Student perceptions and trust of Sustainability information

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Structured Abstract

The aim of this paper is to report student attitudes and beliefs towards climate change adaptation and sustainability-related behaviours. A paper-based questionnaire was delivered to approximately 400 first year and third year students in the same year (2012) of the study. A factor analysis shows that common themes previously identified failed to reflect the diverse range of influences on young people, including family, friends and news media. Contrary to the literature, few significant differences were found in sustainability-related behaviours between first and third semester students, with an increase in scepticism regarding the reality of climate change among the latter. The study focused on Australian undergraduate university

business students, which reduced generalisability of the findings. Achieving significant long-term changes in behaviours will be a substantial challenge for tertiary curricula. The findings of this study can inform instructors in higher education of student attitudes towards sustainability and climate change adaption and in turn inform changes to tertiary curriculum in sustainability and climate change adaption. This paper reports on the second phase of a longitudinal research project examining the effects of an undergraduate business studies curriculum on student views of sustainability. The authors confirm that the research is original and that all of the data provided in the article is real and authentic. Neither the entire work nor any of its parts have been previously published.

Keywords

Business students, higher education, sustainability, climate change, attitudes, behaviour change

Type

Research Paper

Article

Introduction

Recent research suggests that university students are reluctant to consider major lifestyle choices and they demonstrate a *"naïve awareness of the potential impact that their individual contributions would have to sustainability and environmental challenges, and they have a tendency to regard major sustainability issues as both beyond personal control and as the responsibility of others"(Eagle et al., 2015a)*. This paper reports on the second phase of a longitudinal research project examining the effects of an undergraduate business studies curriculum on student views of sustainability and considers the following research questions:

RQ1: How familiar are students with climate change and sustainability concepts at the beginning and end of their first year of study?

RQ2: Where do students find their information and how trustworthy do they think it is?

Data collected from third semester students in an Undergraduate Business Degree from an Australian university is compared to a baseline first semester 'control' group (studying the same curriculum) from the same university (Eagle et al., 2015a), with whom it was intended to establish benchmarks regarding current knowledge, attitudes, perceived norms and the perceived personal relevance of sustainability issues. Future impacts of the revised curriculum will be assessed against these benchmark measures.

Literature Review

The theory of generational replacement (Wray-Lake et al., 2010) suggests that changes in adolescent attitudes are indicators of long term social change, thus if changes are evident in attitudes of students as they progress through their studies, this may indicate the prospect of changes within society as a whole. Nikel (2007) in a study of student teachers concludes that teachers need to *"generate a sense of responsibility in the student learner"* (Nikel, 2007). Azapagic et al., (2005) in a similar study of engineering students concluded that *"if engineers are to contribute truly to sustainable development, then sustainability must become part of their everyday thinking"* . Prior studies of the extant literature has found that students "*undergo profound changes in epistemological assumptions and in identity during their undergraduate years*" (Myers and Beringer, 2010). Thus, changes in knowledge, attitudes and behaviours regarding sustainability and related issues may occur as students' progress through their studies. How much can be attributed to formal study versus maturity and the impact of wider social factors, discussed in a later section of this paper, is unclear. Mixed

results have been found from the limited number of business education studies, with some suggesting positive increases only in awareness and others negative results such as an increased level of cynicism (Sammalisto et al., 2016, Harring et al., 2017). Thus, there is a need to be realistic about expectations of the potential impact of sustainability-related curriculum content.

Competing Forces

A range of social factors may reinforce (social encouragement) or work against (social discouragement) sustainability-related messages contained within the curriculum. These may originate from family or peer groups as well as from information obtained through traditional or digital media (Peattie and Peattie, 2003). While peer influence may be strong for some behaviours, families may also be significant influencers through overall socialization effects and other influences (Grønhøj and Thøgersen, 2012). Unfortunately, research in this area has focused only on those under the age of 18 who are still living in the home environment rather than on the older age groups who are more independent (Grønhøj and Thøgersen, 2009).

News media coverage of issues presents several additional challenges. Importantly in the battle for acceptance and legitimacy of mitigation and adaptation messages, counter messages are distributed by interest groups who are promoting 'climate change scepticism' and risk denial (Antilla, 2005). These messages, communicated largely through the mass media, have been found to be influential in developing public attitudes on the issues (Boykoff and Boykoff, 2004). There is evidence that the media can negatively affect climate change communication by giving equal time to climate change warnings and competing / dissenting views in the interests of journalistic fairness. Such 'even handedness', commonplace in the media (Moser and Dilling, 2004), serves to reinforce perceptions of uncertainty and generates confusion (Boykoff and Boykoff, 2004). Antilla (2005) suggests that emphasising

controversies may be a deliberate strategy to create drama and interest. Thus the media's impact may not always be in line with consensus expert opinion and thus, arguably, not uniformly acting in the public interest. This has been of particular issue in the area in which the university is located. Recent local news media coverage of scientific studies of climate change impact on the environment, particularly the Great Barrier Reef frequently concluded with a well-known climate change denialist stating that the studies are wrong, for example:

> *"...there is widespread but erroneous belief in our society that dangerous global warming is occurring and that it has human causation"* (Carter, 2008).

Theory may provide at least a partial explanation for the evident disconnect between recognition of some global environmental issues and individual behaviours (Threadgold, 2011). Systems Justification Theory highlights people's need for certainty and stability in their lives, but also that this may then result in attempts to shift the blame for environmental degradation onto others, coupled with a failure to accept either future risks to personal lifestyles or any personal responsibility for crating or solving environmental problems (Feygina et al., 2010).

