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Do we really make a difference? A case study on the value of taught environmental sustainability postgraduate programmes within geography.

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Abstract

Purpose: The purpose of this research was to discover the impacts of taught environmental sustainability focused geography postgraduate programmes on student attitudes, behaviours, and practices in relation to environmental awareness within two research intensive universities in the United Kingdom.

Design/methodology/approach: A case study involved online surveys to measure environmental attitudes, behaviours and practices at the start and end of four taught geography postgraduate programmes.

Findings: There was widespread attitudinal change and an increasing prioritisation of environmental issues reported amongst participants after they had completed their programme. However, behavioural change was limited and there was little evidence of greater awareness being translated into changed practices. The learning benefits included a greater focus on inter-disciplinarity, holistic thinking, and critical self-reflection.

Practical implications: The findings demonstrate that postgraduate taught programmes in sustainability improve student awareness and concern about environmental issues, but do not necessarily lead to widespread behavioural change. This raises questions for programme convenors about how education for sustainability can be truly transformational and avoid leading students to develop eco-anxieties over the scale of change required.

Originality/value: There is a lack of research engaging with students on PGT programmes, especially in understanding their impacts on environmental attitudes, behaviours and practices. The research provides an evidence base for understanding the effects of PGT programmes in challenging student values, attitudes and practices, and by implication knowledge transfer post-graduation, with potential to help protect the environment and identify ways of living better with the ever-changing planet.

Key words: Attitudes, Behaviour, Environmental sustainability, Postgraduate, Transformative Learning.

Introduction

Academic rationale

Contemporary postgraduate taught (PGT) programmes (Masters) on sustainability are now attracting a wide range of learners from different academic backgrounds and with a range of life experiences. Yet very

little is known about the attitudes, behaviours and practices of learners and the impact of PGT programmes on these attributes when students have completed their programme.

It may be easily assumed that students choosing a sustainability focused PGT programme would be aware of climate change and this would be reflected in their attitudes, behaviours, and practices. However, it is imperative to question whether the programmes challenge student values, attitudes, and practices in ways that are transformational, or whether they simply raise awareness but do not lead to changes that will contribute to positive societal change to deal with the climate emergency and ecological crises. The findings have important implications given that many of the students are likely to enact the practices they have learnt into professional practices through subsequent employment. Numerous questions arise, including asking whether programmes undermine students' own values and beliefs due to the 'norms' within the teaching? Are the, often depressing, facts of climate change absorbed due to feelings of being overwhelmed? Are programmes initiating action or further inaction? Finally, are there changes between extrinsic (image and appearance) values and intrinsic (community and helping) values?

This paper and the research which underpinned it aimed to explore the impact of environmental sustainability-focused PGT programmes on learner climate change attitudes, behaviours, and practices. This was achieved via three focused objectives:

1. To measure the values, attitudes and reported practices regarding climate awareness of students on environmentally-focused PGT programmes throughout a programme of study;
2. To use quantitative and qualitative methods to explore the relationships between formal learning experiences and changes in values, attitudes and practices;
3. To identify the impact of such PGT programmes on learning and skills development for sustainability

The paper uses empirical data from a case study of four PGT programmes at the universities of Bristol (UoB) and Exeter (UoE), UK. Through undertaking pre- and post-programme online surveys, quantitative and qualitative data were collected to examine attitudes towards the environment and climate change, behavioural responses, environmental priorities, and students' understandings of the learning gain from their programme. The paper is structured in the following way. Firstly, an overview is provided of the evidence in the literature for the impact and role of sustainability programmes in higher education, focusing on the emergent Transformative Education agenda, which highlights the key role for sustained behavioural change that is also able to challenge learner assumptions and dominant social and economic norms. The methodology and methods are outlined, discussing the choice of case study programmes and their characteristics. The online survey used for the research including the recruitment method is discussed. The results sections of the paper describe the ways in which learner attitudes, behaviours and priorities changed pre- and post-programme, using both qualitative and quantitative data. Finally, the pedagogic and practical implications of the research are explored for how PGT programmes on sustainability can lead to transformative outcomes.

Research context

Transformative Education for Sustainable Development

Education for sustainable development has a lengthy trajectory in the post-World War II Western context, with a range of curriculum-based interventions (Pappenfuss et al., 2019) progressively focusing on a coalescence of environmental problems. The United Nations Decade for Education for Sustainable

Development (UNESCO, 2005) cemented the idea of 'Education for Sustainable Development - ESD', and the increasing emphasis being placed on the United Nations Sustainable Development Goals (e.g. the UK's annual SDG Teach-in, which audits teaching allied to the sustainable development goals) (SOS, 2023). Indeed, as universities, local authorities and national governments declare 'climate emergencies' (Bristol was the first university in the UK to declare a climate emergency in 2019 (UoB, 2019)), higher education programmes are becoming increasingly focused on climate change as a holistic, urgent and potentially agential device for tackling environmental issues (FindaMasters, 2023). Yet as Pappenfuss et al. (2019, p.4) also point out:

"...if our record of solving sustainability challenges is a proper gauge of the sum effort of sustainability education, there is scant reason to cheer. Most attempts to solve urgent, large-scale sustainability challenges have failed".

The challenge that has been identified by Burns (2018) is that whilst education 'about' and even 'for' sustainable development may provide the basis for explicit knowledge gain, the transformation of this knowledge into implicit understanding and agency – values and behavioural change – is rarely witnessed. As such, there is a concern that ESD may be operating at a factually superficial level, rather than providing opportunities for personal transformation.

