An Analysis of the Environmental Attitudes of Undergraduate Construction Management Students using the New Ecological Paradigm Scale

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Abstract

Institutions generally lack formal processes to identify the impact that environmental initiatives may have on students, but one possible solution is the use of the New Ecological Paradigm (NEP) scale to monitor these potential changes. The aim of this study is to evaluate the change (if any) in environmental attitudes of undergraduate year two BSc. in Construction Management students following the completion of one semester of the Environmental Management module at the Atlantic Technological University (ATU) in 2021/2022. The research methodology employed a bounded case-study, which included the dissemination of two questionnaires (pre and post the module delivery in semester one). Consequently, one of the limitations is it does not consider other groups, modules, disciplines, or institutions. The findings demonstrate that all the NEP scale questions exhibited shifts toward a stronger pro-ecological stance over the duration of the study. The changes highlighted were that; respondents' pro-environmental attitudes have undergone a positive change, their awareness that humans are consuming too many resources and that these resources are finite has increased, and they have become more aware of damage that humans are causing to the environment; and that there is a requirement to act now to prevent further environmental harm. It is important to monitor any affect environmental education has on students and that the use of the NEP scale can enable an evaluation of the success of third level education in contributing to changes in the affective attributes of students.

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Introduction

Concern around environmental issues began receiving increased attention in the 1970s with concern focusing on water pollution, loss of aesthetic values, and resource conservation (Dunlap et al., 2000). In recent decades, however, environmental problems have evolved in ways and have generally tended to become more geographically dispersed, less directly observable, and more ambiguous in origin. Problems such as ozone depletion, deforestation, loss of biodiversity, and climate change are far more global in nature. Their causes are complex, and their solutions are complicated and often problematic (Stern et al., 1992). The concept of sustainable development (SD) based on three pillars (economic, social, and environmental), was most widely disseminated by the Brundtland Report (WCED, 1987). This report exposed the growing environmental degradation around the world and the need to revisit the current development model. Conceptually, a new model emerged as the result of worldwide concerns about the unpredictable social, environmental, and economic consequences of population growth, economic growth, and accelerating consumption of natural resources (NRCNA, 2011). The Millennium Development Goals (2000 to 2015) and the United Nations (UN) Sustainable Development Goals (SDGs) (2015 to 2030) have been acting as a global and inclusive framework for implementation of this model.

In Ireland, the most recent assessment from the Environmental Protection Agency (EPA), reveals that the quality of Ireland's environment is not what it should be (EPA, 2020). The environmental outlook is not optimistic unless there is an acceleration of the implementation of solutions. This assessment reveals that enduring and systemic challenges are putting pressure on the environment and remain to be solved. These span several environmental topics such as climate, air, soil, water, biodiversity, and waste, across organisations, sectors, business, and all levels of society. These challenges also include the protection of health and wellbeing and ecosystems, reducing emissions and consumption of resources (EPA, 2020).

The 2020 *State of Europe's Environment Report* published by the European Environment Agency (EEA) adds to growing evidence from international bodies advocating for urgency in protecting the environment, safeguarding biodiversity, and tackling climate change (EEA, 2019). According to the EEA: *"The overarching challenge of this century is how we achieve development across the world that balances societal, economic and environmental considerations"* (EEA, 2019, p. 16). Sustainability needs to become the guiding principle for ambitious policies and actions across society (EEA, 2019). Higher Education Institutions

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(HEIs) occupy a central role in creating a more sustainable world by producing graduates capable of meeting the challenges (Blake et al., 2013;Tilbury & Wortman, 2004). Whether students are registered on a course that directly involves environmental awareness or if it is more peripheral to their study, all students should be exposed to concepts and activities that promote environmental awareness. Approaches can be formal, as part of their taught modules, but could also involve informal activities such as campus events. HEIs are also increasingly interested in their impact on the sustainability attributes of its students (Jowett et al., 2014). However, HEIs often lack a formal process and capability to identify any impact, which environmental or sustainability initiatives may have on their students and on other stakeholders (Brody & Ryu, 2006). The New Environmental Paradigm scale (Dunlap & Van Liere, 1978) and the updated New Ecological Paradigm (NEP) scale, (Dunlap et al., 2000), have been extensively used for assessing ecological worldviews and monitoring how this view could change or evolve (Anderson et al., 2007; Teisl et al., 2011).

