these two countries – and this may also be reflected in energy saving behaviours.

There is increasing interest in the relationship between campus sustainability and EfS (Jones, Selby, & Sterling, 2010), as evidence grows that indicates that what happens outside the classroom may either reinforce or challenge what students are taught in the formal curriculum (Cotton, Winter and Bailey, 2013). Universities often conduct their estates management in an unsustainable manner, for instance through poor energy management in buildings, and this may decrease the effectiveness of efforts to teach about energy saving through the formal curriculum. This tension between campus and curriculum has been used to advocate for a more holistic move towards a "sustainable university" (Sterling, Maxey & Luna, 2013), yet ensuring that sustainability permeates all aspects of university business is a continuing challenge; integrative approaches are desirable but not easy to achieve (Fiho et al., 2015). Nonetheless, it is plausible to believe that even where institutions have adopted less holistic approaches to the agenda but have engaged in campus greening, that if students are frequently exposed to messages and events about energy saving, that they may be more likely to develop appropriate energy saving attitudes and behaviours.

Existing evidence is inconclusive: In relation to studies of university students, it appears that high levels of knowledge about sustainability do not necessarily lead to more sustainable behavioural choices. For example, a national survey of UK students focusing on energy-saving behaviour found that 72% of respondents claimed to take energy-saving actions but only 25% reduced their personal air travel (Drayson, Bone & Agombar, 2012). Another UK study suggested that university students have strong attitudes about energy issues yet their knowledge is limited and this undermines their potential for taking appropriate energy saving actions (Cotton et al., a, in press). In New Zealand, Shephard et al. (2009) also found significant confusion among students about appropriate energy saving behaviours. Thus, whilst improving information about energy use is important, it may not be sufficient to influence behaviour. Indeed, Orr (1994:5) argues that there is no correlation between educational level and environmental concern, and claims that education institutions may in fact be part of the problem of environmental destruction: *"The conventional wisdom holds that all education is good, and the more of it one has, the better … The truth is that without significant precautions, education can equip people merely to be more effective vandals of the earth".*

Differences in engagement levels with sustainability

This research considers whether the extent of universities' engagements with sustainability and energy conservation impacts on students and their attendant energy saving perceptions and behaviour. Before going on to outline the different approaches taken to EfS within the three universities that participated in the study, it seems appropriate to begin with a brief reference to the different policy contexts, namely the English and Portuguese HE settings.

The national contexts

In relation to the sustainability agenda in the UK, between 2005 and 2010, the external context drove change in many UK universities. The UK sustainable development strategy, "Securing the Future: Delivering UK sustainable development strategy" (DEFRA, 2005) set out the government's goals on sustainable development. In response to this, the Higher Education Funding Council for England (HEFCE) undertook consultation with the sector (HEFCE, 2005a), then published its own strategy 'Sustainable Development in Higher Education' (HEFCE, 2005b) setting out the approach. A further update was published in 2009 (HEFCE, 2009) along with a consultation on challenging carbon reduction targets for the sector, sufficient to ensure satisfactory progress towards national government targets to reduce carbon emissions by 80 per cent by 2050 and at least 34 per cent by 2020 (against 1990 levels).

A carbon reduction target & strategy for higher education in England (HEFCE, 2010) and the introduction of a link between capital funding and carbon management performance through the "Capital Investment Framework", coupled with external funding opportunities, forced initiatives across the sector. Carbon management became something that universities had to do, rather than something they should do (Shiel & Williams, 2015).The "People and Planet Green League", launched in 2007, also contributed to change and has become a critical driver in raising the profile of sustainable development with senior staff, with high profile rankings published in the Times Higher Education initially and later the Guardian. As McGowan noted when he presented People & Planet with a "British Environment & Media Award" for "Best Campaign" in 2007, "the green league succeeded in dragging environmental issues in from the fringes and making them a central concern for many Vice Chancellors" (McGowan, 2007). However, questions around education and learning were not included in the Green League until 2011 and thus fewer universities focused their efforts on EfS.

