Embedding Climate Change Education into Higher Education Programmes

**Title:** **Embedding Climate Change Education into Higher Education Programmes**

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**Climate education is seen as a key driver for behavioural change, yet usually not continued universally to higher education level. With the rising demand from both students and employers, we propose methods that incorporate climate education from multiple disciplines into current curriculums.**

At the Paris climate agreement, adopted in 2015, there was an international commitment to limit the increase in average global temperature to 1.5°C above pre-industrial levels. To achieve this, greenhouse gas emissions need to be reduced by 43% by 2030 and reach net-zero by 2050[1]. Clearly, this will require a global effort by all sectors of society, including those sectors which are not immediately considered as direct contributors. There is international consensus that a key driver of behavioural change is education and training. The UN Framework Convention on Climate Change and the Paris Agreement call on governments to educate, empower and engage all stakeholders and major groups on policies and actions relating to climate change[2]. As part of a broad curriculum, many countries now include climate change education at high-school level. Indeed, the UN is calling for climate education to become compulsory in schools from 2025 to better equip children to cope with global warming in the future[3]. However, climate education is often not continued to higher education (HE) level. Specialized HE courses often omit the topic of climate change, which leads students graduating with a lack of understanding and awareness of the issues. These students may then go into employment where decisions are made without consideration of climate impact and environmental sustainability. Yet it is at the level of higher education that students feel most empowered to make a difference and embrace positive changes. Thus, there is a strong argument that all university degree programmes should include climate change education in the syllabus if net-zero targets are to be met by 2050 in a collective manner.

**Student demand for sustainability and climate education**

A recent global survey of 10,000 young people aged between 16 and 25 years found that more than 45% of respondents felt that their negativity about climate change affected their daily life and functioning, and many reported a high number of negative thoughts about climate change[4]. There is little surprise then that in a different survey of 1,000 prospective HE students, 78% of participants considered sustainability in learning, teaching and research to be an influencing factor in their choice of institution[5]. In addition, a 2021 survey of 3,900 people at the University of Bath, UK found that 72% of students and 66% of staff believed that climate literacy and education should be embedded in the main curriculum[6]. Thus, there is growing evidence that climate change education is in demand by university and college students.

**Employer demand for climate change and green skills**

Arguably the strongest case for climate change education to be included in university degree programmes is the growing demand for green skills by employers. An analysis of data from LinkedIn

showed that by 2021, 10% of job postings required at least one green skill, a rise of 8% per year since 2016[7]. The same data showed that the global share of green talent was growing fastest (11% per year) among workers with a Bachelors' degree compared to those with other levels of education. Further research conducted by Deloitte indicated that the three industries with the fastest growth of professionals with green skills were Luxury Goods and Jewellery, Investment Management and Apparel and Fashion[8]. These are industries not traditionally directly associated with climate or environmental issues. Further in-depth analysis from the same study indicated that within the variety of green skills, climate change and decarbonisation have the highest level of priority for 68% of organisations. The high demand for green skills by employers is likely due to the acknowledgement by organisations and businesses that green solutions lead to financial benefits. For example, a by-product of businesses that strive to reduce their carbon footprint is greater efficiency in the utilisation of resources. This could lead to lower energy usage and waste reduction, reducing operating costs and boosting profits. The proportion of graduate level jobs requiring green skills will continue to increase as we try to unlock change in the next few decades.

**Methods to embed climate change teaching**

There are various approaches that HE institutions can take to embed climate change education into teaching and learning. These can vary from minor additions to individual sessions of courses or modules (piggybacking), to integrating content from multiple disciplines to offer a course on climate change to all students in the university or a faculty (connecting)[9]. We provide a list of opportunities and examples for embedding climate change into student-facing university courses and activities (Table 1).

The type and level of embedment can be tailored for a wide variety of course structures and formats that may exist in different countries and continents. The most effective methods are those that engage and motivate students. One method of achieving this is to contextualise climate change education to the degree subject chosen by the student. This would enable them to better understand the issue from the perspective of their own field of study and work. Such an approach would also ensure that the issue of climate change is tackled using a broad variety of skills and knowledge leading to effective decision making and a positive climate contribution. For example, a law student would find little value in understanding the science of climate change, though would better engage and benefit immensely from understanding climate law and how policies and legislation can be implemented to curb greenhouse gas emissions. Similarly, an Art and Design student would engage more passionately with ideas to visually communicate climate issues and instigate societal change. The complex challenge of climate change requires contributions from all academic disciplines, thereby developing broad awareness and mass participation among students and academics. It also fosters collaboration between disciplines, broadening student knowledge and improving the effectiveness of solutions.