A focus only on attitudes and knowledge has been shown to have minimal impact on willingness to change personal behaviours (Boyes and Stanisstreet, 2012). This attitude-behaviour gap in relation to environmental challenges has been identified in multiple studies (see, for example, Ockwell et al., 2009, Lorenzoni et al., 2007, Sheppard, 2005). It highlights the need to do more than simply provide information regarding environmental issues (Azapagic et al., 2005). Some research suggests that there is a need to reframe messages to stress the personal relevance of the issues. To provide clear and practical actions that individuals can take within the context of the development of new theories or refinement of existing theories that are able to explain and predict environmental behaviours more

effectively than has been achieved to date (Lorenzoni et al., 2007, Evans et al., 2013, Gatersleben et al., 2014).

A further challenge is that of changing behaviour when this might seem to be going against prevailing norms (Cialdini et al., 1990). In developing both curriculum content and wider behavioural change interventions, research has identified the need to consider the relative impact of two main types of norms, 'injunctive' and 'descriptive', i.e. what is seen as being approved or disapproved by people whose views are important versus what behaviours appear to be occurring in everyday life (Hennessy et al., 2010). In the environmental context, communications based on descriptive norms may actually strengthen beliefs that individuals do not have any ability to influence things as the issues may be seen as too complex or too large for any individual action to impact (Cialdini, 2007, Semenza et al.).

Research Objectives

Higher education is increasingly shifting from teacher centred to learner centred and it is progressively becoming more focussed on learning outcomes (McDaniel et al., 2000). New models for evaluating institutional quality needs to become based more on student talent developed in institutions than on resources (Astin, 1993). McDaniel et al., (2000) calls on universities as role models to *"do whatever it takes to enhance student learning"* this study applies the call to action to the topic of sustainability and climate change and in doing so exposes its students to role models in an educational context. Universities as role models are increasingly recognised as potential change agents in addressing long-standing problems of indifference and inaction regarding climate change impact, environmental protection and sustainability among students (De La Harpe and Thomas, 2009).

The literature indicates that successful strategies for embedding sustainability content into curricula need to be based on comprehensive understanding of the knowledge, attitudes and beliefs held by students at the time that they commence their studies, coupled with an

understanding of how these change across the period of study (Buissink-Smith et al., 2011). However, the majority of studies have reported only short-term effects rather than endeavouring to evaluate longer-term impacts on actual sustainability-related behaviours. Further, European studies suggest a disconnect between academic knowledge and real world behaviours, to the point of suggesting that pro-sustainability attitudes "*vanishes with business experience*" (Kuckertz and Wagner, 2010). The fact that education alone will not change behaviours was signalled as far back as 1990 (Hungerford and Volk, 1990); knowledge will not be used in everyday life unless real benefits are perceived (Lourenço et al., 2013). While Shepharda et al., (2015) are *"seeking to explore how students' worldwide views change as they experience higher education"*, this area has not been comprehensively researched and there is a need for a longitudinal programme of studies both with graduates, their employers and with the wider communities in order to capture the relative influence of all factors that influence behaviours.

The key aim is to provide a comparative benchmark measure of new incoming undergraduate students' and senior undergraduate students knowledge of, and attitudes towards, a range of sustainability issues and thus inform the development of the revised curriculum for a Bachelor of Business programmes.

Methodology

This paper presents the second phase of a longitudinal study of first and third year undergraduate business students (in 2012) in an Australian university, it uses the same methodology as the first phase of the study as summarised below (Eagle et al., 2015b). Phase one consisted of students commencing their first semester of study and phase two consists of students finishing their third semester of study in 2012 (approximately 250 students) that were not subjected to proposed changes to the curriculum. The third phase of data collection has been completed and the cohort was surveyed at the end of their final semester of study in

2015 (approximately 150 students), after the curriculum change had taken place (see Hay et al., 2019 for results of the third phase of the study). A paper-based survey form was delivered as per the schedule of Surveys by Cohort in Table 1 below.

Table 1: Schedule of Surveys by Cohort

	Start Year 1	**End Year 1**	**End Year 3**
New entrants into the first semester of study	2012		
Students in final year of study before sustainability content introduced		2012	
Students in final year of study having completed sustainability curriculum			2015

The anonymous survey was delivered voluntarily in class to third semester students' in their first year of the study (End Year 1, see Table 1) where they were free to choose to participate or not in the research. This was prior to the university undertaking a major curriculum review and introducing new sustainability curricular (in 2013). The questionnaire (see Appendix 1) contained 9 key familiarity terms and 34 statements that were derived from existing instruments used in previous studies and themes related to climate change and sustainability commonly cited in the literature, including: Michalos et al. (2011), Shephard et al., (2009); Kagawa (2007); Lidgren et al., (2006); Marcell et al., (2004) and Kaplowitz & Levine (2005). In addition, 4 demographic questions and 15 source of information and trust of information statements were included (see Appendix 1). The statements used a five-point Likert scale with anchor points of 5 = strongly agree and 1 = strongly disagree. A sixth option of don't know / not interested was included. This latter option was intended to provide an alternative for those who have only vague understandings or no true opinion on the statements listed (Krosnick et al., 2002, Sturgis and Smith, 2010) rather than forcing an artificial pseudo-opinion (Malone et al., 2010). As in phase one of the longitudinal study, both parametric and non-parametric analyses were performed - drawing on the proposition by

Norman (Norman, 2010) that the robustness of parametric statistics for this type of data is frequently unrecognised – and found no differences in the outcomes of the two types of tests. Given that there were few differences between the two cohorts, a factor analysis using the combined sample was selected as the dimension reduction approach to extract factors to be used as new variables in further regression analysis. The procedures recommended by Tabachnick & Fidell (2007), Thurstone (1947) and Iacobucci (2015) were adopted, i.e. Principal Component Analysis (PAC) with Varimax orthogonal rotation (Field, 2000, Rietveld and Van Hout, 1993). An independent samples t-test was used to compare first semester students to third semester students' knowledge of sustainability related terms. The research is guided by the Australian code for the responsible conduct of research and adhere to the supporting Universities ethical guidelines, Ethics Approval Number H4991. The guidelines are located at https://www.jcu.edu.au/research-services/ethics-and-integrity/research-code-of-conduct.