The UK context has certainly ensured the visibility of sustainability issues with senior staff but has also led to a situation in which campus greening (and carbon management in particular) may have enjoyed a higher priority than EfS. In contrast in Portugal, discussion around the role of Universities in relation to sustainable development has been almost non-existent, and the few events which have been organised have been limited to an environmental perspective. This lack of engagement is illustrated by a situation where before 2005, just one institution (the University Nova of Lisboa), had signed up to the Talloires Declaration. Since then although some Portuguese universities have been taking forward sustainability initiatives (e.g. University of Algarve, Aveiro, Porto, Nova of Lisboa, Técnica of Lisboa), there is a gap in terms of coordination and communication at the national level, which could have detrimental consequences (Couto et al., 2005). In this sense, the creation of an organisation, or body to coordinate issues in relation to sustainable development within higher education, is crucial but not evident in Portugal.

An explanation of why there is less higher education activity in relation to sustainability in Portugal is simply because Portugal has been 'behind the game'. The OCDE Report "Good Practices in the National Sustainable Development Strategies of OECD Countries" highlights that of the 30 OCDE countries, 23 of them had prepared formal plans in the field of national sustainable development strategies; some (Australia, United Kingdom, France, Japan, Finland, Luxemburg, Holland, Sweden and Switzerland,) formulated strategies very early and had already revised those strategies. Other countries (including Portugal) had prepared their strategies more recently (OCDE, 2006).

The themes of the Portuguese National Sustainable Development Strategy are detailed in a set of documents approved by the Government. One of the four principles of the strategy "is to progress towards a society of solidarity and knowledge, including through interventions to strengthen the citizen components of education and greater access to information and participation in decision-making" (OCDE, 2006).

In the education sector, the adoption of a 'National Strategy for Development Education' presents a great challenge for the country. The main intention of this plan is to strengthen the inter-institutional cooperation mechanisms between educational agents; develop tools to promote global citizenship by means of learning processes and; raise consciousness of development related aspects in Portuguese society. Although the idea of this national strategy is to promote development education at all levels of education, learning and training, the reality is that its implementation in higher education is still very incipient. Thus, the involvement of higher education in the area of education for citizenship and development education remains to be enforced. In the pre-school, basic and secondary level investment in education for citizenship has been progressed. However, there is a long way to go to overcome obstacles, which include: the frequent non consideration of development education in the context of education for citizenship, especially in the training of professionals; the lack of pedagogical materials to support learning; the financial constraints; and the difficulties that teachers have in working as an interdisciplinary team (IPAD, 2009).

The institutional contexts

Plymouth University (PU) is known within the UK for taking a leading approach in developing sustainability-related curriculum and is esteemed as one of the top 'green' UK universities, currently placed first in the People and Planet Green League table. Since 2004, following the award of a five-year Centre for Excellence in Teaching and Learning – Education for Sustainable Development (CETL ESD) funded by the Higher Education Funding Council for England (HEFCE) and the establishment of the Centre for Sustainable Futures, PU has taken rapid strides in progressing a systematic and systemic approach to sustainability. It is well known for its holistic '4C' model (see Jones et al., 2010) which has sought to drive sustainability across Curriculum, Campus, Culture and Community. Although full systemic integration is still not fully achieved there has been substantial impact recognised through several 'Green Gown Awards'. PU has also been a recipient of Revolving Green Fund monies from HEFCE to embed energy saving measures, and was of the first two UK institutions to gain Silver Accreditation in the LIFE (Learning in Future Environments) programme. Thus, it provides a context in which curriculum and campus greening issues have been taken seriously, substantially developed and more integrated than in most other universities.

At Bournemouth University (BU) the strategic vision includes the aim of "inspiring our students, graduates and staff to enrich the world" and the bold statement: "we will ensure our

environmental credentials are held in high esteem" (BU 2018). Staff are encouraged to address EfS across the curriculum although more attention has been given to developing global citizenship within the curriculum that EfS. In relation to the environmental management of the Estates, 'campus-greening' activities gained momentum from 2005, with the appointment of a dedicated Environmental Officer and an Energy Officer in 2006. Activities initially focused on three target areas: energy efficiency, travel planning, and waste management and recycling. The environmental programme has since developed (with an expanded team of staff) to include a wider range of impact areas including carbon management, water reduction, biodiversity management, sustainable construction and sustainable procurement. Significant investment has been made in carbon management projects such as a biomass heating project, voltage optimisation and building management systems (Shiel & Williams 2015). As a result, BU has consistently appeared in the top ten of the People and Planet Green League table; initiatives at BU have been rewarded by external recognition both locally and nationally, for example: an Earth Charter Award – Engagement in Sustainability 2013; EcoCampus Gold Award 2011; various Green Gown Awards and twice short-listed for Times Higher Education Awards – Outstanding Contribution to Sustainable development (in 2007 & 2011). However, at times progress at BU has faltered; sustainable development has not been fully addressed within the education (Shiel, 2011); capacity building within the community and individual academics contributing to sustainability through research has been more successful (Shiel & Williams, 2015).