This then raises the question of whether it is even possible to embed contextualised climate change education into all subject areas? We show that all 61 subjects listed by the UK's Quality Assurance Agency for Higher Education (QAA) are mapped against one of seven climate change subtopics[10](Table 2). Each of the subject areas may contribute to more than one climate subtopic. However, here we only map subject areas to the single most relevant subtopic to demonstrate that regardless of the subject being studied there is an opportunity to embed contextualised CCE into HE curricula. The level of embedding would depend on the subject area. For example, an environmental science student may discuss climate change in every module throughout their course, while for a creative arts student, climate change may only be discussed as part of a single module. A variety of

options exist as to how and where CCE is embedded within a degree programme. This could be at programme/course level or at module level (Table 1). Aside from classroom teaching, CCE could be delivered as part of field visits and residential trips. Laboratory and practical exercises could be designed to highlight climate issues. Assessments could be designed in the context of climate change. Seminar sessions can include role play scenarios related to climate change. Simulations and games could be effective platforms for demonstrating and raising awareness of climate issues. Further traction can be achieved if professional, statutory and regulatory bodies (PSRBs) and other course accreditation bodies mandate CCE as part of their requirements.

In summary, the complexity of the climate change challenge requires a multidisciplinary approach if international targets for net-zero emissions are to be achieved by 2050. Higher education institutions such as universities and colleges provide the perfect platform for climate change education to be delivered, and green skills to be developed across all subject disciplines. There is growing evidence that students are attracted to institutions and courses that include sustainability and climate education. Employer demand for green skills, climate change and decarbonisation are on the rise. Universities and colleges have a duty to ensure their courses are aligned with industry needs and can benefit from greater recruitment and better graduate outcomes. Thus, there is a strong case for CCE to be mandated in all Higher Education degree programmes.

**Ethics declarations**

Competing interests

The authors declare no competing interests.

**References**


1. The Paris Agreement (UNFCCC, accessed 14th March 2023) https://unfccc.int/process-and-meetings/the-paris-agreement

2. Climate Change Education (UNESCO, accessed 14th March 2023) https://www.unesco.org/en/education-sustainable-development/climate-change

3. Should schools teach climate change studies? These countries think so (World Economic Forum, accessed 14th March 2023) https://www.weforum.org/agenda/2022/08/climate-change-schools-education/

4. Hickman, C. et al. *The Lancet Planetary Health*, **5**(12), e863-e873 (2022)

5. Green Campus Report (Shakespeare Martineu, accessed 14th March 2023) https://www.shma.co.uk/market-expertise/education/green-campus/

6. Climate Action Survey 2022, University of Bath, accessed 14th March 2023) https://blogs.bath.ac.uk/climate-action/

7. Global Green Skills Report 2022 (LinkedIn Economic Graph, accessed 14th March 2023) https://economicgraph.linkedin.com/

8. A blueprint for green workforce transformation (Deloitte, accessed 14th March 2023) https://www2.deloitte.com/uk/en/pages/consulting/articles/green-skills-for-green-economy.html

9. Molthan-Hill, P. et al., *Journal of Cleaner Production*, **226**, 1092-1101 (2019)

10. Subject Benchmark Statements (UK QAA, accessed 14th March 2023) https://www.qaa.ac.uk/the-quality-code/subject-benchmark-statements