Statistical Analysis

The analysis compares first and third semester students in 2012 prior to a curriculum change to sustainability course material taught in an undergraduate business degree at an Australian university. The reliability of the two cohorts was assessed using Chronbach's Alpha coefficients. An independent samples t-test was conducted to compare self-reported knowledge of key terms related to sustainability between the first semester and third semester cohorts (2012). A factor analysis using the confirmatory factor analysis tools in SPSS Version 24 explored the dataset for its suitability for Principal components analysis (PCA), with oblique rotation of factors using Oblimin rotation (delta=0). The number of factors to be retained is guided by Kaiser's criterion (eigenvalues above 1), inspection of the screeplot, and through Monte Carlo PCA for parallel analysis (Watkins, 2000). The size of eigenvalues obtained from PCA were compared with those obtained from a randomly generated data set

of the same size. Only factors with eigenvalues exceeding the values obtained from the corresponding random data set are retained for further investigation.

Descriptive Statistics

Two hundred and forty seven (247) students completed the survey. Of the students surveyed, 66% were female and 34% were male. Of the first year students 67.6% were in their first semester and 32.4% were in their third semester. The majority of students were studying accounting (32.5%) or management (including HRM) (24.6%), 16.7% were completing a double major, 11.3% were completing tourism/hospitality/sports management, and another 9.2% in marketing or economics (2.1%). The remaining students were studying finance (3.3%) or international business (<1%). Nearly 85% of students were Australian, 5.4% were from Asia, 3.8% from Europe, and 1.7% from Papua New Guinea. The remaining 4.2% were from other countries.

Reliability

Nine terms relating to the familiarity of sustainability (see Appendix 1) used in the independent t-tests were tested for reliability where a very good internal consistency was evident ($\alpha = .88$). The Chronbach alpha score exceeds .7 indicating a preferable internal consistency (Pallant, 2016). Thirty-four sustainability related statements used in the factor analysis (see bold text in Appendix 1) were tested for reliability where a very good internal consistency was evident ($\alpha = .86$). The corrected item total correlation values identified ten statements with a value of less than 0.3. Values less than 0.3 indicate that the statements were measuring something different from the scale as a whole, as such the statements with low item-total correlation were removed from further analysis (see grey text in Appendix 1).

Sustainability Terms, Self-reported Knowledge

Independent Samples t-test

There is a statistically significant difference, at the 0.05 level of significance, between first semester and third semester students for the terms "economic sustainability", "environmental sustainability", "sustainable development", "conservation, climate change", "climate change adaption" and "environmental protection", but not for "social sustainability" or "energy conservation" (see Table 2). Results show that third semester student's had a higher knowledge scores of the seven listed terms, but no statistical difference exists between first semester and third semester students in terms of "social sustainability" or "energy conservation", indicating that their knowledge level of those topics did not change during the time period.

Table 2: Results of independent samples t-test for self-reported familiarity with sustainability related terms and their meaning

Outcome	**Group Semester 1 (n=167)**		**Semester 3 (n=80)**		**95% CI for Mean Difference**	**t**	**df**
	M	**SD**	**M**	**SD**			
Economic Sustainability	3.47	1.20	3.98	0.93	-0.782,-0.234	-3.65*	196
Environmental sustainability	3.79	1.08	4.11	0.86	-0.594, -0.052	-2.35*	244
Social sustainability	3.25	1.12	3.41	1.25	-0.473, 0.151	-1.02	245
Sustainable development	3.45	1.16	4.01	0.85	-0.821, -0.306	-4.31*	205
Conservation	3.64	1.21	4.04	1.02	-0.689, -0.105	-2.68*	182
Climate change	3.98	1.12	4.36	0.77	-0.659, -0.114	-2.79*	245
Climate change adaptation	4.13	0.97	3.48	1.10	0.371, 0.942	4.55*	140
Environmental protection	3.80	1.19	4.14	0.79	-0.593, -0.089	-2.67*	220
Energy conservation	4.25	1.07	4.11	0.94	-0.138, 0.416	0.99	245

P <0.05

Sustainability Statements, Self-reported Knowledge

Principal Component Factor Analysis

The remaining 24 statements about sustainability were subjected to principal components analysis (PCA) using SPSS Version 24. Inspection of the correlation matrix revealed the presence of many coefficients of .3 and above. The Kaiser-Meyer-Olkin value was .92, exceeding the recommended value of .6 (Kaiser, 1974, Kaiser, 1970) and Bartlett's Test of

Sphericity (Bartlett, 1954) reached statistical significance (p=.000), supporting the factorability of the correlation matrix.

Principal components analysis initially revealed five components with eigenvalues exceeding 1, explaining 34.39%, 8.55%, 6.20%, 4.96%, and 4.47% of the variance respectively. An inspection of Catell's (1966) scree test revealed a clear break after the first factor (see Figure 1) indicating that further investigation of components was required.