The aim of this study is to evaluate the change (if any) in environmental attitudes of undergraduate year two BSc. in Construction Management students following the completion of one semester of the Environmental Management module at the Atlantic Technological University (ATU) in 2021/2022. To achieve this aim, two objectives were set out: (1) to critically evaluate existing literature relating to environmental education (EE) and, in particular, the use of the NEP scale to measure environmental attitudes; and (2) to evaluate changes (if any) in the environmental attitudes of students prior to and following the delivery of semester one of the Environmental Management module based on the NEP scale.

Environmental education in higher education

The relevant role of HE for SD was formally recognised in the 1972 *UN Conference on Human Environment*. Some years later, the *Agenda 21* and the *Rio Declaration on Environment and Development (1992)*, presented the need for a societal engagement by: "establishing innovative equitable global partnerships through the creation of new levels of cooperation among states, key sectors of society and general population" (UNCD, 1992, p. 1). Taking that into account, the UN declared the 2005–2014 period as the decade for education for SD, establishing an international mandate to incorporate sustainability principles, values, and practices, into all aspects of education. Ever since this mandated decade, HEIs have been engaging in Education for Sustainable Development (ESD) to respond to environmental challenges (Ramísio et al., 2019). Worldwide HEIs have published various declarations and

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charters, created partnerships, and have made commitments to embedding sustainability. International frameworks include: *Talloires Declaration, Halifax Declaration, Association of University Leaders for a Sustainable Future, Kyoto Declaration, Thessaloniki Declaration, Swansea Declaration, COPERNICUS University Charter, Global Higher Education for Sustainability Partnership, Lüneburg Declaration, Declaration of Barcelona, Abuja Declaration and Torino Declaration* (Ramísio et al., 2019).

Within Ireland, the *Second National Strategy on Education for Sustainable Development to 2030* (DE&S, 2022) provides a framework to support contributions that the education sector is making towards a more sustainable future at individual, community, local, national, and international levels. The strategy aims to ensure that education contributes to SD by equipping learners with the relevant knowledge, key dispositions, skills, and values that will motivate and empower them throughout their lives to become informed active citizens who act for a more sustainable future. It has been developed against a background of growing recognition of the importance of education in achieving SD. It also emerged from a specific commitment in *Our Sustainable Future* (DEC&LG, 2012), Government of Ireland's overall strategy on SD and from Ireland's obligation to produce a national strategy on ESD.

New Ecological Paradigm scale

The history of the NEP dates to the 1960s to the US environmental movement inspired by the publication of Rachel Carson's book '*Silent Spring',* which exposed the hazards of pesticides and questioned humanity's faith in technological progress (Carson, 1962). Social psychologists at the time formed a hypothesis that the world view of the population, known as the dominant social paradigm (DSP), was changing towards a view that reflected greater concern for the environment. The DSP related to the values, attitudes, confidence, and beliefs felt or adopted regarding wealth, continuous development, and technological and scientific achievements, which were described as the reason for little awareness of environmental problems (Catton & Dunlap, 1980; Dunlap & Van Liere, 1978; La Trobe & Acott, 2000). In the following decades, there was a shift from the DSP to a more eco-centric paradigm in the individual or social interpretation of nature within the system of all these values, beliefs, and attitudes (Albrecht et al., 1982; Dunlap & Van Liere, 1978). Scholars moved to develop valid and reliable measures of this worldview that would help to gain a better understanding of these changes and their relationship to demographic, economic, and behaviour change in the population (Stern et al., 1995). Among the efforts to measure change, Riley Dunlap and

