
Perceptions of the natural environment in undergraduate students: influence of degree programme and learning style

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Abstract

A study of over 400 first year undergraduates sought to link environmental perception with the degree programme being taken and their perceived approach to learning using a range of measures. A questionnaire was used to assess whether students had a strong feeling of closeness of association with nature; assessed their views on environmental issues and if they thought of the natural environment in a wide, 'wholistic' way or a narrow, compartmentalist way. Results indicated that their environmental perception varied significantly according to the type of degree being taken, with those taking natural science subjects and arts tending to perceive a greater closeness to nature, hold more pro-environmental views and perceive the natural environment in a more integrative way than students taking psychology and law degrees. Students taking pharmacy and biomedical programmes scored more highly on pro-environmental views than students taking either psychology or law but tended to perceive the environment in a more narrow, compartmentalist way. The students perceived approach to learning was not a significant controlling variable in determining their closeness to nature, to their environmental views or perception of the natural environment.

Keywords: Environment, Perceptions, Discipline differences

1. Introduction

Unless the human population en masse does not reduce pollution, resource use and waste production, the resulting degradation of the environment will dominate all of our futures (e.g. Dietz et al., 2003; Rockström et al., 2009; Ehrlich & Ehrlich 2013). Lifestyle changes by a minority of individuals will not have sufficient impact to avert environmental disaster and, in the meantime, will serve only to curb those individual's freedoms.

This is encapsulated by the infamous idea of the 'Tragedy Of The Commons' (Hardin, 1968) which describes the predicament we all face when confronted with today's environmental problems such as climate change, resource depletion and disposal of waste. Pro-environmental behaviour requires altruistic behaviour and an awareness of

the impacts of one's actions on the environment (Gäarling et al., 2001). Such awareness relies on a realisation that the natural environment and its provision of resources through ecosystem functioning, such as clean air and water, soil formation, food, regulation of the global climate, are in fact, life support systems (*sensu* Odum, 1989) and that current resource use and the production of waste and pollution are compromising the ability of natural systems to supply such life support (Millennium Ecosystem Assessment, 2005; Norris, 2011). Mayer and Frantz (2004) found that students taking environmental studies exhibited higher connectedness to nature than students on other degree programmes, which may result from their enhanced awareness. This awareness may not always be theoretical and via formal education, indeed the influence of family upbringing on adolescent environmental behaviours has been shown to be important and

strongly correlated to parental behaviour (Grønhøj & Thøgersen 2012), and it seems likely that young people who are already interested in environmental issues are more likely to select such degree subjects at university.

Research shows that within the western world, the young, the highly educated and those living in cities are amongst those who show the highest environmental concern (Fransson & Gärling, 1999; Samdhal & Robertson, 1989). While some studies have suggested that a more ecologically sound world view is emerging (Olsen et al., 1992) more recent studies have also found a decline in pro-environmental behaviour from older to younger people (European Commission, 2008), despite the younger generation sometimes holding stronger pro-environmental views (Grønhøj & Thøgersen, 2009).

Environmental understanding is linked to the likelihood that an individual will carry out pro-environmental behaviour (Davis et al., 2009), and environmental awareness is a factor in prompting the personal changes necessary to live a more environmentally sustainable manner. It has been argued that environmental sympathies alone, however, are not sufficient to result in pro-environmental behaviour (Bamberg, 2003) and that life-style changes occur only when other social and immediate pressures are conducive (Bamberg, 2003; Berenger, 2005).