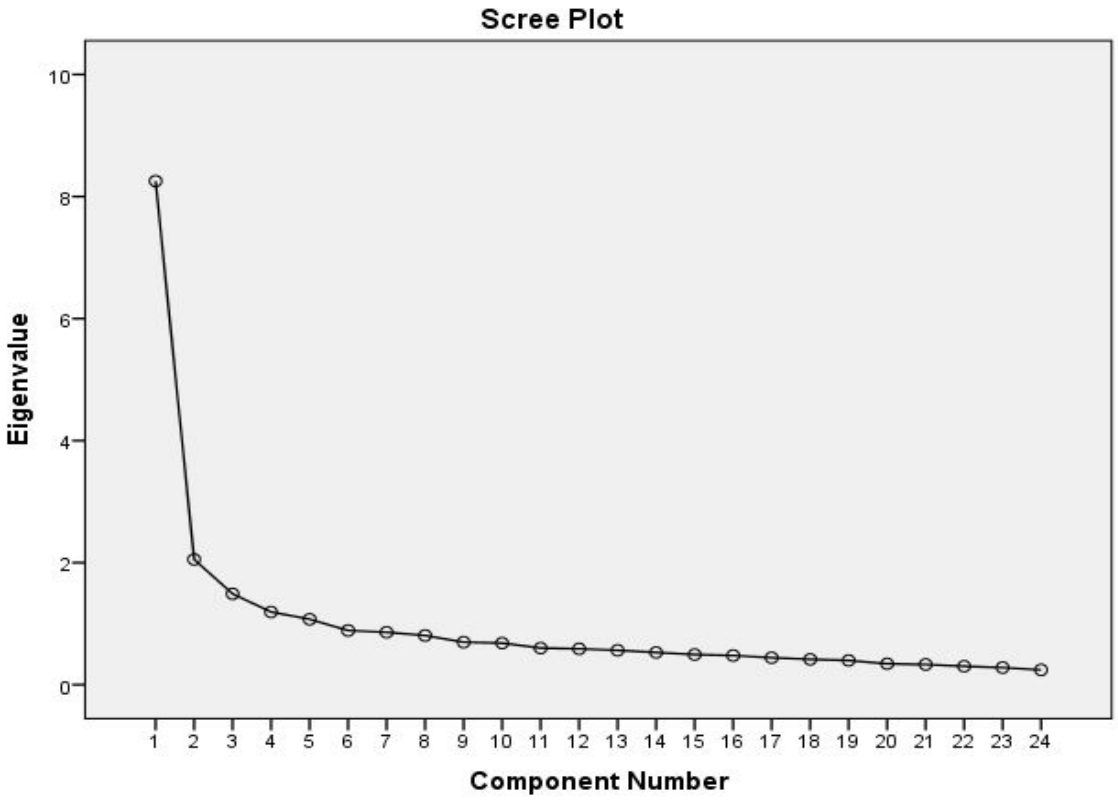

Figure 1: Principal Components Analysis Screeplot

A Parallel Analysis showed three components with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size (24 variables x 247 respondents, see Table 3) suggesting a three component solution.

Table 3: Monte Carlo PCA for Parallel Analysis Output (Variables=24; N=247; Replications 100)

Components	Actual Eigenvalue from PCA[a]	Random Eigenvalue	Standard Deviation	Decision

1	**8.057**	**1.6191**	**0.058**	**Accept**
2	**2.049**	**1.5093**	**0.040**	**Accept**
3	**1.466**	**1.4356**	**0.038**	**Accept**
4	1.190	1.3723	0.031	Reject
5	1.043	1.31	0.030	Reject

a. Only cases for which Year of study = First year - First & Third Sem. Combined are used in the analysis phase.

When consulted, the Component Matrix identified that most of the items in factor one, two and three load strongly above .4 and very few items load above .4 on components four and five, confirming a three-factor solution as appropriate. The Pattern Matrix further supports our decision to retain three factors showing seven items loading to component one, five items loading to component two and three items loading to component three. The principal components analysis was repeated forcing three factors. Communalities amongst items revealed one statement with low a value (<.3) indicating that it was a poor fit with other items in the component. The item was removed and the analysis repeated using the remaining 23 items about sustainability.

The three-component solution explained 50.31% of the variance, with Component 1 being identified as “Sustainably Active” and contributing 35.03%, Component 2 identified as “Aware but Inactive” contributing 8.91% and Component 3 identified as “Aware but Sceptical” contributing 6.37% of the variance.

Table 4: Pattern and Structure matrix for PCA with Oblimin rotation of a three factor solution