These concerns have led to the development of Transformative Learning approaches that have their root in notions of emancipatory learning, critical reflection, personal development and a focus on extra-rational knowledge (Dirkx, 1998). In representing a shift away from rationalized, mechanised, instrumental and dualistic forms of learning, Aboytes and Barth (2020) discuss the importance of learning processes, outcomes and conditions as ways of understanding how people learn, what they learn and how they are supported, respectively. In this way, Burns (2018) argues for a re-orientation of learning to focus on relationality, subjectivity and inter-connections. Practically, Kasworm and Bowles (2012) argue that this can be achieved through intervention strategies: self-reflection, critical reflection, a supportive social environment, the use of arts, literature, film and drama, and a focus on affective processes.

O'Brien and Howard (2016, p. 115) neatly summarise the motivation that advocates of Transformative Learning have to pursue this alternative pedagogic agenda within sustainable development education:

"...the repurposing of education must reflect a vision that contributes to well-being for all - individually, collectively and for the 'other than human' life on our planet".

Transformative Education for Climate Change: inter-disciplinarity, inter-cultural learning and personal agency

Within the context of education for sustainable development, the emergence of programmes focusing on climate change has witnessed significant expansion in recent years. In the UK for example, there are (as of 2023) 152 PGT Masters focusing on climate and climate change (FindaMasters, 2023). Such programmes frequently feature several key attributes: the complex, inter-connected and inter-disciplinary nature of climate change; the globalised nature of the physical and social science of climate change; and the connection between science, society, and the individual learner. Programmes have sought to mobilise narratives of inter-disciplinarity, inter-cultural understanding and notions of social and personal agency ('we') to develop a pedagogy of climate change. The following sections explore the ways in which the characteristics have been examined in the literature, before setting out a methodological approach to explore the role of affective learning through examining personal agency.

Inter-disciplinary learning

Climate change is a keystone topic for why inter-disciplinary learning is needed to foster greater understanding in higher education. Yet Aktas (2015) has noted how university programmes have persisted in seeking to tackle inherently complex problems through siloed disciplinary approaches. One of the particular challenges for PGT programmes is the embedded nature of disciplinary training that is transferred from undergraduate training (Wals and Blewitt, 2010), alongside the entrenched pedagogies of academic staff who may have been trained and practiced in conventional subject areas for several decades (Howlett et al., 2016; Vincent et al., 2015).

This 'lag' of siloed training and a potential entrenching of practices amongst undergraduates in individual disciplines has presented developers of climate change Masters programmes with several challenges. First, the very nature of framing the climate change 'problem' is dependent on ontological and epistemological understandings. For example, is climate change fundamentally a scientific, technical, cultural, economic, or behavioural challenge? Eagan's (2002) early work in this area highlighted the challenges of problem identification, diagnosis and analysis because of the diverse perspectives involved. Focus has turned towards what Dale and Newman (2005) and Luppi (2011) term a collective understanding, which avoids simply deploying a multi-disciplinary approach, but seeks to build understanding from the ground up. Achieving this idea in intense PGT programmes is challenging, given both their duration and limited capacity for fundamental (epistemological and methodological) teaching, issues highlighted for UK Masters programmes by Gantogtokh and Quinlan (2017).

Second, Eagan's (2002) early analysis focused on the importance of skills, something recently corroborated by Abbonizio and Ho (2020), Annan-Diab and Molinari (2017) and Baumber (2022). Arguably, the process of building collective understandings about an issue as complex as climate change is disruptive, discomforting and anxiety producing. Aktas (2015) identified that agility, flexibility, and empathy were three attributes of resilient learning for sustainable development, with Howlett et al. (2016, p. 306) arguing that skills sets need to be developed to enable learnings to:

"...cope with uncertainty, poorly defined situations and conflicting or, at least diverging norms, values, interests and reality constructions, as environmental problems such as climate change mean we do not know what the future will look like or the particular problems we may face" (Howlett et al., 2016, p. 306).

Inter-cultural understanding

Alongside the explicit knowledge needed for tackling climate change through an appreciation of complex systems and collective disciplinary understandings, there are a series of 'ways of working' – tacit understandings – which are needed to foster global citizenship (Morais and Ogden, 2011). Inter-cultural learning is a way of articulating these ways of working, acknowledging that much of the original motivation for exploring inter-cultural learning has been driven by the growing importance of international recruitment and diversity of on-campus programmes, alongside increases in student exchange programmes (Bennett, 2009; Volet and Ang, 2012). Research has also focused on inter-cultural learning for employability (Hunter et al., 2006) and global graduate skills (Evans, 2019; Kang et al., 2018). However, it is the focus on a broader, potentially 'softer' set of skills that is of concern in understanding how higher education can foster engaged global citizenship for tackling global challenges (Bell, 2016; Evans 2019).

Morais and Ogden (2011) argue that three characteristics of global citizenship are significant: self-awareness, civic engagement and global competence. They argue that globally competent students:

“...recognize their own limitations and abilities for engaging in intercultural encounters. They demonstrate an array of intercultural communication skills and have the abilities to engage successfully in intercultural encounters. Globally competent students display interest and knowledge about world issues and events” (Morais and Ogden, 2011, p. 448).

In developing these ideas, the authors argue that global competence is comprised of the following: (1) self-awareness: recognising limitations and understanding that they are positioned within a context that has subjectivity; (2) inter-cultural communication: effectively being able to listen and convey arguments across cultural boundaries; (3) global knowledge: a wide interest in World events that appreciates the contingent and contested nature of knowledge construction. Bennett’s (2009) definition is also informative here, highlighting the importance of subjective cultural context (or worldview) and an ability to interact sensitively to appreciate different knowledge frameworks.