In sharp contrast to the two UK universities, the University of Beira Interior (UBI) has evidenced very little engagement with sustainable development. There is no formal policy or evidence of strategies to suggest that engagement with sustainable development has been taken seriously. Some actions have been taken in relation to energy and water conservation and also to address recycling but actions are not generally part of an overarching strategic approach. However, an interesting feature of the university and something that could be classified as 'sustainable development' (in terms of conserving the past for future generations) is the way that the institution has re-purposed the buildings that comprise its estates: old buildings with historical, cultural and architectural value, have been repaired and conserved to provide learning spaces but also a museum for the public. The endeavour has carefully adapted historical landmarks, revitalizing them into educative and investigation spaces. In this way the institution has been promoting both sustainable construction and building conservation in a way that exemplifies preservation of the past to provide new learning. In relation to the curriculum however, there is no drive to incorporate sustainable development into courses. There are a few post graduate courses that partially address sustainability but beyond that, EfS is not being considered across disciplines.

On the basis of the different country and institutional contexts this study seeks to explore differences in the student populations between the three institutions. Thus, the following research questions were posed:

RQ1: Do students at institutions that have a longer history and more visible approach to environmental management have more positive perceptions of environmental practices at their institution?

RQ2: Are students at institutions that have a longer history and more visible approach to environmental management likely to report more positive attitudes and behaviours regarding energy conservation?

Method

The first stage of this research involved an exploratory study of the knowledge understanding and behaviours of students in relation to energy consumption within the UK. Although the details of that study (Cotton et al., a, in press) are not reported here, it constituted the basis for this research and inspired the aim to explore whether there were differences between cultural contexts.

For this specific research, data were collected through a survey of English and Portuguese students. This took the form of a self-administered questionnaire which was made available online in one Portuguese and two English public universities. The original survey (within the UK) was designed and implemented to address a wider sample (which both the UK universities participated in); however a sub-set of questions was used to gather comparable data from the Portuguese institution. In this study a particular set of questions has been used to enable comparison. The full questionnaire was designed to enable information to be gathered about students' perception of the environmental practices of their institution in relation to energy use (Yes/No questions), attitudes and behaviours regarding energy saving (five-point scales (min 1, max 5), where 3 is the indifference value) and perception of their own use of energy in terms of level of usage (from 1= very low energy user to 5= high energy user). Some questions were also posed to gather demographic information (age, gender and nationality). See Cotton et al. (b, in press) for further information about survey development. After collection, the data were analysed and interpreted using the statistical software SPSS 21.0 (Statistical Package for Social Sciences). A descriptive analysis was undertaken with frequencies and central tendency statistics, together with ANOVA tests.

Results

The total sample is composed of 800 (34.9%) students from the University of Beira Interior (UBI) (Portugal - PT), 679 (29.6%) students from Plymouth University (PU) and 815 (35.5%) students from Bournemouth University (BU) (35.5%). These last two institutions are located on the South Coast of the United Kingdom (UK) and make up 65.1% of the sample. Gender and age distribution is represented in table 1.

Table 1. Gender and age distribution by institution

University	Gender		Age	
UBI	Male	310 (38,8%)	20 or under	367 (45,9%)
	Female	490 (61,3%)	21-25	331 (41,4%)
	Total	*800 (100%)*	26-35	84 (10,5%)
			36-45	17 (2,1%)
			46-55	_
			Over 55	1 (0,1%)
			Total	*800 (100%)*
PU	Male	198 (29,2%)	20 or under	338 (49,8%)
	Female	473 (69,7%)	21-25	331 (48,7%)
	Missing	8 (1,2%)	26-35	_
	Total	*679 (100%)*	36-45	_
			46-55	_
			Over 55	_
			Missing	10 (1,5%)

			Total	*679 (100%)*
BU	Male	240 (29,4%)	20 or	209 (25,6%)
	Female	559 (68,6%)	under	361 (44,3%)
	Missing	16 (2,0%)	21-25	147 (18,0%)
	Total	*815 (100%)*	26-35	54 (6,6%)
			36-45	30 (3,7%)
			46-55	4 (0,5)
			Over 55	10 (1,2%)
			Missing	*815 (100%)*
			Total	

Regarding the students' perceptions of their campus environmental practices, a set of four general questions was posed. Table 2 shows the results for the three institutions (the highest percentages are shown in **bold text**).