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colleagues at Washington State University developed the New Environmental Paradigm, sometimes referred to as the original NEP (Dunlap & Van Liere, 1978). Their hypothesis was that the NEP scale could be used to measure a population was in transition from the DSP to a more environmentally conscious view of the world. The NEP scale is a measure of endorsement of an environmental worldview. It is used extensively in environmental education where differences in behaviour or attitudes are believed to be explained by underlying values, a worldview, or a paradigm. The NEP has been used to determine environmental attitudes in school children (Harrison, 2020; Manoli et al., 2007; Wu, 2012), secondary school students (Altunoglu et al., 2017; Atav et al., 2015) and higher education students (Erdogan, 2013; Jowett et al., 2014; Harraway et al., 2012; Rideout, 2005).

The original NEP developed by Dunlap et al. (1978) contained twelve items that appeared to represent a single scale in the way in which populations responded to them. This original NEP received criticism for several shortcomings, which included lack of internal consistency among individual responses; poor correlation between the scale and behaviour; and, dated language used in the instrument's statements (Stern et al., 1995). Dunlap and colleagues then developed the New *Ecological* Paradigm Scale to respond to criticisms of the original NEP (Dunlap et al., 2000). This is sometimes referred to as the revised NEP scale to differentiate it from the New Environmental Paradigm scale. The NEP scale is shown in Table 1(below).

Table 1: NEP Scale Questions (Source: Dunlap et al., 2000).

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 produces disastrous consequences.
4.	Human ingenuity will ensure that we do not make the Earth unliveable.
5.	Humans are seriously 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 special 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 limited 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.

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The revised NEP scale is constructed from responses to fifteen statements that measure agreement or disagreement. Respondents are requested to indicate the level of agreement or disagreement with each statement. Responses are then used to construct statistical measures of environmental concern among the target group. The seven even numbered items within the NEP scale questions, if agreed to by a respondent, are meant to represent statements endorsed by the DSP. The eight odd items, if agreed to by a respondent, are meant to reflect endorsement of the revised NEP. Using a Likert scale, respondents are asked to indicate strength of agreement with each statement (1. Strongly agree, 2. Agree, 3. Neither agree nor disagree, 4. Disagree, 5. Strongly disagree). The NEP scale has five facets which are analysed under the following headings: Anti-exceptionalism; Anti-anthropocentrism; Limits to growth; Balance of nature, and Eco-crisis (Dunlap et al., 2000).

> *Anti-exceptionalism:* is one of the theoretical sub-dimensions covering items 9, 4, and 14 of the NEP Scale. It is based on the idea that the people who accept the NEP are supposed to reject that human beings are exempt from the laws of nature.

> *Anti-anthropocentrism:* is the theoretical sub-dimension involving the view that nature exists for meeting the needs of human beings in the first place (items 2 and 12) as well as the view of rejecting it (item 7).

> *Limits to growth:* The NEP suggests that growth and development have a limit, which is based on the limitedness of the resources in the world. In line with this view, item 1 puts an emphasis on population increase, and item 11 highlights the limitedness of resources via an analogy likening the world to a spaceship. Item 6 stands as a negative item suggesting that the world has plenty of resources.

> *Balance of nature:* The NEP claims the existence of a balance that can be disrupted by human beings. Items 3, 8, and 13 of the scale are about the theoretical sub-dimension of the balance of nature.

> *Eco-crisis:* The NEP argues that human intervention in nature may lead to negative results at a disaster level that might be described as an eco-crisis. Items 5, 10, and 15 of the scale are about the theoretical background of eco-crisis.

Dunlap et al. (2000) asserted that the revised NEP had several strengths, making it a valid and reliable tool for measuring a population's environmental worldview. They noted that the scale was internally consistent (i.e., respondents who answered some items in one pattern, tended to respond to other items in a consistent manner), a valid measure of a single scale.