	Pattern Coefficients			Structure Coefficients			
	Sustainably Active	**Aware but Inactive**	**Aware but Sceptical**	**Sustainably Active**	**Aware but Inactive**	**Aware but Sceptical**	**Communalities**
We must set aside areas to protect endangered species	**0.744**	-0.011	-0.150	**0.705**	-0.337	0.232	**0.518**
Sustainability is important to me in making choices about which products or services I choose	**0.723**	-0.040	0.016	**0.744**	-0.474	0.094	**0.555**
I have changed to environmentally friendly light bulbs	**0.707**	0.166	0.097	**0.667**	-0.322	0.291	**0.473**
Overuse of our natural resources is a serious threat to the health and welfare of future generations	**0.669**	-0.238	-0.153	**0.722**	-0.278	0.065	**0.582**
I avoid buying from a company which shows no concern for the environment	**0.668**	-0.030	0.093	**0.706**	-0.393	0.151	**0.508**
Economic development, social development and environmental protection are all necessary for sustainable development	**0.665**	-0.139	-0.072	**0.701**	-0.143	0.260	**0.510**
At home I try to recycle as much as I can	**0.629**	0.135	0.148	**0.616**	-0.514	0.388	**0.410**
I often look for signs of ecosystem deterioration	**0.504**	-0.010	0.329	**0.603**	-0.154	0.297	**0.464**
If things continue on their present course we will soon experience a major ecological catastrophe	**0.463**	-0.395	-0.107	**0.593**	-0.292	0.476	**0.483**
Environmental issues are very important to me	**0.462**	-0.282	0.190	**0.631**	-0.558	0.118	**0.510**
Taxes on polluters should be increased to pay for damage to communities and the environment	**0.452**	-0.299	0.042	**0.585**	-0.492	0.241	**0.421**
We, as a society, should radically change our way of living to offset the danger of climate change	**0.415**	-0.325	0.025	**0.554**	-0.499	0.220	**0.398**
Every time we use coal, oil or gas we contribute to climate change	-0.023	**-0.787**	0.008	0.299	**-0.779**	0.185	**0.608**
The greenhouse effect is caused by an ozone hole in the earth's atmosphere	-0.095	**-0.781**	0.056	0.371	**-0.755**	0.151	**0.579**
Human induced climate change is occurring at some level	0.080	**-0.750**	-0.047	0.381	**-0.771**	0.131	**0.601**
Humankind will die out if we don't live in tune with nature	0.102	**-0.736**	-0.071	0.238	**-0.761**	0.212	**0.590**
My personal computer use contributes to climate change	0.090	**-0.641**	0.083	0.495	**-0.697**	0.327	**0.503**
Carbon dioxide is the primary gas responsible for the greenhouse effect	-0.044	**-0.597**	0.317	0.374	**-0.653**	0.259	**0.518**
The government should take an active role in the global effort to curb the problem of rapid climate change	0.218	**-0.594**	0.126	0.289	**-0.712**	0.444	**0.572**
Society will continue to solve even the biggest environmental problems	-0.012	-0.075	**0.740**	0.230	-0.243	**0.754**	**0.574**
There is little action that I can take to reduce the threat of climate change	-0.156	-0.198	**0.634**	0.106	-0.283	**0.635**	**0.442**
Worrying about the environment often holds up development projects	0.200	0.171	**0.518**	0.394	-0.376	**0.535**	**0.328**
My friends and family believe they should alter their behaviour to prevent global climate change	0.177	-0.190	**0.489**	0.279	-0.031	**0.584**	**0.427**

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 9 iterations.
b. Only cases for which Year of study = First year - First & Third Sem Combined are used in the analysis phase.

Following Oblimin rotation Factor 1 *"Sustainably Active"* showed a strong negative correlation with Factor 2 *"Aware but Inactive"* and a moderate correlation with Factor 3 *"Aware but Sceptical"*. This result was expected as the curriculum change had not been introduced as yet.

Table 5: Component Correlation Matrix[a]

Component	Sustainably Active	Aware but Inactive	Aware but Sceptical
1	1.000	-.406	.286
2	-.406	1.000	-.234
3	.286	-.234	1.000

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization[a]
Only cases for which Year of study = First year - First & Third Sem Combined are used in the analysis phase.

Multiple Regression

A standard multiple regression was used to test the influence of various independent variables (familiarity with nine sustainability-related terms, and the frequency and trustworthiness of different information sources) on the sustainability attitudes and behaviour changes. In standard multiple regression, the independent variables are entered into the equation simultaneously with their predictive power over and above that of all the other independent variables (Tabachnick and Fidell, 2007). Preliminary analysis showed no violation of the assumptions of normality, linearity and multicollinearity.

The underlying assumptions were met for multicollinearity (all values above.3), normality ((normality, linearity, as well as outliers) were checked. The normal probability plots (P-P) of the regression standardized residual and the scatterplots suggest no major deviation from normality and appropriate linearity. Outliers were also checked. The collinearity statistics indicate no appearance of high multicollinearity with all variables having a variance inflation factor below 2.5 (highest is 2.2) and tolerance greater than .20.

The results of the regression (

Table 6) indicated the three predictors Sustainably Active ($R^2 = 0.115$, $F_{9, 446} = 6.47$, $p < 0.01$), Aware but Inactive ($R^2 = 0.135$, $F_{9, 447} = 7.76$, $p < 0.01$) and Aware but Sceptical ($R^2 = 0.106$, $F_{9, 447} = 5.90$, $p < 0.01$) explained 35.6% of the variance. It was found that conservation (β .169, p=.000) then environmental sustainability (β .157, p=.013) have the strongest influence over sustainable attitudes and behaviour change in students who are aware but inactive. For students that are aware but sceptical, social sustainability (β .134, p=.020) and environmental protection (β .099, p=.040) had the strongest influence. Sustainably active students were strongly influenced by the terms environmental sustainability (β .162, p=.006) and conservation (β .128, p=.004). There was no significant influence observed of familiarity of the remaining terms in

Table 6.

Table 6: Standard Multiple Regression of the influence of term familiarity on the Sustainability attitudes and behaviours change

Predictor: Familiarity with sustainability terms	**Dependent Variable(s)**								
	Sustainably Active			***Aware but Inactive***			***Aware but Sceptical***		
	β	*S.E*	*p*	***β***	*S.E*	*p*	***β***	*S.E*	*p*
Indicators									
Economic Sustainability	**-.022**	.051	.662	**-.064**	.055	.244	**.010**	.050	.848
Environmental Sustainability	**.162**	.059	.006	**.157**	.063	.013	**.071**	.058	.221
Social Sustainability	**.047**	.044	.283	**-.011**	.047	.822	**.134**	.043	.02
Sustainable Development	**.014**	.046	.761	**.021**	.049	.673	**-.012**	.045	.785
Conservation	**.128**	.044	.004	**.169**	.047	.000	**.079**	.043	.070
Climate Change	**-.003**	.051	.952	**.067**	.054	.213	**-.071**	.050	.154
Climate Change Adaption	**.023**	.045	.609	**.025**	.048	.607	**.053**	.044	.229
Environmental Protection	**.042**	.049	.389	**-.014**	.052	.788	**.099**	.048	.040
Energy Conservation	**-.035**	.050	.485	**.047**	.054	.382	**-.064**	.050	.195
Constant	2.037	0.201	.000	2.016	.215	.000	2.059	.197	.000
R^2	0.115			0.135			0.106		
Adjusted R^2	0.098			0.118			0.088		
F statistic $p<0.01$	$F_{(9,446)} = 6.47$			$F_{(9,447)} = 7.76$			$F_{(9,447)} = 5.90$		

We suggest that the relatively low explanation of variance noted earlier may be due to the fact that none of the themes identified in the literature included competing and conflicting influences. Therefore a range of questions relating to perceived trustworthiness of the media used are considered, see Table 7 for the ranking of information sources by level of trust.