Several published methods of assessment of environmental perception exist in the literature. The interconnectedness of an individual to nature has been measured by several researchers (see for example, Schultz, 2002; Shultz et al., 2004; Mayer & Frantz, 2004). The '*Inclusion of Nature in Self*' matrix (Schultz, 2002) is adapted from the '*Inclusion of Other in the Self*' scale (Aron et al., 1992) has been used in a range of environmental perception studies (Davis et al., 2009; Perkins, 2010). This consists of two circles shown at varied distance apart or overlap to present 'self' and 'nature' and asks respondents to select the arrangement which best reflects their feeling of interconnectedness. Environmental views have been assessed by direct questions of subjects' opinions on a range of environmental matters. One such method is the *New Environmental Paradigm* (Dunlap & Van Liere, 1978; Dunlap et al., 2000) which asks respondents to agree or disagree to

fifteen different statements about environmental issues.

University students predominantly comprise young adults who, by virtue of going on to complete a degree and potentially post graduate degrees, are more likely to enter into management, education or policy-making careers. Understanding the perception of environmental issues held by such young people, who are posed to have a relatively greater influence on society compared to young people not entering higher education, is therefore important when we are concerned with reducing mass environmental apathy and inactivity. There is however a growing voice of discontent that argues that, at present, universities are producing graduates who perpetuate our current unsustainable life styles and economic systems (McIntosh et al., 2001; Cortese, 2003). Such authors suggest that students leaving university with degrees in non-natural science or non-environmental science topics, in particular, may be more likely to continue such unsustainable life styles. The importance of this issue, and the role that students may play in future, is acknowledged by a proposal by the Quality Assurance Agency for new guidance for universities on embedding sustainable development education within curricula (QAA, 2013).

To appreciate the dependence and impacts of human beings on global life-support systems an awareness of the complexity and interconnectedness within the natural world, and between the human population and natural world, is required (Bowden & Marton, 1998; Jacobson & Wilensky, 2006; Stewart, 2012). While higher education should be an opportunity to promote such sophisticated, relational ways of thinking, much teaching in higher education focuses on reducing down large subjects into modules, lectures within modules and bullet points in slides (see Stewart 2012 for review). Academic teachers often note that students fail to see the relationships between different modules and between the different learning and assessment activities within modules.

There is a risk that such an approach may be counter to that needed to grasp an understanding of complex natural systems which might go on to manifest itself in pro-environmental views and behaviour. The tendency of individuals to

comprehend complex concepts in a wholistic way, or focus on discrete units of information is considered a form of cognitive approach referred to as wholist or analyst (Riding, 1996; Riding & Raynor, 1998). An analyst cognitive approach may not enable the individual student to appreciate the interconnected and interdependence we have with the natural environment, as readily as a student who has a more wholistic thinking approach. Warburton (2003) argues that wholistic style of thinking is required to comprehend the interdisciplinary thinking and interconnectedness of topics necessary for understanding environmental issues. Similarly, a related cognitive ability of field independence has been argued to be important in enabling complex learning (Tinajero & Páramo, 1997; Zang, 2004).

Field independence is variously described as the ability to separate a concept or idea from its original learned context (Evans et al., 2013) and enables the learner to integrate ideas (McCune & Entwistle, 2011). The importance of wholist and field-independent approaches to learning is likely to be significant in understanding environmental issues. These considerations are important to teaching, because, as Stern et al. (1992) argues, a lack of understanding of environmental problems stems from the fact that the major environmental problems of today, such as climate change and loss of biodiversity, have complex causes, cover a wider geographic area and require complex and wide ranging solutions.

This study asks how natural environmental perception varies across a large group of newly started first year undergraduates to investigate if students on certain degree programmes consider themselves closer to nature, hold more pro-environmental views and consider the natural environment in a more wholistic way than those on other degree programmes. The influence of the students' approach to learning, as tending towards wholist or analyst, was also studied using a crude indicator to ascertain if this too was related to the environmental perception measures.