Table 2. Environmental practices at the university – students' perceptions

	Answer	UBI (PT)	PU (UK)	BU (UK)
Is there enough information available on energy use on campus?	YES	21,3%	**32,8%**	22,9%
	NO	78,8%	66,6%	76,2%
	No answer	–	4,0%	0,9%
Does the university do enough to save energy?	YES	10,9%	**31,7%**	15,3%
	NO	40,0%	23,4%	27,2%
	DON'T KNOW	49,1%	44,0%	57,3%
	No answer	–	0,9%	0,1%
Are you aware of any initiatives taken to conserve energy on the university campus?	YES	3,3%	**32,3%**	20,2%
	NO	96,8%	67,3%	79,4%
	No answer	–	0,4%	0,4%
Have you seen any of the energy certificates displayed on campus buildings?	YES	6,4%	**38,4%**	24,8%
	NO	93,6%	60,5%	74,4%
	No answer	–	1,0%	0,9%

It is clear that the Plymouth University students were much more positive about all the questions asked (although somewhat mixed responses were received from all universities). In particular, when asked whether their university does enough to save energy, the Plymouth students were 16 percentage points higher in terms of positive responses than the Bournemouth students and more than 20 percentage points higher than the Portuguese university on this question. There was a particularly low awareness of the existence of energy certificates in the Portuguese university, perhaps simply because these are not commonplace in Portugal. However, the fact that the Portuguese students are less aware of other initiatives to conserve energy suggests that there is a wider issue at play here in terms of the priority placed by institutions on energy saving in the two countries.

These findings seem to provide clear evidence in support of RQ1, in that the institution with the longest history and more visible approach to environmental management had students who were more positive about the environmental practices of their institution. Similarly, the institution with the least visible approach and commitment to environmental management

had the fewest positive response on these questions.

In order to explore the second research question, an analysis of students' attitudes towards energy-saving was undertaken. This involved a descriptive analysis, together with a one-way ANOVA, reported in table 3 below.

Table 3. Descriptive analysis and Oneway ANOVA for environmental attitudes regarding energy

		N	Mean	SD
I would do more to save energy if I knew how	UBI (PT)	800	4,07	,953
	PU (UK)	678	4,10	,764
	BU (UK)	814	**4,22**	,727
	Total	2292	4,13	,826
The way I personally use energy does not make a difference to the national energy situation	UBI (PT)	800	**2,45**	1,079
	PU (UK)	678	2,20	,970
	BU (UK)	812	2,28	,982
	Total	2290	2,31	1,018
I can influence what the government does about energy problems	UBI (PT)	800	**2,86**	1,014
	PU (UK)	677	2,62	1,010
	BU (UK)	811	2,67	1,003
	Total	2288	2,72	1,014
I can influence what companies do about energy problems	UBI (PT)	800	**2,89**	,955
	PU (UK)	675	2,57	1,030
	BU (UK)	813	2,60	1,031
	Total	2288	2,69	1,015
I trust the government to do something about any energy problems	UBI (PT)	800	**2,69**	1,048
	PU (UK)	676	2,34	1,007
	BU (UK)	809	2,63	1,072
	Total	2285	2,57	1,055
Scientists will find ways to solve energy problems	UBI (PT)	800	**3,68**	,850
	PU (UK)	678	3,58	,866
	BU (UK)	806	3,59	,830
	Total	2284	3,62	,849
More wind farms should be developed to generate electricity, even if they are located in scenic environments	UBI (PT)	800	3,51	1,089
	PU (UK)	678	**3,70**	1,097
	BU (UK)	814	3,64	1,084
	Total	2292	3,61	1,092
The government should have stronger standards on fuel efficiency of cars **(*)**	UBI (PT)	800	4,05	,855
	PU (UK)	677	4,00	,877
	BU (UK)	814	3,97	,856
	Total	2291	4,01	,863
Climate change has been established as a serious problem and immediate action is necessary	UBI (PT)	800	**4,39**	,754
	PU (UK)	679	4,19	,916
	BU (UK)	811	4,03	,905
	Total	2290	4,21	,871
Climate change is caused by human activities related to using energy **(*)**	UBI (PT)	800	4,01	,814
	PU (UK)	677	3,97	,932
	BU (UK)	813	3,92	,928
	Total	2290	3,97	,891
There are benefits to people in the country from climate change	UBI (PT)	800	2,46	1,122
	PU (UK)	676	2,44	1,016