Table 7: Information Sources Ranked by Trust

	High Freq. Use %	High Trust %
Internet	73.0	21.7
Television News	70.1	30.8
Word of Mouth	65.9	18.3
Television Advertising	61.3	17.5
Family	59.6	24.2
Radio News Items	56.5	19.6
Social Media	52.0	12.6
Radio Advertising	50.4	12.5
Direct Mail	44.8	17.6
Friends	40.6	23.9
Cinema	36.6	12.1
Television Documentaries	35.3	24.4
Magazine Editorial	22.4	14.7
Magazine Advertising	16.8	15.1

The low level of trust in advertising sources is unsurprising, a 1994 review of six decades of research in this area showed a consistent level of some 30% of people trusting advertising as a source (Calfee and Ringold, 1994). The high level of trust in television news is interesting,

given that this medium has provided considerable coverage of climate sceptics as part of the 'even handedness' philosophy noted earlier (Eagle et al., 2015a).

The influence of frequency and trustworthiness of information on sustainability attitudes and behaviours changes varies depending on the source of the information.

A multiple regression analysis was used to test the influence of the frequency of use of information sources for sustainability and climate change on students' attitudes toward behaviour change. The results of the regression analysis Sustainably Active (R^2 =0.115, $F_{15, 439} = 3.79$, $p < 0.01$), Aware but Inactive (R^2 =0.074, $F_{15, 439} = 2.33$, $p < 0.01$) and Aware but Sceptical ($R^2 = 0.130$, $F_{15, 440} = 4.40$, $p < 0.01$) explained 31.9% of the variance. Television documentaries (β .141, p=.000) were frequently used for sustainably active students information. While aware but sceptical students were frequently sought information from friends (β .067, p=.009), radio advertising (β -.088, p=.040) and other sources (β .055, p=.035). Other sources include twitter, environmental websites and classes at university. All other information sources are insignificant in frequency for students gathering information about sustainability and climate change, see Table 8.

Table 8: Standard Multiple Regression of the influence of frequency of information source on the Sustainability attitudes and behaviours change

Indicators	***Sustainably Active***			***Aware but Inactive***			***Aware but Sceptical***		
	β	*S.E*	*p*	***β***	*S.E*	*p*	***β***	*S.E*	*p*
Television News	**.032**	.042	.446	**.065**	.046	.160	**.061**	.041	.132
Television Documentaries	**.141**	.034	.000	**.063**	.037	.092	**.015**	.032	.654
Television advertising	**-.034**	.035	.338	**.006**	.039	.882	**-.027**	.034	.423

Radio News	**-.024**	.043	.576	**-.057**	.047	.231	**.040**	.042	.335
Radio Advertising	**-.072**	.044	.103	**-.014**	.048	.766	**-.088**	.043	.040
Magazine Editorial	**.063**	.041	.123	**-.016**	.045	.718	**.019**	.039	.619
Magazine Advertising	**.009**	.042	.828	**.052**	.046	.265	**.070**	.041	.083
Cinema	**.041**	.040	.302	**.053**	.044	.221	**.021**	.038	.576
Word of Mouth from Family and Friends	**-.030**	.039	.444	**.026**	.043	.547	**.041**	.038	.281
Internet	**.046**	.031	.143	**.054**	.034	.117	**-.011**	.030	.722
Social Media	**.028**	.028	.317	**-.021**	.031	.506	**.018**	.027	.520
Direct Mail	**-.025**	.036	.488	**.000**	.039	.990	**.046**	.034	.177
Family	**.015**	.044	.734	**-.072**	.049	.140	**-.049**	.043	.254
Friends	**-.009**	.027	.738	**.037**	.029	.202	**.067**	.026	.009
Other Sources	.032	.027	.229	**.047**	.029	.110	**.055**	.026	.035
Constant	2.806	.137	0.000	2.946	.150	0.000	2.424	.131	0.000
R^2	0.115			0.074			0.130		
Adjusted R^2	0.084			0.042			0.101		
F statistic, $p<0.01$	$F_{(15,439)} = 3.79$			$F_{(15,439)} = 2.33$			$F_{(15,440)} = 4.40$		

A third multiple regression analysis was used to test the influence of trustworthiness of information sources about sustainability and climate change on students' attitudes toward behaviour change. The results of the regression analysis Sustainably Active (R^2 =0.106,

$F_{15, 439} = 3.35$, $p < 0.01$), Aware but Inactive ($R^2 = 0.104$, $F_{15, 439} = 3.38$, $p < 0.01$) and Aware but Sceptical ($R^2 = 0.161$, $F_{15, 440} = 5.62$, $p < 0.01$) explained 28% of the variance.

Aware but sceptical students place their trust in television advertising (β .140, p=.001) and television news (β -.122, p=.004), as well as in word of mouth from family and friends (β -.109, p=.012). While aware but inactive students place their trust in radio news (β -.169, p=.004), television documentaries (β .140, p=.006) and television advertising (β .096, p=.049). Radio news is slightly more significant than magazine editorials for sourcing information about sustainability and climate change for sustainably active students.