2. Methods

A number of measures were used to examine environmental perception (Appendix A). These consisted of *Inclusion of Nature in Self* (Schultz, 2002), environmental views via the *New*

Environmental Paradigm (Dunlap et al., 2000) and free text responses to investigate the breadth of perception of the environment. Answers were analysed using content analysis (Bell, 1999; Silverman, 2006) by assigning the words used to answer the questions to one of five categories (Appendix B) determined from a pilot study (Fisher, 2010). The categories covered were then related to perceived preferences for handling information, from a roughly 'wholistic' or 'analytical' perspective. A simple self-report indicator was used, in the form of statements that asked whether students preferred tackling problems by starting with the bigger picture, 'deconstructing' concepts into constituent parts, or through a more analytical 'constructive' approach.

Questionnaires were provided to first year students during October 2011, within four weeks of beginning their degrees. Questions were handed out to students during comfort breaks in lectures at Liverpool John Moores University. Courses surveyed included Pharmacy and Biomedical Sciences, Law, Music, Psychology, and Natural Sciences. Students were left to complete the questionnaires during the break during their lecture, before collection at the end. Questionnaires were the preferred data collection method because they are known to limit bias arising from interaction between participant and researcher, such as feeling the need to give academically-correct answers in front of a tutor (McNeill & Chapman, 2005). Questionnaires allowed students to provide answers which would not be attributable to the individual (Cohen et al., 2000), and gave the participants the opportunity to answer the questions in their own time, thus reducing feelings of pressure.

Differences in the *Inclusion of Nature in Self (INS)* score, *New Environmental Paradigm (NEP)* score and breadth of terms used to describe the environment between degree programmes were analysed using one-way ANOVA. Differences between the two learning styles were analysed using T-tests. The strength of influence of degree programme groupings and the influence of 'wholist' or 'analyst'-style groupings on the answers to the fifteen individual *New Environmental Paradigm* questions was investigated using Discriminant Function Analysis. The percentage data, such as percentage of respondents who selected a term, word or image

in each category, were transformed by arcsine transformation prior to analysis. Correlations between *Inclusion of Nature in Self*, *New Environmental Paradigm* scores, breadth of descriptive terms and estimated degree performance were made using Spearman's rank correlation. SPSS version 17 was used for all data analysis.

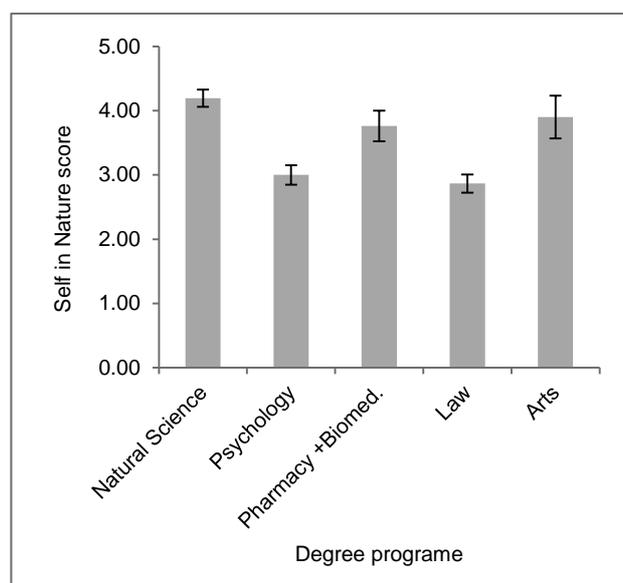
3. Results

In total, 428 questionnaires were completed. There were 145 questionnaires completed by Natural Science students, 93 from Psychology students, 64 from Pharmacy and Biomedical students, 106 from Law students and 20 from Arts (music) students.