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Research methodology & methods

As the research incorporates a literature review, a bounded case-study, the dissemination of two questionnaires, and analysis of associated data, a mixed methods framework was considered the most appropriate framework in which to assess the environmental attitudes of undergraduate students using the NEP scale. The number of possible purposes for mixing is large. Hence, it is not possible to provide an exhaustive list. In almost all cases, the mixing of methods, methodologies, and/or paradigms will help answer the research question and make improvements over a more basic study design. Fuller information will be obtained in the mixed methods study (Schoonenboom & Johnson, 2017).

Two main types of data were gathered during this research, namely primary and secondary. Secondary data was used to undertake an analysis of current literature on the research topic while the primary data was gathered and analysed to meet the aim and objectives of the study. According to Largan & Morris (2019), secondary data can consist of both quantitative and qualitative data. The analysis of previous research also allowed the author to identify the previous research methods which have been used, understand the views of experts within the research field and assist in the development of a benchmark with which the research findings can be compared (Gray, 2004). Conducting a literature review revealed previous and parallel research efforts associated with the research subject and was an essential stage of the research project (Fellows & Liu, 2003). A literature review on the use of the NEP scale was conducted at the start of the research and was further supplemented with additional material throughout the research to address the specific needs of the research. The literature analysis was initiated by conducting a broad search for peer-reviewed articles published in the environmental education area using several databases, including Academic Search Complete, ScienceDirect, and Google Scholar[1]. The researcher also referred to books available in the ATU library.

Primary data was collected through a mixed methods methodological framework within a bounded case-study. Quantitative data from the questionnaire was subject to a detailed analysis using SPSS. For this study, the 15-item NEP Scale, was twice distributed to students in questionnaire format and used as the measurement tool. The degree to which the NEP is accepted was evaluated based on the distribution of the answers given to each item and the average score. The questionnaire also included demographic and behaviours at home

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[1] Keyword searches included 'New Ecological Paradigm scale,' 'sustainable development,' 'environmental education,' and, 'higher education.'

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questions. It was initially disseminated to three fourth year students, two postgraduate students and two lecturers within the Building and Civil Engineering department as part of a pilot study. The group were asked to consider the questions posed and comment appropriately on content, phraseology, ambiguity etc. There were no changes required because of this feedback.

The questionnaire and associated calculations were repeated at the end of the 13-week semester one and the findings analysed to determine if students' environmental attitudes had improved because of undertaking the Environmental Management module. Semester one of the Environmental Management module covers a wide range of 'bigger picture' issues in relation to environmental management, sustainability and climate change. The topics include climate change, the fundamental environmental and sustainability issues affecting the planet, ecosystems and species, waste production and management, biodiversity, habitat protection, the biogeochemical cycle, and environmental and sustainability policies. Questionnaire dissemination during online lecture time was chosen above other means (e.g., email or postal questionnaires) as it was postulated that this would elicit a more substantial response rate (Ebert et al., 2018). In previous studies, questionnaires administered face-to-face by Zhuang et al. (2008) yielded a 95% response rate, as did Huang et al. (2006) in their questionnaire, which was handed out in public areas. It was also important to consider the use of information and communications technology (ICT) to administer the questionnaire and Microsoft Forms was chosen to disseminate the survey as students were familiar with the use of this platform.

For the first round of the questionnaire[2], out of a sample size of 34, 28 responses were received giving an overall response rate of 82%. For the second round of the questionnaire, out of a sample size of 28, 22 responses were received giving an overall response rate of 78.5%. It is a common limitation for questionnaires not to be answered online (Boschman et al., 2012) and considering the responses rates of 82% and 78.5% respectively, the response rate was considered acceptable.