	N	Mean	SD
BU (UK)	811	**2,66**	,997
Total	2287	2,53	1,052

Note: Five point scale 1- Strongly disagree, 2- Disagree, 3- Neither agree or disagree, 4- Agree, Strongly agree
(*) non-significant for p<0,05

Results from this analysis are rather less clear, although all variables except for two (when considered individually), show significant differences between the groups (at p>0,05). Overall, the Portuguese students report a stronger belief that climate change is a serious problem which needs urgent action. They also exhibit a stronger sense of agency and trust than the UK students: They are more likely to believe that they can exert influence over the government and companies than the UK students, and they are more likely to have faith in other actors (the government or scientists) to solve energy problems. However, the BU students are most likely to claim that they would do more to save energy if they knew how (the Portuguese students were lowest on this measure, perhaps because they felt that the responsibility for action lay elsewhere), and PU students are most likely to take responsibility for the impact of their own use of energy, as well as being more enthusiastic about wind farms than the other groups. Overall, the findings seem to suggest that the students at both UK universities felt that their own actions were more important than other actors, whereas the students from the Portuguese university felt the opposite. Thus there is no clear answer on whether students at a university with longer history and visibility of environmental management had more positive attitudes to energy conservation.

Similar analysis was carried out for environmental <u>behaviours</u> regarding energy (table 4).

Table 4. Oneway ANOVA for energy-saving behaviours

		N	Mean	SD
Turn off lights when they are not in use	UBI (PT)	800	3,51	,566
	PU (UK)	679	3,61	,556
	BU (UK)	813	**3,64**	,529
	Total	2292	3,59	,552
Turn down the heat	UBI (PT)	800	3,01	,760
	PU (UK)	678	3,12	,772
	BU (UK)	810	**3,15**	,760
	Total	2288	3,09	,766
Try to save water **(*)**	UBI (PT)	800	3,14	,667
	PU (UK)	676	3,13	,750
	BU (UK)	809	3,09	,777
	Total	2285	3,12	,732
Walk or cycle short distances instead of going by car	UBI (PT)	800	2,95	,914
	PU (UK)	677	**3,31**	,775
	BU (UK)	812	3,15	,849
	Total	2289	3,13	,863
Buy things that are likely to involve less energy or resource use	UBI (PT)	800	2,41	,765
	PU (UK)	676	**2,55**	,818
	BU (UK)	811	2,51	,839
	Total	2287	2,49	,809
Pay a bit more for environmentally friendly products	UBI (PT)	800	2,32	,743
	PU (UK)	679	**2,49**	,845
	BU (UK)	811	2,41	,844

	Total	2290	2,40	,813
Avoid charging mobile phones overnight	UBI (PT)	800	**2,20**	,921
	PU (UK)	674	1,94	1,003
	BU (UK)	809	1,97	1,025
	Total	2283	2,04	,989
Turn off the stand-by button of the TV set or switch appliances off at the plug	UBI (PT)	800	2,58	,953
	PU (UK)	679	**3,00**	1,023
	BU (UK)	808	2,91	1,007
	Total	2287	2,82	1,009
Use rechargeable batteries	UBI (PT)	800	2,39	,935
	PU (UK)	676	**2,65**	,968
	BU (UK)	807	2,51	,972
	Total	2283	2,51	,963

Note: Four points scale 1- Never, 2- Infrequently, 3- Frequently, 4- Always

Again, results are somewhat mixed depending upon the behaviour being considered. All the variables are significant for differentiating between the groups (p< 0,05) except the variable "Try to save water" (p>0,05). PU presents the highest scores for most items (walk or cycle, buy things with less energy/resources involved, pay more for green products, turn off the stand-by button, and use rechargeable batteries), followed by BU which leads on "Turning off lights when they are not in use" as well as "Turn down the heat". UBI is highest only on the item, "Avoid charging mobile phones overnight". Given that the university with the longest history and visibility of environmental management (PU) has the highest number of leading items, followed by the other UK university (BU), and then the Portuguese university (with the least significant record in environmental management) has lower responses, this suggests that the behavioural aspect of RQ2 can be confirmed.