3.1 How does environmental perception vary between degree programmes?

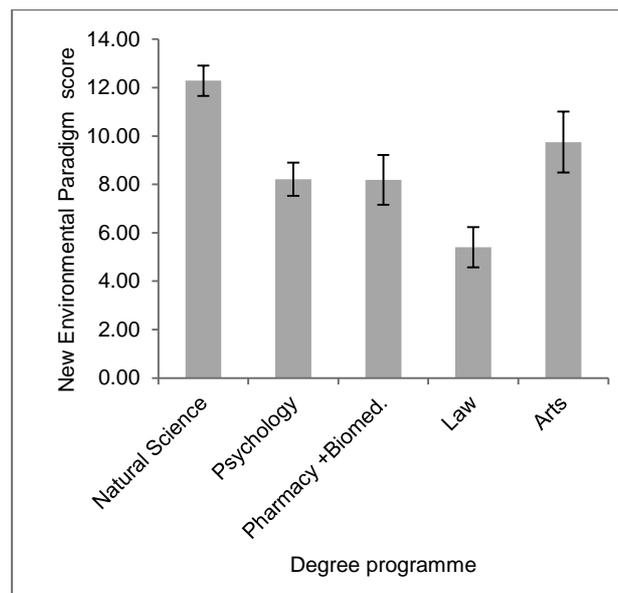
Natural Science, Pharmacy and Biomedical students showed significantly greater ($p < 0.05$) *Inclusion of Nature in Self* than Psychology and Law students (Figure 1). The mean score of Arts students was similar to that of the Natural Science students, but the sample size of Arts students was smaller and the result was not significantly different.

Figure 1: The mean *Inclusion of Nature in Self* score from students from different degree programmes.



Natural Science students exhibited a significantly greater *New Environmental Paradigm* score

Figure 2: The mean *New Environmental Paradigm (NEP)* score from students from different degree programmes.



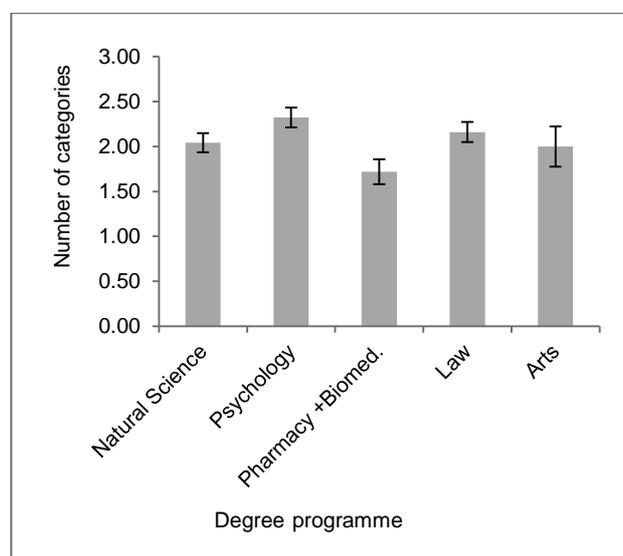
($p < 0.05$) than all other degree programmes, with the exception of Art students which had too few cases (Figure 2). Degree programme significantly discriminated between *New Environmental Paradigm* ($\lambda_1 = 0.214$, $p = 0.028$) question numbers 1, 2 and 12 (1; 'We are approaching the limit of the number of people the earth can support', 2; 'humans have the right to modify the natural environment to suit their needs' and 12; 'humans were meant to rule over the rest of nature'). Natural Science students scored significantly higher to *NEP* question 1 and lower to *NEP* question 2 than all degree programmes ($p < 0.001$). Pharmacy and Biomedical students and Arts students appeared to exhibit stronger pro-environmental views than Law and Psychology students by scoring more highly in *NEP* question 1 and lower on *NEP* question 2, than Law students and Psychology students ($p < 0.05$). Pharmacy and Biomedical, Law, and Psychology students were significantly more anthropocentric than Natural Science students as indicated by the significantly higher scoring on *NEP* question 12 ($p < 0.05$, $p < 0.001$ and $p < 0.01$ respectively).

There was a significantly greater ($p < 0.05$) range of terms used to describe nature by Psychology students than students taking Pharmacy and Biomedical degrees (Figure 3).

There was a strong positive correlation between pro-environmental views and perception of

interconnectedness with scores for *New Environmental paradigm* and *Inclusion of Nature in Self* being strongly correlated ($r = 0.350$, $p < 0.001$, $N = 420$).