Personal agency for climate change

The increasing number of Masters programmes focused on climate change also raises the issue of the ways in which such courses may be transformative in the sense that they deeply challenge unsustainable practices at the scale of the individual learner and through developing a culture of embedded sustainable practices in the learning environment (Burns, 2018). In colloquial terms, this might be understood as students and academics ‘walking the talk’, both in terms of the pedagogic practices which are employed and the extent and longevity of personal transformation in behaviours that may result from studying a Masters degree on climate change.

From an institutional perspective, there is ongoing debate about the role that academics have to play in putting into practice the implications of climate science for carbon emissions reductions. This has most notably been focused on the issue of ‘academic flying’ and debates around the trade-offs required to maintain scientific activity whilst reducing carbon emissions (Higham and Font, 2020, Tseng et al., 2022a; 2022b). Indeed, the rising importance of international student income for funding UK universities heightens the tension between the need to tackle the climate emergencies declared by many universities and the economic need to generate income from overseas fees (Shields, 2019).

However, there has been less focus on the extent to which higher education programmes may lead to the level of self-reflection that Kasworm and Bowles (2012) discuss, which may go on to bring about changes in values and behaviours at the individual learner scale. This research explores the role that PGT programmes may have in shifting learner values and behaviours, or indeed reinforcing existing (un)sustainable practices over time. To address this issue, the concept of the ‘value-action gap’ (Kollmuss and Agyeman, 2002) is used as a way of understanding the ways in which Masters programmes may or may not promote individual change and the recognition students have in registering such changes. This builds in part on the insights offered by the psychological concept of cognitive dissonance, mobilised to understand student engagement and potential dis-comfort in inter-disciplinary education by Feng (2012). This research highlighted the potential for sustainability education to heighten awareness of sustainability concerns and raise dis-comfort about an individual’s personal commitment to taking action (which may be hindered by both structural and psychological factors). Exploring this issue engages with research that has questioned the effectiveness of cognitive learning strategies over affective ones (Shephard, 2008), and the potential difference that forms of experiential learning may play in achieving different affective outcomes (Ely, 2018; Sommer et al., 2022).

Empirically, research that has sought to understand the role of sustainability education in motivating individual changes in values and behaviours has utilised both quantitative surveys (e.g. Aziz et al., 2013; Eagle et al., 2015; Zsóka and Asvanvi, 2023) and qualitative methods such as student self-reflection and prompting emotional reactions (e.g. Savageau, 2013; Tillmanns, 2020). Such research has reflected a general trend in wider psychological scholarship, which has shown that changes in values, attitudes and behaviours are reported, and that experiential interventions can be particularly affective in generating transformative outcomes (Sommier et al., 2022). However, there is a lack of scholarship that has explored the impact of the growing emphasis in UK higher education on anthropogenic climate change and the particularly stark behavioural implications that climate change presents (Knutti, 2019). Climate change is a particularly challenging sustainability issue because of its inter-connected, global-scale and complex nature. Indeed, there are clear but personally challenging changes in values and behaviours that can be taken, such as abstaining from flying, opting for a meat-free diet, and investing in alternative energy technologies. These represent a marked shift away from the incremental behaviourism that has defined behavioural change approaches since the 1990's in the UK (Barr, 2018). Accordingly, to respond to these issues, the remainder of this paper seeks to understand whether and how four UK PGT programmes that focus on climate change from an inter-disciplinary and international perspective promote changes in values and reported behaviours, and the implications of how students are presenting agential responses to their learning, and what lessons can be drawn about how climate change pedagogy needs to evolve.

Methodology and methods

The research on which this paper is based was conducted within two Universities in South West England with similar PGT programmes, such as cohort sizes, research rankings and both being research intensive universities. In Bristol, the university was founded in 1876 as University College, Bristol, the precursor to becoming the UoB in 1909. UoB is ranked =61st best university on the world, 9th in the top ten UK university ranking (QS World University Rankings 2023), 8th in the UK for graduate employability (QS Graduate Employability Rankings 2022) and a top five university for research, with the School of Geography ranked as =1st for cutting edge research in the UK (THE analysis of REF 2022). In Exeter, the university was founded in 1851 as a school of Art and Science, receiving University Charter in 1955. The UoE is 163rd in QS 2023 world rankings, and 23rd in the UK, 32nd for graduate employability, 18th for research in the UK, with the Geography Department ranked as 9th (THE analysis of REF 2022).

The research focused on the MSc in Climate Change Science and Policy (CCSP) and the MSc in Environmental Policy and Management (EPM) at UoB, and the MSc Global Sustainability Solutions (GSS) and MSc Sustainable Development (SD) at UoE. All of the Masters programmes covered the topics of climate change, environmental issues and resources, sustainability challenges, and the role of policy and advocacy. The structure included 6 compulsory and optional taught units, except for GSS where there were 7, and a dissertation or internship/partnership project (

Table 1). The programmes provide training and expertise to those who will go onto work in highly influential roles within businesses, statutory agencies, NGO's and the local state. Accordingly, ensuring that students understand and can engage with transformative pedagogic practice is critical at this moment of climate emergency.