Discussion and Conclusions

The findings from the data provide the following provisional answers to the questions that were posed as part of this research:

- Students at institutions that have a longer history and more visible approach to environmental management do appear to have more positive perceptions of environmental practices of their institution
- There is no clear evidence to conclude that students at institutions that have a longer history and more visible approach to environmental management are likely to report more positive attitudes towards energy conservation, since in several aspects respondents from UBI report higher scores.
- Students at institutions that have a longer history and more visible approach to environmental management are likely to report more positive behaviours regarding energy conservation. Those differences are significant except for the case of water saving.

The clearest finding from this research is that the greater engagement by Plymouth University in sustainability and environmental management impacts on the students studying at that institution, since they are significantly more likely to be aware of energy saving initiatives and are more positive about their university's efforts regarding energy conservation. This is an important finding in the light of research exploring the hidden

curriculum of the campus environment, which suggests that students are alert to both the positive and negative messages which arise from their university's on-campus sustainability activities (see Winter & Cotton, 2012). The difficulty of embedding sustainability across the higher education curriculum makes the use of informal learning through the campus environment particularly important: here is a space that universities can use to promote good environmental management to students from all disciplines and at all levels of the university, unlike curricula initiatives which depend upon the understanding and good-will of diverse members of academic staff. Effective use of university campus and estates can also help mitigate the observation of Hopkinson, Hughes and Layer (2008, 439) that *"the student experience at most universities typically has a fragmented connection of the values, ideals and practical aspects of living, studying or working in a sustainable way"*. This research suggests that campus energy-saving initiatives can be an important step towards a holistic 'sustainable university', aligning campus, curriculum and community, a long-standing aspiration of Plymouth University (Selby, 2009).

The second research question concerning the relationship between environmental management initiatives and wider attitudes and behaviours of students is harder to answer. There is some evidence that students exhibit more positive energy-saving behaviours at universities which have a greater focus on environmental management and where efforts to introduce EfS within the curriculum are combined with extra-curricular initiatives and estates-led projects (a feature that has been more evident at Plymouth University). However, the data cannot tell us whether this is an outcome of the university environment (students are encouraged to act more sustainably because they see their university doing so) – although this is a plausible interpretation - or whether universities with a stronger record in environmental management simply attract more sustainably-minded students. Further research would be required to answer this question.

One unexpected finding from this study is the variation between attitudes towards energy and, in particular, the variation between the Portuguese and UK students in terms of agency and locus of control. These results, suggesting that UK students have a generally low level of trust and sense of influence over government and business, echo the findings of earlier UK research (Cotton et al., b, in press). Both studies suggest that students in the UK perceive themselves as having very limited agency beyond the personal sphere. Cotton et al. hypothesise that this is, in part, exacerbated by the low income and low status of students as members of society. However, the fact that Portuguese students had a significantly different view raises further questions about how differences in context might lead to such variation. The data do not clearly and conclusively suggest that students at institutions with a more visible approach to environmental management have more positive attitudes towards energy conservation, although it would be interesting to repeat the study using a wider range of questions (perhaps including the New Ecological Paradigm scale) to gain a wider view of students' attitudes. Further, gender issues merit more detailed exploration. Although these have not been considered in this paper, early analysis of the wider data set suggests that females are more likely to respond positively to energy conservation (Paço et al., 2015); testing this further and evaluating whether gender differences are similar across different countries, might be helpful.

There are obviously limits to the claims that can be made on the basis of this sample. Whilst the findings give some interesting indicators towards where, and why, differences might occur across different student populations, the research is limited by the number of

institutions involved. Nonetheless, as an exploratory study, the results suggest that this is an area that merits further investigation and that there is some merit in ensuring alignment between EfS curriculum developments with institutional energy saving initiatives. Such alignment requires working across the academic and professional services boundaries and this in itself may be a tough challenge. It would be interesting to ascertain whether particular initiatives and campaigns targeted at energy reduction have more impact than others and what types of interventions aligned with the curriculum are more likely to result in behaviour change. Such studies might involve before and after comparisons of actual energy consumption (rather than reported behaviours) if other externalities could be controlled. An extension of the study across Europe, or internationally, would be of significant interest and enable conclusions to be drawn about the influence of institutional approaches and the over-arching influence of cultural context. In a context where carbon reduction is high on the agenda the lessons learned in relation to those contexts and interventions that impact positively on behaviour change would be valuable.

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