Figure 3: The mean number of categories covered by terms used when asked to think of words, terms and images for the word 'nature' by students from different degree programmes.



The tendency to perceive the natural environment in a wide 'wholistic', or narrow way when asked to think of words and images for the terms 'Wildlife', 'Nature' and 'Natural Environment' showed high positive correlation between the number of categories covered with their responses for all three terms (all $p < 0.05$). There was no significant correlation between the breadth of categories covered for any of the three terms and *New Environmental Paradigm* scores or *Inclusion of Nature in Self* scores.

3.2. Does environmental perception vary with self-perceived approach to learning?

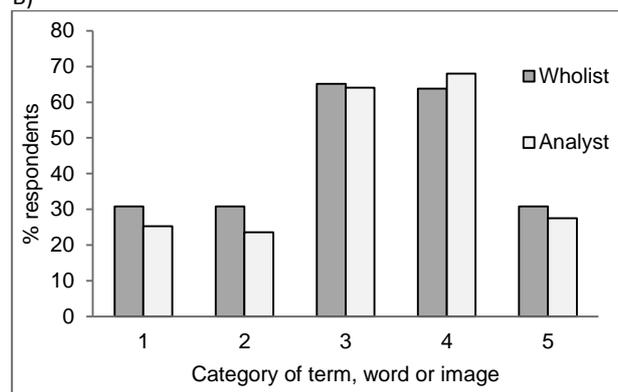
56 % of respondents perceived themselves to have 'wholistic-type' approach to learning, and 44 % as having an 'analysis-type' approach to learning. Those students who perceived their approach to learning to be more 'wholistic' in style suggested a significantly ($p = 0.019$) wider variety of words, terms or images when asked to think about the term 'Nature' than students who perceived themselves as 'analysts' (Figure 4). 'Wholists' also tended to suggest a greater variety of words when

asked to think of the term 'natural environment' but this was not statistically significant.

There was no significant difference in *Inclusion of Nature in Self* or *NEP* scores between students who perceived themselves as having 'wholistic' and 'analyst' approaches to learning. Discriminant Analysis showed that the 'wholistic-analyst' grouping was a poor predictor of the differences in answers to individual *New Environmental Paradigm* questions ($\lambda_1 = 0.019$, $p = 0.935$).

There was a slight significant difference in the proportion of the two different self-report approaches to learning between degree programmes, with arts students tending to comprise a greater proportion of 'wholists' than students studying pharmacy and biomedical degrees ($p < 0.1$).

Figure 4: The proportion of respondents who suggested a term, word or image in each of the categories, grouped according to learning style. 1= charismatic fauna, 2= non-charismatic fauna, 3= other organisms, 4= physical environment or processes, 5= intangible terms (Appendix B)



4. Discussion

Natural Science and Pharmacy and Biomedical students scored more highly on *Inclusion of Nature in Self* than students taking Psychology and Law, and the former students are more likely to carry out pro-environmental acts. Indeed Davis et al. (2009) found *Inclusion of Nature in Self* to be a good predictor of pro-environmental behaviour irrespective of social pressures and the individuals' environmental views. Degree subject also significantly affected *New Environmental Paradigm* answers, especially to questions 1 ('limits to growth') and 2 and 12 (both anthropocentric) (Dunlap et al., 2000). Students studying psychology

and law gave the more anthropocentric answers and were less likely to place importance on limits to the growth of the human population.

Both Psychology and Law can be argued to be anthropocentric subjects, taken by students interested in humans and in human legal and social structures. Pharmacy and Biomedical Sciences and Arts subjects, however, whilst also anthropocentric in that they exist for the purpose of human well-being, may be broader in terms of inclusivity, e.g. Pharmacy and Biomedical students are also trained in the elemental properties of life such as chemistry and microbes, which exist beyond the human. It also is possible that those students taking arts subjects have been trained to examine subjects in a more field-independent or 'wholist-style' way and therefore are also less likely to be anthropocentric.