Table 1: Course comparison

| MSc Course | CCSP | EPM | GSS | SD |
|------------------|---|---|---|---|
| Summary | Tools and methods of climate science, role of evidence in policy making | Environmental policy, management, protection and advocacy | World sustainability challenges | Environmental, social and economic sustainability challenges |
| Structure | 6 taught units + dissertation | 6 taught units + dissertation | 7 taught modules + dissertation or internship | 6 taught modules + dissertation |
| Topics | Climate change science, adaptation, mitigation, models, qualitative data analysis | Climate science, remotely sensed data, environmental governance, policy analysis and statistical methods, a consultancy project | Global systems and challenges, climate change science and solutions | Environmental change, natural resources, wellbeing and inequalities |

The method deployed to address the research objectives was an online quantitative and qualitative survey of students using a non-probability, purposive sampling technique. A link to an online Microsoft Forms survey was emailed to four cohorts of students with a set time frame for completion of two weeks. For the 2020-2021 cohorts the survey was collated for attitudes and beliefs at stage 1 (start of course) and stage 2 (end of course) in a combined survey at the end of the course, whilst for 2021-2022 cohorts the survey was conducted separately to gather views at the start of the course and at the end. Some students also completed the combined survey at the end in response to an email request to increase the survey numbers. Ethical approval was given by the UoB School of Geographical Ethics Committee (RE-A-RODWAYDYER-20210713) and the UoE Department of Geography Ethics Committee (ref: 488626) and the survey instrument made clear to participants that their data would be treated in confidence and reported anonymously. The survey focussed on questions relating to the student's values, attitudes, and practices as well as their beliefs regarding climate change and the environment. For example, students were asked about their behaviours with regards to packaging, recycling, re-using, travel choices, and environmental campaign group activity, as well as their level of agreement on environmental attitudes, such as "Nature is not harmed by human changes". Students were asked to rank the importance of some common socio-environmental issues (e.g. anthropogenic climate change). It also posed questions regarding their learning experience and the learning gain students believed they had obtained from their programme. This allowed for a comparison to see if and how self-perceived changes had occurred due to undertaking the taught Masters' course. Statical analysis was undertaken within SPSS-29, including descriptive statistics and tests of inference using Wilcoxon Signed-Rank tests where the data met the assumptions of this test. Qualitative analysis deployed thematic coding to analyse three questions within the survey that examined learning gain, skills development, and the impacts of the programme.

The following analysis provides an overview of the participants' profiles as context for addressing the research questions. The associations between starting and finishing a programme and changes in attitudes, behaviours and key environmental priorities were examined using quantitative analysis. This was then supplemented by illustrative data from the qualitative questions in the survey to highlight the nature of the associations. Finally, the ways in which students understood the value of their programme in terms of learning gain and skills development were investigated.

Results

Background

In total there were 134 responses from the potential 317 students over the two years surveyed on the MSc programmes (a response rate of 42.3%), with CCSP (UoB) making up 25% (n=33), EPM (UoB) 44% (n=59), GSS (UoE) 29% (n=39) and SD (UoE) 2% (n=3) of the sample. Slightly more than half were female respondents (n=76, 57%). The majority of the students were within the 20-24 age group and fresh from undergraduate courses (n=83, 70%), whilst a quarter were 25-30 (n=34), and only 17 (13%) of respondents were over 30 in age. Car ownership increased after the course from a pre-course mean of 0.54 to a post-course mean of 0.67. The programmes attract students from a wide range of undergraduate backgrounds, including those with pure scientific training (n=72, 55%), health and life sciences (n=11, 8%), engineering (n=6, 4%), and those with social science degrees (n=32, 24%), and the arts (n=11, 8%).

Attitudes

As the students were highly motivated to undertake the programmes, it could have been expected that differences between attitudes and behaviour might not have occurred between the start and end of the year of study. However, that was not the case, as seen by

Table II which shows the ranked differences and the significance levels of changes. It is seen that students' main difference was getting through daily life and surviving rather than the environment ($z = 3.998$, $p = <0.001$), whereby the students mostly disagreed with the statement and strongly disagreed after completing the programme. They also more strongly disagreed with the statement saying that the environment was of little concern to them ($z = 3.638$, $p = <0.001$). The students disagreed at the start of the programme with the statement that personal welfare was not affected by problems such as waste disposal, but there was a significant shift towards more neutral attitudes by the end of the course ($z = 2.305$, $p = 0.021$). Their concern for the environment was enforced by the increase in agreement with statements regarding nature and the environment ($z = 3.578$, $p = <0.001$), the belief that the environment is often forgotten in decision making ($z = 2.36$, $p = 0.003$), and that the overuse of natural resources could harm human development ($z = 2.636$, $p = 0.008$). Although the differences were not significant, there was a slight change from neutrality towards agreement when thinking about attitudes towards land development, students more strongly disagreed when asked if nature is not harmed by human changes, whilst the attitude that human welfare should be of primary concern only slightly moved from neutral towards agreement.

Table II: Attitudes and Behaviour Differences

| | Statement | Before commencing programme mean rank | After programme mean rank | Test statistic |
|--|---|---------------------------------------|---------------------------|----------------------------|
| Likert scale where 0=strongly disagree and 4=strongly agree | | | | |
| Attitude statement | Getting through daily life and surviving is what concerns me the most, not the environment | 1.18 | 0.86 | z= 3.998 Sig. = <0.001* |
| | The environment is of little concern to me | 0.22 | 0.09 | z= 3.638 Sig. = <0.001* |
| | Nature and the environment have as much value as human beings | 3.34 | 3.52 | z= 3.578 Sig. = <0.001* |
| | The environment is forgotten too often when decisions are made | 3.32 | 3.55 | z= 2.36 Sig. = 0.003* |
| | If we over-use natural resources, human development may be harmed in the future | 3.59 | 3.78 | z= 2.636 Sig. = 0.008* |
| | My personal welfare is not affected by problems like waste disposal | 1.69 | 1.74 | z= 2.305 Sig. = 0.021** |
| | Humans should not develop any more resources or land, in order to protect the natural environment | 1.90 | 2.38 | z= 1.707 Sig. = 0.088 |
| | Nature is not harmed by human changes | 0.12 | 0.07 | z= 0.577 Sig. = 0.564 |
| | Human welfare should be our primary concern in the future | 2.03 | 2.19 | z= 0.376 Sig. = 0.707 |
| Behaviour statement | Look for packaging that can be easily re-used or recycled | 2.60 | 3.24 | z= 5.431 Sig. = <0.001* |
| | Avoid air travel for holidays | 1.73 | 2.12 | z= 4.334 Sig. = <0.001* |
| | Try to repair things before buying new items | 2.92 | 3.31 | z= 4.274 Sig. = <0.001* |
| | Buy products that can be used again, rather than disposable items | 2.85 | 3.26 | z= 4.204 Sig. = <0.001* |
| | Buy produce with as little packaging as possible | 2.60 | 3.05 | z= 4.198 Sig. = <0.001* |
| | Reuse glass bottles and jars | 2.48 | 2.86 | z= 4.184 Sig. = <0.001* |
| | Reuse old plastic containers, like margarine tubs | 2.16 | 2.48 | z= 3.659 Sig. = <0.001* |
| | Buy fruit and vegetables loose, not packaged | 2.79 | 3.00 | z= 3.579 Sig. = <0.001* |
| | Reuse paper | 2.68 | 3.02 | z= 3.038 Sig. = 0.002* |
| | Wash and reuse dishcloths rather than buying them | 3.04 | 3.05 | z= 2.646 Sig. = 0.008* |