| Area of Embedment | Type of Specialisation | Description and General Characteristics | Example |
|---|---|---|---|
| Course/Programme Level | Climate Change Specialisation | Programme title and majority of the course content directly related to climate change | Example course titles include:<br>• BSc (Hons) Climate Change<br>• BS Environmental Science and Climate Change<br>• MSc Climate Change Politics and Policy |
| | Environmental Specialisation | Programme title related to climate though 'climate change' not explicitly in the title. Significant component of the course content directly related to climate change or the environment | Example course titles include:<br>• BSc (Hons) Geography<br>• BS Atmospheric Science Major<br>• MSc Environment and Sustainability |
| Module Level | Core Module Specialisation | At least one core course module on climate change included in the programme | • A compulsory module on climate change as part of a BSc Earth Science course<br>• A compulsory module on Climate and Environmental Policy as part of a Political Science Major |
| | Optional Module Specialisation | At least one optional module on climate change available for selection in the programme | • In North America, a climate change course available for selection as part of the 'minor' element of study<br>• An optional module on Climate Finance as part of an MSc Accounting and Finance course. |
| | Sub-Topic Specialisation | Climate change covered as a sub-topic within a module | • Climate Change delivered within a module on Biodiversity<br>• Geography field trip focused on climate impacts<br>• Laboratory exercise to investigate the drivers of climate change |

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|---|---|---|---|
| University/College-wide Initiatives | Extra-Curricular Activities | Internal groups, events and activities focussed on Climate Change | • Guest speaker on Climate Change as part of a university/faculty/department seminar series<br>• Hosted conference, open to students, with a focus on climate change and/or environmental sustainability<br>• Careers events and professional development opportunities focussed on green skills<br>• Student societies focussed on climate change and/or environmental issues |
| | Raising Awareness | Climate change communication to current & prospective students, and external communities that form a pipeline for future students | • Sustainability strategy explained as part of the university or course induction<br>• University sustainability presentation at Open Days for prospective students<br>• Environmental sustainability debated as part of an outreach/local community activity |

Table 1 – Methods and examples for embedding climate change education in higher education institutions. ('BSc' and 'BS' – Bachelor of Science; 'MSc' – Master of Science; 'Hons' – A 'with honours' degree).

| Climate topic | UK QAA Subject Area |
|---|---|
| **Climate Impacts on Society, Communities and Culture** | Anthropology |
| | Area Studies |
| | Communication, Media, Film and Cultural Studies |
| | Criminology |
| | Early childhood studies |
| | Housing studies |
| | Languages, Cultures and Societies |
| | Philosophy |
| | Politics and International Relations |
| | Sociology |
| | Social Policy |
| | Social Work |
| | Welsh |
| | Youth and Community Work |
| **Climate Impacts on Human and Animal Health** | Biomedical science |
| | Counselling and Psychotherapy |
| | Dentistry |
| | Dietetics |
| | Early childhood studies |
| | Health Studies |
| | Medicine |
| | Optometry |
| | Osteopathy |
| | Paramedics |
| | Psychology |
| | Veterinary Nursing |
| **Climate Impacts on Human Behaviour** | Anthropology |
| | Archaeology |
| | Area Studies |
| | Classics and Ancient History |
| | Criminology |
| | Events, Hospitality, Leisure, Sport and Tourism |
| | Forensic science |
| | Geography |
| | History |
| | Law |
| | Policing |
| | Theology and religious studies |
| | Town and Country Planning |

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|---|---|
| **Climate Change Science, Modelling and Data Science** | Chemistry |
| | Earth sciences, environmental sciences and environmental studies |
| | Geography |

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|---|---|
| | Librarianship, Information, Knowledge, Records and Archives Management |
| | Mathematics, Statistics and Operational Research |
| | Physics, Astronomy and Astrophysics |
| **Technological Solutions to Climate Change Mitigation and Adaptation** | Agriculture, Horticulture, Forestry, Food and Consumer Sciences |
| | Architectural technology |
| | Architecture |
| | Biosciences |
| | Chemistry |
| | Computing |
| | Engineering |
| | History of Art, Architecture and Design |
| | Landscape Architecture |
| | Land, Construction, Real Estate and Surveying |
| | Materials |
| **Climate Communication, Education and Behavioural Change** | Art and Design |
| | Communication, Media, Film and Cultural Studies |
| | Creative Writing |
| | Dance, Drama and Performance |
| | Education Studies |
| | English |
| | Languages, Cultures and Societies |
| | Linguistics |
| | Music |
| | Psychology |
| **Climate Finance, Investment and Insurance** | Accounting |
| | Business and Management |
| | Economics |
| | Finance |
| | Mathematics, Statistics and Operational Research |

Table 2 – UK QAA subject areas mapped to climate change topics.