While these suggestions are conjecture, there are many studies that have identified differences in how students' perceptive knowledge and the certainty of knowledge according to their degree discipline (e.g. King & Kitchener, 1994; Jehng et al., 1993; Paulsen & Wells 1998). Students chose a degree subject as a result of their interests and aspirations for future careers and therefore it is likely that their perception of the environment is a product of their world view, rather than influences received while studying their degrees. Indeed, these questionnaires were carried out in October 2011 which was less than 5 weeks after the students had begun their degrees, meaning that the study of the degree programme itself could only have had a minimal impact on the student's perception of the natural environment. Instead, differences in degree programmes perception is more likely to be a cohort-effect of shared similar world views, which both governs their choice of degree programme as well as their environmental perception. Such views may be a product of parental influence (Grøhøj & Thøgersen 2012).

Also, Mayer and Frantz (2004) hypothesise that our sense of connectedness with nature increases with an increase in time spent outdoors in contact with nature. It is likely that the Natural Science students have spent a greater proportion of their working, volunteering or relaxation time outside on average than students on other degree programmes. Understanding what influences an individual's environmental viewpoint is a field deserving urgent

research given the recent decline in public acceptance of environmental problems and therefore willingness to act (Science & Technology Committee, 2010). In 2006, 81% of UK citizens were found to be 'fairly or very concerned' but this fell to 76% in 2009 (Science & Technology Committee, 2010). We need to identify the most influential medium through which to deliver environmental information and enhance understanding in all. Indeed, the Science and Technology Committee (2010) found that 'more could be done to improve risk communication of scientific matters in the media'.

A slightly greater proportion of students saw themselves as 'wholists' than 'analysts' but this was not related to how closely connected to nature they felt (*Inclusion of Nature in Self*) or to their environmental views (*New Environmental Paradigm*). While it seems logical that a 'wholist-style' approach to learning would be required to appreciate environmental issues (Warburton, 2003) and therefore to the likelihood of holding pro-environmental views, as well as seeing oneself as 'part of nature', there was in fact no significant difference between the two learning-approach groups. 'Wholist' types did suggest a significantly wider variety of terms when asked to think of the word 'nature' compared to 'analysts'. The lack of apparent difference in environmental perception between the two learning styles is not surprising given the multitude of sources of information on the environment and the mixture of influences that individuals are exposed to, which may predominate over characteristics such as approach to learning.

Our environmental perception is clearly not a product simply of our learning style. Nisbett et al. (2001) argue that learning styles can be a product of our social and cultural norms, and as a result our world view varies as a product of these influences.

This study is exploratory, the intention to gain some initial insight into how individuals grouped in different academic disciplines relate to nature and environment environments. In terms of thinking styles it is acknowledged that more rigorous, sophisticated assessments of cognitive style are needed to fully understand potential interactions between thinking strategies and environmental perceptions: this would be a valuable field for future research. From this study, it would seem

that learning style as measured here does not appear to be important in influencing environmental perception. Rather perception stems from the variety of influences which go together to make an individual's world view (which is a function in a student's choice of degree programme). While students taking natural science subjects are more pro-environmental, the question to be asked is whether those students taking other degree disciplines can be exposed to information which will foster similar pro-environmental views, and if so, how?

The literature on the influences of socio-economic, cultural and religious and demographic factors on environmental perception is growing. There is a mixed picture emerging of the possible importance of generation or age (European Commission 2008; Grøhøj & Thøgersen 2009), level of education (Fransson & Gärling, 1999; Samdhal & Robertson, 1989; Mayer & Frantz, 2004) with some researchers finding a lack of influence from such factors (Mayer & Franz, 2004). Certain consistent patterns are arising, such as the greater pro-environmental tendencies of females over males (Davidson & Freudenburg, 1996; Mayer & Franz, 2004; Zelexny et al., 2000; Tam, 2013), in urban populations over rural ones (Fransson & Gärling, 1999; Samdhal & Robertson, 1989) and in students studying natural or environmental sciences compared those who are not (Mayer & Franz, 2004 and in this article).