Research findings and analysis

Quantitative data collected from the questionnaires was analysed using SPSS Version 28.0 for Windows. The primary statistical analysis was concerned with comparing responses between the two versions of the questionnaire to identify potential changes in environmental attitudes

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[2] The ATU set of ethical principles, which are set out in the Research Ethics Policy of the college, were utilised for the purposes of this research. The questionnaires were granted prior approval by the research supervisors and the research ethics committee. One of the core principles focuses on *'offering reciprocity'* and it should be noted that students were made aware that there was no benefit or privileges to be gained from taking part.

and beliefs based on the responses from various sections of the questionnaire. Demographics were included in the first questionnaire. It is outlined first to provide clarity on the respondents' age, gender, level of education and area where they live. It should be noted that the findings and analysis for the questionnaire are based on the 21 respondents who answered both questionnaires. 95% (n=20) of respondents were aged between 18-25 years, while 5% (n=1) of respondents were aged between 26-30 years (Figure 1). This was to be expected as there is only one mature student currently registered on the course.
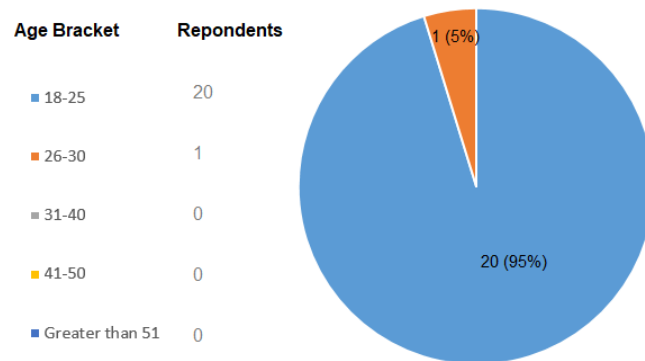

Figure 1: Age breakdown of questionnaire respondents.

100% (n=21) of the respondents identified as male. This could be considered a limitation of the questionnaire as gender balance is important when identifying attitudes and beliefs of a group of people. Previous studies have shown that diversity, including gender balance and gender perspectives, helps to enhance the quality and relevance of research (Bergman & Rustad, 2013; Heidari et al., 2016). However, there is only one female registered on the course and she did not take part in either of the questionnaires. The findings show that 90.5% (n=19) of respondents were educated to secondary school level, whilst only 9.5% (n=2) had completed a third level higher certificate (Figure 2).
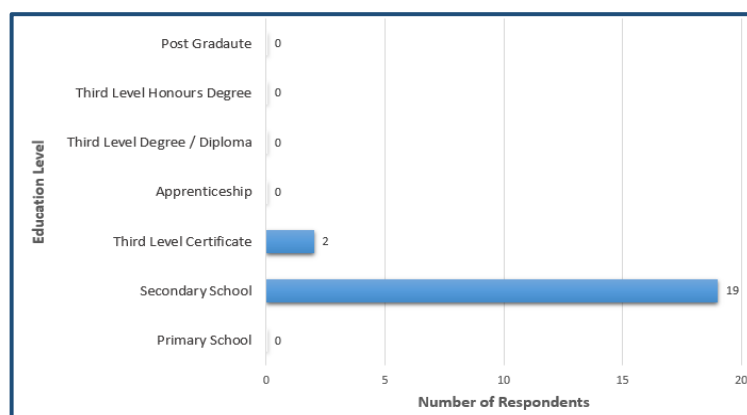

Figure 2: Current level of education of questionnaire respondents.

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The demographics underpinning the responses (Figure 3) show that students were raised in a range of different demographic areas, whilst, interestingly, none of the respondents were raised in a large city. 42.8% (n=9) of respondents were raised in a rural location, whilst 23.8% (n=5) of respondents were raised in a small village and the remaining 33.3% (n=7) of respondents were raised in a town.
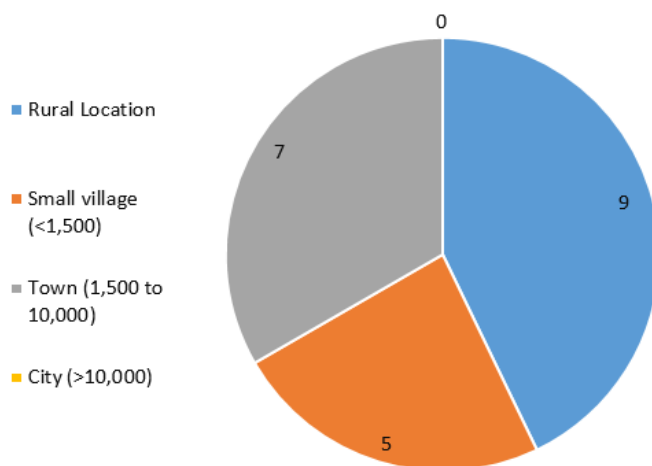

Figure 3: Demographics of questionnaire respondents.