Table 9: Standard Multiple Regression of the influence of Trustworthiness of information source on the Sustainability attitudes and behaviours change

Indicators	*Sustainably Active*			*Aware but Inactive*			*Aware but Sceptical*		
	β	*S.E*	*p*	***β***	*S.E*	*p*	***β***	*S.E*	*p*
Television News	**.022**	.045	.618	**.052**	.048	.276	**-.122**	.042	.004
Television Documentaries	**.062**	.047	.186	**.140**	.050	.006	**.084**	.044	.056
Television advertising	**.054**	.045	.230	**.096**	.048	.049	**.140**	.042	.001
Radio News	**-.150**	.054	.006	**-.169**	.058	.004	**-.072**	.050	.154
Radio Advertising	**.032**	.052	.540	**.027**	.056	.633	**-.015**	.049	.756
Magazine Editorial	**.152**	.056	.007	**.116**	.061	.058	**.070**	.053	.185
Magazine Advertising	**.053**	.035	.133	**.025**	.038	.503	**.045**	.033	.167
Cinema	**.003**	.045	.950	**.009**	.049	.858	**.051**	.042	.230
Word of Mouth from Family and Friends	**.025**	.046	.584	**-.031**	.049	.537	**-.109**	.043	.012
Internet	**.022**	.043	.614	**.022**	.047	.643	**.073**	.041	.076
Social Media	**-.019**	.044	.664	**-.058**	.07	.214	**-.042**	.041	.305
Direct Mail	**-.039**	.038	.306	**-.029**	.041	.480	**.060**	.036	.099
Family	**-.061**	.059	.306	**.010**	.064	.876	**.036**	.056	.518
Friends	**.092**	.059	.117	**.014**	.063	.829	**.050**	.055	.361

Other Sources	**.005**	.026	.838	**.026**	.028	.350	**.031**	.025	.205
Constant	2.708	.129	0.000	2.889	.139	0.000	2.485	0122	0.000
R^2	0.106			0.104			0.161		
Adjusted R^2	0.075			0.073			0.132		
F statistic, p<0.01	$F_{(15,439)} = 3.345$			$F_{(15,439)} = 3.38$			$F_{(15,440)} = 5.62$		

Conclusions and Directions for Future Research

Knowledge provision by tertiary education providers alone is not likely to overcome climate change scepticism, particularly if family members and social networks reinforce this scepticism outside the classroom. In communicating real-world sustainability challenges, there is a need for an integrated programme that stresses salience, legitimacy and credibility in order to motivate individuals and communities to consider the likely effects of climate change on their lives. Motivated people cannot see the link between their behaviour and its outcomes, therefore do not see the point of taking action (Cooke and Fielding, 2010). Before any such programme is instigated, there is a clear need to investigate barriers to, and potential enablers of behaviour change and the most effective spokespeople, communications channels and message frames that will make sustainability issues personally relevant in terms of immediacy and significance of local impacts.

Our future research programme will continue to track students through their studies and into the first few years of their entry into the workforce, and extend to perceptions of climate change challenges within the communities from which the majority of students originate. This will enable us to examine how the attitudes and perceptions of our students change with the new, sustainably aware, business curriculum foundation and to then make recommendations for future curriculum design as well as providing a basis of informed techniques for community-based education, aimed at influencing attitudes and behaviour. The

research programme will also enable us to determine the relative influence, both short and long-term, of education and other factors on actual behaviours.

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Appendix 1: Sustainability Questionnaire Pages 1-4

Sustainability Questionnaire: Indicative Questions

"Sustainability is a key issue for organisations in the twenty-first century as they increasingly acknowledge that their policies and practices have social and / or environmental consequences. Accordingly, many companies are implementing elements of sustainability into their business practices. In step with this trend is the increased recognition that sustainability-related subjects need to be included in the curriculum of business courses" (Stubbs & Cocklin, 2008, p. 206).

Our curriculum developments need to be grounded in a clear understanding of the knowledge and attitudinal base from which you start studying the themes and how you studies change knowledge, attitudes and beliefs over time. Please help us in our curriculum development activity by completing the following questions.

Please indicate below how familiar you are with each of the following terms and their meanings.	Very familiar	Some-familiar	Unsure	Slightly / vaguely familiar	Not familiar at all	Don't know / not interested
Economic Sustainability	⑤	④	③	②	①	⓪
Environmental sustainability	⑤	④	③	②	①	⓪
Social sustainability	⑤	④	③	②	①	⓪
Sustainable development	⑤	④	③	②	①	⓪
Conservation	⑤	④	③	②	①	⓪
Climate change	⑤	④	③	②	①	⓪
Climate change adaptation	⑤	④	③	②	①	⓪
Environmental protection	⑤	④	③	②	①	⓪
Energy conservation	⑤	④	③	②	①	⓪

	Please indicate how strongly you agree or disagree with the following statements	Strongly agree	Somewhat agree	Neutral / undecided	Somewhat disagree	Strongly disagree	Don't know
1	Human induced climate change is occurring at some level	⑤	④	③	②	①	⓪
2	The greenhouse effect is caused by an ozone hole in the earth's atmosphere	⑤	④	③	②	①	⓪
3	Humankind will die out if we don't live in tune with nature	⑤	④	③	②	①	⓪
4	Every time we use coal, oil or gas we contribute to climate change	⑤	④	③	②	①	⓪
5	My personal computer use contributes to climate change	⑤	④	③	②	①	⓪
6	Carbon dioxide is the primary gas responsible for the greenhouse effect	⑤	④	③	②	①	⓪
7	Society will continue to solve even the biggest environmental problems	⑤	④	③	②	①	⓪
8	My Friends and family believe they should alter their behaviour to prevent global climate change	⑤	④	③	②	①	⓪
9							
10	The government should take an active role in the global effort to curb the problem of rapid climate change	⑤	④	③	②	①	⓪
11	Environmental issues are very important to me	⑤	④	③	②	①	⓪