| | | | | |
|--|---|------|------|----------------------------|
| | Recycle | 3.68 | 3.74 | z= 2.126 Sig. = 0.033** |
| | Belong to environmental groups | 0.52 | 0.83 | z= 1.947 Sig. = 0.052 |
| | Belong to community groups | 0.37 | 0.43 | z= 1.508 Sig. = 0.132 |
| | Walk and cycle instead of using a car | 3.01 | 2.98 | z= 1.376 Sig. = 0.169 |
| | Use public transport instead of using a car | 2.79 | 2.76 | z= 1.133 Sig. = 0.257 |
| | Belong to political party groups | 0.26 | 0.31 | z= 0.277 Sig. = 0.782 |

* p<0.01; **p<0.05

Behaviour

The differences in behaviour are also ranked within

Table II, whereby simple behaviours such as looking at packaging which can easily be recycled ($z = 5.431$, $p = <0.001$), trying to repair items ($z = 4.274$, $p = <0.001$), buying re-usable products ($z = 4.204$, $p = <0.001$), avoiding packaging ($z = 4.198$, $p = <0.001$), buying loose vegetables ($z = 3.579$, $p = <0.001$), reusing paper ($z = 3.038$, $p = 0.002$) all had significant increases in agreement. There were also significant differences in behaviours regarding re-using glass ($z = 4.184$, $p = <0.001$) and plastic containers ($z = 3.659$, $p = <0.001$), changing towards greater agreement, whilst recycling ($z = 2.126$, $p = 0.033$) was slightly more strongly agreed with. Avoiding air travel also indicated a significant change in behaviours from the disagreement side of neutral to some agreement on the acceptance of the need for change ($z = 4.334$, $p = <0.001$).

However, changes in behaviour on some more difficult issues were not significant and classed as strongly disagreed with, such as belonging to environmental, community, or political party groups. There was a very slight and insignificant change from agreement with walking and cycling to being more neutral, and only slight agreement on using public transport, which possibly reflected the increase in car ownership. These results potentially reflected the ability of having autonomy over aspects of life such as food and waste, whereas transport can be less empowering, for example, it is much more difficult to influence bus services. Students appeared to not be changing big behaviours but altering the smaller easily controllable aspects of their lives.

Impact

Table III shows ranked impact statements for the MSc programmes according to the students' personal beliefs. Students agreed that their environmental awareness had improved due to undertaking their MSc programme, and, in support of the behaviour questions, indicated that they wanted to take more personal action to help the environment. The students also agreed with the statements that they had become more reflective learners, had greater empathy with nature, had made changes to their environmental behaviours, and had greater empathy with other humans. Confirming their reported behaviours, the statement that they wanted to be involved in more collective action by joining environmental groups was their lowest ranked priority. When asked questions regarding the impact of the MSc programme on other behaviours, the overall ranking was clear on impacts with modal values (in brackets) showing the students to be very clear on the top 3, the middle (4-7), and the least important (8-10) personal actions (Table III).

Again, simple personal actions were ranked as most important, such as reducing meat consumption followed by avoiding car use, and trying to reduce energy and water consumption at home. The middle ranked values all involved more personal effort such as avoiding buying new clothes, installing non-fossil fuel heating, only buying locally sourced products and ceasing flying for holidays. Again, the importance of joining action groups and campaign groups was low. Buying organic food was also a low priority, possibly due to expense.

Table III: Impact of the MSc programme

| Impact statement | Mean rank |
|--|------------------|
| Likert scale where 0=strongly disagree and 4=strongly agree | |
| My environmental awareness has improved | 3.44 |
| I want to take more personal action in future (i.e. individual behaviour change) to help the environment | 3.25 |
| I am a more reflective learner | 3.19 |
| I want to take more collective action in future (e.g. joining an environmental interest group) to help the environment | 3.08 |

| | |
|--|------------|
| I have greater empathy with nature | 2.83 |
| I have made changes to my environmental behaviours | 2.74 |
| I have greater empathy with other humans | 2.74 |
| I want to take more direct action in future (e.g. joining an organisation like Extinction Rebellion) to help the environment | 2.55 |
| Ranked in order 0=most important and 10= least important (Modal value in brackets) | |
| Reducing meat consumption | 2.86 (1) |
| Avoiding car use | 4.41 (2/3) |
| Trying to reduce my energy and water use at home | 4.50 (4) |
| Avoiding buying new clothes and upcycling | 4.51 (6) |
| Installing a non-fossil fuel heating system in my home | 5.00 (6) |
| Only buying locally sourced products where available | 5.72 (7) |
| Cease flying for holidays | 5.87 (8) |
| Joining a direct action group like Extinction Rebellion and protesting | 6.83 (10) |
| Joining a campaign group like the National Trust | 7.40 (10) |
| Only buying organic produce where available | 7.92 (10) |