The NEP scale section and the behaviours at home section are reported using the mean and standard deviation to track changes in behaviours and attitudes of respondents. Numerous previous studies have used the mean and standard deviation as a legitimate means of tracking the changes using the NEP scale (Atav et al., 2015; Erdogan, 2009; Harraway et al.,2012; Jowett et al., 2014; Ntanos et al., 2019). Table 2 below presents the mean responses for Q1 and Q2 and the corresponding percentage change to each of the 15-item NEP scale, for each of the questionnaires. A significance value (P-value) of the differences is also reported. The P-value is the probability of obtaining the observed difference between the samples if the null hypothesis were true, i.e., in this case, if the difference is zero. When the P-value is less than 0.05, the conclusion is that the two means are statistically significantly different.

Table 2: Mean responses and p-values of the 15-item NEP scale for each questionnaire.

Items	Mean Q 1	Mean Q 2	P-value	Change
1. We are approaching the limit of the number of people the Earth can support.	2.57	1.71	0.0001	Agree +33.5%
2. Humans have the right to modify the natural environment to suit their needs.	3.33	3.38	0.8851	Disagree +1.5%
3. When humans interfere with nature it often produces disastrous consequences.	1.90	1.81	0.6370	Agree +4.7%
4. Human ingenuity will ensure that we do not make the Earth unliveable.	2.62	2.76	0.5324	Disagree +5.3%
5. Humans are seriously abusing the environment.	1.90	1.52	0.0242	Agree +20%
6. The Earth has plenty of natural resources if we just learn how to develop them.	1.52	1.86	0.1066	Disagree +22.4%
7. Plants and animals have as much right as humans to exist.	1.86	1.57	0.1655	Agree +15.6%
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.	3.48	3.81	0.2822	Disagree +9.5%
9. Despite our special abilities, humans are still subject to the laws of nature.	2.19	1.62	0.0035	Agree +26%
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.	3.62	3.95	0.1743	Disagree +9.1%
11. The Earth is like a spaceship with very limited room and resources.	2.95	2.14	0.0040	Agree +27.5%
12. Humans were meant to rule over the rest of nature.	3.48	3.95	0.0872	Disagree +13.5%
13. The balance of nature is very delicate and easily upset.	2.00	1.81	0.2908	Agree +9.5%
14. Humans will eventually learn enough about how nature works to be able to control it.	2.48	2.86	0.1617	Disagree +15.3%
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	2.05	1.76	0.1139	Agree +14.1%

(NEP score: 1. Strongly agree, 2. Agree, 3. Neither agree nor disagree, 4. Disagree, 5. Strongly disagree).

The results demonstrate that the mean scores for each of the 15 NEP scale questions show that the mean scores for all the items exhibited changes over the duration of the study. Four

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of the NEP items showed a statistically significant change (items 1, 5, 9 and 11). All shifts were toward a stronger pro-ecological stance. Table 3 (below) presents the mean responses and percentage change to each of the seven questions on respondents' behaviours at home.

Table 3: Mean responses and p-values of the respondent's behaviour at home for each questionnaire.