… Page 2

12	**There is little action that I can take to reduce the threat of climate change**	⑤	④	③	②	①	⓪
13	The average JCU student is not at all concerned with the issue of climate change	⑤	④	③	②	①	⓪
14	**I save water by taking a shower instead of a bath (in order to spare water).**	⑤	④	③	②	①	⓪
15	I always switch the light off when I don't need it.	⑤	④	③	②	①	⓪
16	I walk or bike to places instead of going by car	⑤	④	③	②	①	⓪
17	**At home I try to recycle as much as I can**	⑤	④	③	②	①	⓪
18	**I have changed to environmentally friendly light bulbs**	⑤	④	③	②	①	⓪
19	**I often look for signs of ecosystem deterioration**	⑤	④	③	②	①	⓪
20	**We must set aside areas to protect endangered species**	⑤	④	③	②	①	⓪
21	**Economic development, social development and environmental protection are all necessary for sustainable development**	⑤	④	③	②	①	⓪
22	**Overuse of our natural resources is a serious threat to the health and welfare of future generations**	⑤	④	③	②	①	⓪
23	**Taxes on polluters should be increased to pay for damage to communities and the environment**	⑤	④	③	②	①	⓪
24	**Worrying about the environment often holds up development projects**	⑤	④	③	②	①	⓪
25	Our planet has unlimited resources	⑤	④	③	②	①	⓪
26	Nature is always able to restore itself	⑤	④	③	②	①	⓪
27	Humans have the right to change nature as they see fit	⑤	④	③	②	①	⓪
28	People worry too much about pollution	⑤	④	③	②	①	⓪
29	People worry too much about climate change	⑤	④	③	②	①	⓪
30	We cannot slow the rate of climate change	⑤	④	③	②	①	⓪
31	**We, as a society, should radically change our way of living to offset the danger of climate change**	⑤	④	③	②	①	⓪
32	**If things continue on their present course we will soon experience a major ecological catastrophe**	⑤	④	③	②	①	⓪
33	The so-called 'ecological crisis' facing human beings has been greatly exaggerated	⑤	④	③	②	①	⓪
34	**Sustainability is important to me in making choices about which products or services I choose**	⑤	④	③	②	①	⓪
35	**I avoid buying from a company which shows no concern for the environment**	⑤	④	③	②	①	⓪

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We are interested in finding out where you get your information from about sustainability and climate change. For each source listed, we would like to know how often you use it and how trustworthy you believe the information is. Please mark your answers by circling the appropriate number for each item listed.

1. Frequency of use of sources	Daily	Weekly	Monthly	About 2 – 3 times a year	Perhaps once a year	Rarely or never
Television News Items	⑤	④	③	②	①	⓪
Television Documentaries	⑤	④	③	②	①	⓪
Television Advertising	⑤	④	③	②	①	⓪
Radio News Items	⑤	④	③	②	①	⓪
Radio Advertising	⑤	④	③	②	①	⓪
Magazine Editorial	⑤	④	③	②	①	⓪
Magazine Advertising	⑤	④	③	②	①	⓪
Cinema	⑤	④	③	②	①	⓪
Word of mouth from family or friends	⑤	④	③	②	①	⓪
Internet	⑤	④	③	②	①	⓪
Social media (please specify)	⑤	④	③	②	①	⓪
Direct mail	⑤	④	③	②	①	⓪
Family	⑤	④	③	②	①	⓪
Friends	⑤	④	③	②	①	⓪
Other Sources (please specify)	⑤	④	③	②	①	⓪
2. Trustworthiness	Totally Trust-worthy	Highly Trust-worthy	Fairly Trust-worthy	Slightly Trust-worthy	Not Trust-worthy at all	N/A – do not use this source
Television News Items	⑤	④	③	②	①	⓪
Television Documentaries	⑤	④	③	②	①	⓪
Television Advertising	⑤	④	③	②	①	⓪
Radio News Items	⑤	④	③	②	①	⓪
Radio Advertising	⑤	④	③	②	①	⓪
Magazine Editorial	⑤	④	③	②	①	⓪
Magazine Advertising	⑤	④	③	②	①	⓪
Cinema	⑤	④	③	②	①	⓪
Word of mouth from family or friends	⑤	④	③	②	①	⓪
Internet	⑤	④	③	②	①	⓪
Social media (please specify)	⑤	④	③	②	①	⓪
Direct mail	⑤	④	③	②	①	⓪
Family	⑤	④	③	②	①	⓪
Friends	⑤	④	③	②	①	⓪
Other Sources (please specify)	⑤	④	③	②	①	⓪

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Finally, please tell us a little about yourself so that we can compare our respondents to the overall population:

What is your intended major?

Accounting	Economics	International Business	Finance	Tourism / Hospitality / Sports Management	Management / HRM	Marketing	Other (please specify)
①	②	③	④	⑤	▾	«	»

What is your gender:

Male	Female
①	②

In what age group are you?

24 or under	25 – 34 years	35- 44 years	45 years or older
①	②	③	④

What is your nationality?

Australian	British	Other European (please specify)	Papua New Guinean	Indian	Chinese	Vietnamese	Other (please specify)
①	②	③	④	⑤	⑥	⑦	⑧

Which ethnic group do you most identify with?

White - Australian	White - British	White – any other white background (please specify)	Aboriginal	Torres Strait Islander	Pacific Islander	Asian (please specify)	Any other ethnic group (please specify)
①	②	③	④	⑤	⑥	⑦	⑧

Thank you very much for completing this questionnaire! If you have any questions, comments, or concerns regarding this research project, please contact Professor Lynne Eagle or Professor David Low