Priorities

Student views on their priorities for the future are ranked in order of difference made by undertaking the programme within Table IV, along with a Likert scale of agreement on solution statements. Interestingly, the positive change on the importance of species and biodiversity loss was the most significant difference ($z = 2.952$, $p = 0.003$) whilst drought and water scarcity ($z = 2.515$, $p = 0.012$) was also a positive priority. There were significant changes regarding plastics pollution of land, water, and sea ($z = 2.875$, $p = 0.004$), and local air pollution ($z = 2.004$, $p = 0.045$) whereby they became less important. The issues which did not show significant differences due to the programme were mostly ranked with lower importance, including rain forest depletion, food waste and traffic congestion, except for global climate change which was considered highly important at the start of the course and at the end, with little change.

Students agreed with the statement suggesting laws should be passed to regulate polluting activities, followed by investing in smart technologies to improve sustainability, and increasing taxes in a targeted way to invest in sustainable infrastructures. However, placing limits on individuals' carbon emissions through limiting activities is seen as less important, with a neutral rating.

Table IV: Priorities for the future

| Priority statement | Before commencing programme mean rank | After programme mean rank | Test statistic |
|---|---------------------------------------|---------------------------|-------------------------------|
| Ranked in order 0=most important and 8=least important | | | |
| Species and biodiversity loss | 3.45 | 2.87 | $z = 2.952$ Sig. = 0.003* |
| Plastics pollution of land, water and sea | 3.67 | 4.06 | $z = 2.875$ Sig. = 0.004* |
| Drought and water scarcity | 4.64 | 4.43 | $z = 2.515$ Sig. = 0.012** |
| Local air pollution | 5.66 | 6.09 | $z = 2.004$ Sig. = 0.045** |

| | | | |
|---|------|------|--------------------------|
| Global climate change | 1.51 | 1.30 | z= 1.892 Sig. = 0.058 |
| Rain forest depletion | 4.22 | 4.13 | z= 1.311 Sig. = 0.190 |
| Food waste | 5.53 | 5.58 | z= 0.496 Sig. = 0.620 |
| Traffic congestion | 7.31 | 7.53 | z= 1.663 Sig. = 0.96 |
| Likert scale where 0=strongly disagree and 4=strongly agree | | | |
| Pass laws to regulate polluting activities | | | 3.57 |
| Invest in smart technologies to improve sustainability | | | 3.22 |
| Increase taxes in a targeted way to invest in sustainable infrastructure | | | 3.17 |
| Place limits on individuals' carbon emissions through limiting activities | | | 2.10 |

* p<0.01; **p<0.05

Qualitative insights on the impact of PGT programmes on sustainability

The evidence provided above for specific and limited changes in reported behaviours associated with studying the PGT programmes was reflected in the qualitative data. It was in the area of attitudinal change and raised awareness where participants gave extensive examples of how the programmes had an effect. However, there were also examples of scepticism and the impact of eco-anxiety.

In terms of reported behavioural changes, the quantitative data revealed that these were largely associated with slight increases in participation in habitual domestic practices, such as forms of materials consumption and recycling. For some participants, there was evidently a link made to changes in individual actions:

'It made me think a lot more about my personal actions, and how the choices I make as an individual can impact the world. It made me realise how far we as a society need to go, and made me realise how important these issues are' (r 13);

'I am very pleased with the impact this MSc has had on me, which I feel has influenced my whole life - work and home life. I feel much more insightful and informed, and can take positive action going forwards' (r 21).

However, behavioural change was mentioned much less than the wider knowledge acquisition gained from the PGT programmes. Aligned to the quantitative data on both attitudinal change and the priorities of students, there was a sense that participants had a fuller, broader and deeper understanding of environmental issues:

'In terms of my environmental awareness, I am more aware of the complexities involved in addressing the climate crisis - particularly with regards to political barriers to action - whereas beforehand I believe I naively thought that it was as simple as reducing emissions' (r 9);

'The programme has been instrumental in my change in attitude towards the environment issues... This attitude has also been adopted by close family members. In

terms of improvements in awareness, I have subscribed to multiple online publications which report on climate related issues on a daily, weekly or monthly basis. This helps me stay up to date on recent developments in technology or policy implementation' (r 10).

Such awareness was transformational for some students:

'Opened my eyes, I was taught about it all before but the course really made it all hit home with me and made me properly appreciate the urgency with which we need to act' (r 45);

Indeed, the impact was articulated not only in terms of raised awareness but also career choices: 'Researching COP26 has made me more aware that I want a career in climate policy, and I have undertaken voluntary experience and more political action as part of this.' (r 22);

'Undoubtedly positive. I now have a job as a sustainability consultant which I would never have got without this degree (r 27).

Yet it is notable from the quantitative data that the difference in changes in attitudes, behaviours and priorities, even when these were significant, were relatively small. The qualitative data suggested that this may be because such programmes are, to a greater or lesser extent, self-selecting and so the opportunities for impact amongst some learners may be minimal:

'Not much impact because I was aware beforehand and we didn't do much policy and actual community learning it was more science based and past change' (r 5);

'Already cared a lot for the environment - hence why I chose this degree' (r 15);

'Positive, but due to my undergraduate degree I was already quite aware' (r 24).