Items	Mean Q 1	Mean Q 2	P-Value	Change
I segregate my waste for recycling.	1.48	1.43	0.7725	3.4% increase
I turn off lights in rooms that I am not in.	1.48	1.24	0.1098	16.2% increase
Whenever possible, I take a short shower to conserve water.	2.14	2.00	0.5860	6.5% increase
I switch off or unplug any appliances when not in use, rather than leaving them on standby.	1.71	1.52	0.3835	11.1% increase
I use public transport over a car whenever possible.	2.81	3.00	0.5034	6.8% decrease
I purchase energy efficient appliances and lightbulbs.	1.71	1.71	1.0000	No change
I leave the tap running when brushing my teeth.	3.29	3.29	1.0000	No change

In terms of any changes in respondents' behaviours at home, the results demonstrate that the mean scores for four of the behaviours (waste segregation, turning off lights, taking shorter showers and switching off appliances) exhibited a shift to a more positive environmental behaviour. Two of the behaviours saw no change (purchasing energy efficient appliances and turning off taps when brushing teeth), whilst there was a decrease in the use of public transport by the respondents. None of the changes in behaviour were statistically significant. However, a P-value is affected by sample size and the magnitude of effect. Generally, the larger the sample size, the more likely a study will find a significant relationship if one exists (These et al., 2016). Van Voorhis & Morgan (2007) suggest a sample size of at least 30 is required to accurately test statistical significance, which was not possible in this study. A study with a larger sample size could yield greater statistical insight.

Primary research discussion

The results demonstrate that the mean scores for each of the 15 NEP scale questions show that the mean scores for all the items exhibited changes. All shifts were toward a stronger pro-ecological stance, similar to the findings of Harraway et al. (2012).

Anti-exceptionalism: There was a 26% increase in agreement that humans are still subject to the laws of nature. However, there was a 5.3% increase in the level of disagreement in the belief that human ingenuity would ensure that we do not make the Earth unliveable which shows that respondents' awareness of environmental issues has increased. In addition, there was also an 15.3% increase in the level of disagreement that humans will eventually learn enough about how nature works to be able to control it, which highlights that respondents have become more aware that humans may not be able to control environmental impacts to the planet.

Anti-anthropocentrism: There was a small shift in respondents rejecting the idea that humans have the right to modify the natural environment to suit their needs (disagreement increased by 1.5%), whilst there was an increase in disagreement of 13.5% for respondents rejecting the idea that humans were meant to rule over the rest of nature. There was a larger shift in agreement (increase of 15.6%) in respondents agreeing that plants and animals have as much right as humans to exist. All these changes highlight that respondents' pro-environmental attitudes have undergone a positive change during the time that the module was delivered.

Limits to growth: The NEP scale questions in relation to 'limits to growth' saw large changes in the respondents' pro-environmental attitudes. There was a 27.5% increase in agreement that we are approaching the limit of the number of people the Earth can support, whilst there was also a 27.5% increase in agreement that the Earth is like a spaceship with limited resources. There was also a 22.4% increase in the level of disagreement that the Earth has plenty of natural resources if we just learn how to develop them. The responses to the 'limits to growth' questions show that respondents have become more aware that humanity is consuming too many resources, which are finite, or must be allowed sufficient recovery time for nature to replenish.

Balance of nature: There were small shifts in the questions relating to the 'balance of nature' in the NEP scale. However, this is likely because respondents' pro

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environmental attitudes were already quite positive in the first questionnaire. There was an increase of 4.7% in the respondent's belief that when humans interfere with nature it often produces disastrous consequences. There was a larger shift in respondents' agreement (increase of 9.5%) that the balance of nature is very delicate and easily upset while there was an increase in disagreement of 9.5% for respondents rejecting the idea that the balance of nature is strong enough to cope with the impacts of modern industrial nations. As with the other elements of the NEP scale these changes highlight that respondents' pro-environmental attitudes have also undergone a positive change over the course of the semester.

Eco-crisis: Respondents showed a large shift in agreement (increase of 20%) in terms of believing that humans are abusing the environment while there was also an increase in agreement (increase of 14.1%) that if things continue on their present course, we will soon experience a major ecological catastrophe. There was also an increase in disagreement of 9.1% that the so-called "ecological crisis" facing humankind has been exaggerated. The responses to the 'eco crisis' section of the NEP scale again highlights that respondents have become more aware of the damage that humans are causing to the environment and that there is a requirement to act now to prevent further harm.