What is not clear are the reasons for some of the differences revealed when grouping by subject: the lower environmental perception of Law and Psychology students in particular, over say Arts students. Given that all the respondents here had been at university for 5 weeks or less it seems unlikely to be an influence of the topic teaching, and more likely to be bound up in past personal and family experiences and maybe past education cohorts. The next step would be to see if the differences persist to graduation and if so, consider strategies by which higher education can enhance environmental awareness. The finding that those starting out on degrees in Law and Psychology are less pro-environmental and feel less connected to nature than other than other students, is of special concern given the inevitable increase in the requirements for environmental policy and laws, and for pro-environmental behaviours, in the near future.

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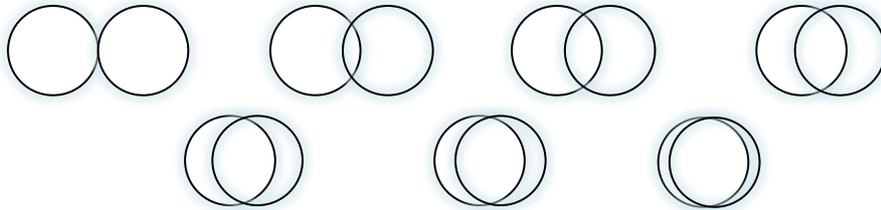
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Appendix A

1) For each of the three terms below- list up to 5 words, terms or images which come to mind when you think of each term.

1. Wildlife.....
2. Nature.....
3. The natural environment.....

2) Please circle the picture below that best describes your relationship with the natural environment (yourself= circle on the left; natural environment= circle on right).



3) Which of the following best reflects your approach to understanding a new topic? (please circle one)

When encountering new topics I prefer starting with the big picture and then breaking it down into its constituent parts

When encountering new topics I prefer to study and analyse smaller units of information then see how it all fits together later

4) What degree are you studying?

5) Are you a Level 4, Level 5, Level 6, or Level 6 after sandwich year student? *Please circle.*

6) What degree class do you estimate you will get? 1st , 2:1, 2:2, 3rd or fail? *Please circle.*

7) Listed below are statements about the relationship between humans and the environment. For each one, please indicate whether you STRONGLY AGREE, MILDLY AGREE, are UNSURE, MILDLY DISAGREE or STRONGLY DISAGREE with it.

1. We are approaching the limit of the number of people the earth can support
2. Humans have the right to modify the natural environment to suit their needs
3. When humans interfere with nature it often produced disastrous consequences
4. Human ingenuity will insure that we do NOT make the earth unliveable
5. Humans are severely abusing the environment
6. The earth has plenty of natural resources if we just learn how to develop them
7. Plants and animals have as much right as humans to exist
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations
9. Despite our abilities humans are still subject to the laws of nature
10. The so called "ecological crisis" facing humankind has been greatly exaggerated
11. The earth is like a spaceship with very little room and resources
12. Humans were meant to rule over the rest of nature
13. The balance of nature is very delicate and easily upset
14. Humans will eventually learn enough about how nature works to be able to control it
15. If things continue on their present course, we will soon experience a major ecological catastrophe

Appendix B

Categories

- 1 = Charismatic fauna, such as mammals and birds.
- 2 = Non-charismatic fauna, such as reptiles and invertebrates.
- 3 = Other organisms, such as plants, microbes and fungi.
- 4 = Environments and processes, such as words for specific habitats, or processes which describe weather, decomposition, food-web interactions, extinctions etc.
- 5 = Intangible terms, such as 'green', 'freedom', 'balance', 'inspiring'