Finally, two further themes that emerged from the qualitative analysis provided insights into the challenges faced by those convening PGT degrees in environmental sustainability. First, some participants expressed their feelings of frustration and the over-whelming nature of the challenges through the lens of eco-anxiety or 'eco-grief':

'it's had a positive impact but I am more stressed about the environment' (r 23);

'...the sheer quantity of information we've been intensely immersed in has been at times quite overwhelming, and the negative information can be quite depressing, leading to a kind of eco-grief' (r 49).

Such a phenomenon is a well-known issue with younger learners (Hickman, 2020), but it is notable that some learners expressed this sense of hopelessness about the gravity of the task at this advanced level of learning. A second, related point is that the focus of the programmes on breadth, depth and opening up critical learning opportunities may have also led to uncertainties about practically tackling environmental issues. For example:

'Highly positive awareness yet still sceptical about the actual implementation' (r 1);

'It has made me more sceptical of the carbon zero targets businesses have set. I think we clearly need to go beyond these targets and change the human-nature relationship that has been dominated by humans (wealthy humans) abusing nature over the past 200 years' (r 2).

The analysis demonstrated that the impact of the programmes, as observed in the quantitative data, was mainly to raise awareness and increase the priorities focused on tackling environmental issues urgently. The data also demonstrated that behavioural change was limited and confined to specific domestic behaviours. It is important to note that the data for such programmes represented a self-selecting sample of mostly pre-concerned learners. Moreover, there was some evidence that the programmes could foster forms of eco-anxiety and scepticism about future pathways.

Learning and Skills Development

The PGT programmes were all taught within the context of geography and yet what was notable from the qualitative data on learning and skills development was the emphasis students placed on inter-disciplinary learning and making connections. This was supplemented by two other major narratives emerging from the data: (1) a focus on challenging and making sense of knowledge claims through a clear sense of how critical learning skills had been developed by the programme; and (2) an articulation of how self-growth, self-reflection and empathy had been enhanced.

The theme of inter-disciplinarity and connection was reflected in several ways through the data. For example, on the GSS MSc, learners focused on holism as a core element:

'Provided me with a holistic viewpoint' (r 36);

'I now look at world events and environmental behaviours as part of wider systems and tend to research more holistically' (r 44).

On the CCSP and EPM MSc programmes, connections were drawn between different parts of academic research on sustainability, often highlighting the under-stated role of the social sciences in contributing to understandings of climate change:

'The MSc programme really tied the science behind climate change to human actions and intervention. This has helped me to consider how the impacts in one discipline/field affect another discipline/field' (r 8);

'I am far more interested in social science now and understand how vital it is to tackling all the problems we are facing' (r 19).

It was therefore clear that the programmes had broadened knowledge horizons and challenged some students to consider the role of other scientific disciplines or the broader implications of a systems approach.

A second narrative that emerged in the qualitative data related to challenging knowledge claims and critical thinking. As the following participant noted, the programmes appeared to provide capacity to step back and take stock of the wealth of knowledge in the field:

'I don't take everything as it is presented, especially by the media - I take time to research claims and statements that have been made to see if they are reliable and true' (r 7).

The effect of this 'taking time' was articulated as a more cautious and cognisant approach:

'My critical thinking/analysis has considerably improved, in that I no longer take research papers, government reports etc. at face value and actively consider the extent to which I agree/disagree with the narrative' (r 9);

'I am more wary of making broad statements about climate change given the uncertainties around it, and more critical of the solutions proposed to mitigate climate change. I am also more cognisant of the need to adopt a broader systems-based approach to understanding the relationships between human systems and the environment' (r 29).

Respondent 29 related their critical understanding to the broader academic framework of using a systems approach, and this appeared to raise awareness of the importance of considering others when judging claims, for example:

'...I've had to consider lots of different interest groups in my studies' (r 37).

This recognition of the diverse nature of sustainability, climate change and associated impacts related to a third narrative in the qualitative data, which focused on empathy, self-growth and self-reflection. In terms of empathy, this related both to the human and non-human:

'I have gained a greater understanding of inequality in relation to environmental issues which has really changed my attitude' (r 47);

'I make sure I always take the environment into consideration whenever I am making a decision' (r 48).

For other learners, the impact of the PGT programme was apparently transformative, with a focus on renewed self-belief and a deeper understanding of their role in tackling sustainability challenges:

'The programme has definitely challenged me intellectually and I now feel better equipped to educate myself, and therefore others, on sustainability matters' (r 21);

'I have felt encouraged to speak more openly about my opinions in discussion and have found myself relating environmental issues back to the context of policy and potential solutions so in this sense perhaps I'm now more holistic' (r 34);

'Feel more connected to what I want to learn and pursue' (r 35).

Accordingly, there was evidence in the qualitative data that both awareness and understanding had been impacted upon by the PGT programmes through a recognition of the importance of a systems and interdisciplinary perspective, and that some of this was likely to have been transformative, through challenging the assumptions of learners and developing a greater sense of self-belief.

Discussion

From the results it is apparent that the undertaking of a PGT programme focusing on environmental issues and climate change within geography at the two universities did have impacts on attitudes and behaviours of students. The greatest impacts were seen in regard to simple individual attitude and behaviour changes such as waste and packaging, whilst 'big' behaviours appeared to be less challenged.