In terms of changes in the respondents' behaviours at home, there was a 3.4% increase in respondents segregating their waste for recycling. However, respondents had already shown good behaviours in terms of recycling in the first questionnaire. With regards to energy conservation, there was a 16.2% increase in respondents switching off lights in rooms that they are not in, whilst unplugging appliances to reduce energy usage saw an 11.1% increase. There was no change in behaviours in relation to purchasing energy efficient appliances and lightbulbs. Yet, as with the recycling questions, respondents had already shown good behaviours in terms of purchasing energy efficiency appliances in the first questionnaire. Respondents also showed improvements in behaviours in terms of water consumption with a 6.5% increase in the respondents who would take a shorter shower. However, there was no change in behaviours in terms of leaving the tap running when brushing their teeth but again respondents had already shown very good behaviour for this in the first questionnaire. The findings from the questionnaire are similar to those of Heyl et al. (2013) who found that actions, such as switching off the lights and turning off the taps, are among the more frequent environmentally friendly behaviours undertaken by university students. In terms of the use of

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public transport, surprisingly there was a 6.8% decrease in the use of public transport over the use of a car, where possible. One potential explanation for this is the increase in COVID-19 cases from September to December 2021 (the period of the study), which may have caused some respondents to lean towards avoiding public transport. It is also important to note that, public transport was also running at a reduced capacity during this time to ensure compliance with social distancing regulations put in place.

Conclusions

From the literature, it is evident that HEIs occupy a central role in creating a more sustainable world by producing graduates capable of meeting increased environmental challenges (Blake et al., 2013; Tilbury & Wortman, 2004;). Educational approaches may be formal, with taught courses, assessments, and qualifications, but more often involve informal activities such as co-curricular or extra-curricular on-campus sustainability programmes (Harraway et al., 2012). Although the literature was extraordinarily varied on the issues involved, it is clear that environmental attitudes is a key feature of concern (Buissink-Smith et al., 2011) and that of all the instruments used in recent years to research environmental attitudes, the NEP scale (Dunlap et al., 2000) has been extensively used for measuring how environmental concern changes over time (Anderson et al., 2007; Teisl et al., 2011). HEIs generally lack formal processes to identify the impact that environmental initiatives may have on their students, but one possible solution is the use of the NEP to monitor these potential changes.

The literature analysis also found that HE institutions that hope to routinely evaluate their impact on the environmental attributes of their students should consider incorporating some form of sampling and modelling into their quality assurance programmes. In whatever way the institution hopes to impact on its students, environmental outcomes may need to be either evaluated, or assessed, or both. Whether the driver for change comes from academic curiosity, academic responsibility, or accountability to some external authority or agreement, it is to be hoped that evaluation will be based on more than simply collecting student perceptions of institutional effectiveness (Jowett et al., 2014). At this stage of their studies in HE the students in the case-study group may not have been exposed to environmental management modules unless undertaken off campus or as part of their second level studies. It was therefore important to monitor any affect environmental education had on the chosen cohort of students. The NEP has proven useful in exploring changes in the students relating to these matters.

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The results demonstrate that the mean scores for each of the 15 NEP scale questions show that the mean scores for all the items exhibited changes over the course of the study. All shifts were toward a stronger pro-ecological stance. The results from this study show that second-year students initially had wide-ranging ecological worldviews and contributory sustainability intentions. Following the completion of semester one of the Environmental Management module, the key changes noted are that; respondents' pro-environmental attitudes have undergone a positive change over the duration of the semester, their awareness that humans are consuming too many resources and that these resources are finite had increased, and they have become more aware of the damage that humans are causing to the environment and that there is a requirement to act now to prevent further harm. The study demonstrates that monitoring any affect environmental education has on various cohorts of students, using the NEP scale, may enable an evaluation of the success of third level education in contributing to these changes (McBeth & Volk, 2009). Within the current study, the NEP has proven to be useful methodological tool in exploring the changes in the students relating to these matters. It is a tool that can be more broadly applied across the education sector.

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