This supports previous research that suggests academic programmes in higher education do have effects on values and attitudes, and that reported behaviours do show change from the start to end of a course (e.g. Aziz *et al.*, 2013; Eagle *et al.*, 2015; Zsóka and Asvanvi, 2023). To this extent, there is evidence from our research that some closure of the value-action gap (Kollmuss and Agyeman, 2002) occurs in relation to specific pro-environmental behaviours. This was particularly the case in relation to what might be considered conventional practices, such as waste reduction and personal energy use. Such practices are important but they do reflect the relatively narrowly defined trajectory of pro-environmental behaviours that reflects a Neo-liberal framing of citizenship, viewing individuals as passive 'citizen-consumers' rather than politically active participants in more radical, collective change (Barr *et al.*, 2021). In contrast, there was some evidence of how cognitive dissonance – the feelings of discomfort experienced when confronted with practices that conflict with values – was expressed in relation to the enormity of climate change, the changes needed and the anxieties this may produce (Feng, 2012; Hickman, 2020).

Nonetheless, there was evidence from this research that the pedagogic structure of the MSc programmes did provide openings for more reflexive, critical and engaged learning about sustainability. This took several forms, which connect with the characteristics of inter-disciplinarity, inter-cultural learning and the broader construct of Transformative Learning. First, the qualitative data highlighted the holistic, inter-disciplinary perspective students had learned to embrace from their programme. This fulfils in part the vision for developing collective understandings of sustainability articulated by Dale and Newman (2005) and Luppi (2011). Students articulated that they felt able to view issues of climate change and sustainability from a range of perspectives, albeit that their programme had enabled them to start on a journey, which is inevitably brief (Gantogtokh and Quinlan, 2017). Even so, students articulated that they had come to appreciate the role of hitherto under-rated approaches to understanding climate change, such as the role of social sciences. Second, the data also demonstrated how the programmes enabled students to consider the inter-sectional issues associated with climate change, in particular highlighting inequality and empathy with social groups different to their own background. This level of self-awareness and ability to contextualise climate change relates well to elements of both Bennett's (2009) and Morais and Ogden's (2011) work on global citizenship and globally competent students. Indeed, the data supports the way in which this awareness is mobilized in a third form, which is an appreciation of the role of critical thinking in relation to climate change. Forming a key element of Kasworm and Bowles' (2012) operationalization of Transformative Learning, critical reflection was something that the student participants raised frequently, in the ways that they had begun to question knowledge sources, media representations of climate change and deal with their own feelings about climate change.

Despite these positive impacts reported by students from studying their programme, there was limited evidence of widespread characteristics of Transformative Learning. Whilst students reported being more critically engaged and self-reflective, expressions of an eagerness to engage in major changes in lifestyles, radical climate action or collective forms of resistance were largely absent. What emerges from the data is along the trajectory of individual behaviourism, with few hints of what may be possible through

collective action (Barr, 2018). Accordingly, whilst the programmes studied in this research may promote critical thinking, an openness to different approaches and a recognition of inequalities globally, they appear not to challenge dominant individualist, Neo-liberal and conventional behavioural approaches to climate change. In relation to Dirkx's (1998) writing on Transformative Learning, it can be stated that there was some evidence for critical reflection and personal development, but little that leads to emancipatory learning or a full incorporation of extra-rational knowledges.

The research was limited by a number of factors. First, the programmes were taken from a largely geographical disciplinary context with similar pedagogic approaches, other environmental sustainability programmes may yield different results. Second, the developed world context in which issues of sustainable development and climate change are examined, and as such these results apply to that setting. Third, further qualitative research (such as in-depth interviews) with participants may yield detail on the trends observed in the data. However, the results do point towards a dis-juncture in learning about sustainability that indicates boundaries exist for students on what they are willing and feel enabled to change in their own lives. This raises speculation on the role and power of post-graduate programmes like these to effect substantial change without the process of learning about transformational lifestyle shifts beginning much earlier in school curricula and student development.

Conclusion

This research sought to examine the changes in student attitudes, behaviours and practices associated with studying a one-year PGT environmental sustainability programme, and the learning gain and skills development students articulated from their studies. Using four programmes located within geography departments at two UK research intensive universities, the findings illustrated the apparent role in such programmes in enhancing student knowledge and understanding, and developing critical thinking, self-reflection, and a holistic perspective on sustainable development. The survey participants showed a greater likelihood of reporting more positive environmental attitudes and associated priorities. However, it was notable that behavioural change and shifts in pro-environmental practices were limited to particular kinds of well-established and socially normalised behaviours, such as waste reduction, repair and recycling. Other behaviours and broader practices (such as community-focused actions) did not show evidence of change. Indeed, whilst there was clear evidence of learning gain and skills development for students, there was also some evidence of eco-anxiety and scepticism associated with the likelihood of effective change being possible to overcome sustainability challenges.

This suggests that whilst such programmes can certainly increase knowledge and understanding, they may not be challenging learners' learned ways of 'being and doing' that are part of conventional socio-economic practices. Perhaps a radical pedagogy of 'learning by being' needs to be considered, which embeds experiential learning as a way of increasing empathy and centring the learner in debates on sustainability. In short, it can be argued that the evidence suggests that students are taught to be good abstract learners, who can connect and dis-connect easily from climate change, rather than deeply engaging with it. Indeed, this can be further argued that this has implications for sustainability practice, because without transformative learning, students will not necessarily have the skills to be able to challenge dominant socio-economic paradigms that lead to ecologically harmful and climate changing practices.

It is imperative that further research should focus on two key areas. First, there needs to be a wider disciplinary understanding of how sustainability is taught and embedded into curricula at both the postgraduate and undergraduate levels, and indeed how these levels relate to school-based education on sustainability. This requires a deeper understanding of associated pedagogies and the ways in which some disciplinary settings and / or pedagogic approaches have different outcomes for student learning. Second, research is needed to understand the ways in which sustainability curricula within higher education are formulated and the role that existing norms and practices have in potentially perpetuating practices that are either un-sustainable or lacking in transformative impact.

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