MAINSTREAMING CLIMATE CHANGE EDUCATION IN UK HIGHER EDUCATION INSTITUTIONS

KEY MESSAGES

- **Mainstreaming Climate Change Education** (CCE) across all learning and operational activities enables Higher Education Institutions (HEIs) to better serve their core purpose of preparing learners for their roles in work and wider society, now and in the future.

- **Student and employer demand for climate change education is growing**, not just in specialist subjects but across all degree pathways.

- **The attitudes, mindsets, values and behaviours that graduates** need to engage with climate change include the ability to deal with complexity, work collaboratively across sectors and disciplines and address challenging ethical questions.

- **The complexity of the climate crisis means all disciplines have a role to play** in delivering education for the net-zero transition. Embedding interdisciplinarity is crucial to ensuring that our response to climate change makes use of all of the expertise HEIs have to offer and promotes knowledge exchange and integration for students and staff.

- **Student-centered CCE**, including peer-to-peer learning, is a powerful tool for facilitating an inclusive and empowering learning experience, and developing graduates as change agents for the climate and ecological crisis.

- **HEIs should develop learning outcomes for CCE** that include understanding the scale, urgency, causes, consequences and solutions of climate change; how social norms and practices are driving the climate crisis; and the ability to identify routes to direct involvement in solutions via every discipline.

- **Pedagogical approaches to teaching CCE** should enable learners to engage with, and respond to, climate change as a "real-world" problem, such as through experiential learning.

- **Further recommendations for the HEI sector** include developing a strategy for aligning CCE teaching provision with governance structures; partnering with industry, government and third sector organisations to enable context-specific CCE; and working with trade unions and accreditation bodies to enable curriculum reform.

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INTRODUCTION

Achieving the UK's goal of reaching net-zero greenhouse gas emissions by 2050 will require unprecedented changes across all sectors of the economy and society. Facing up to the scale of the challenge will necessitate the development of new skills and an educational focus that adequately prepares current and future generations to make decisions under uncertainty, incorporating sufficient flexibility to respond to emerging data on the climate and ecological crises as they continue to intensify. This will include taking steps in their personal lives, professional lives and civic lives to reduce greenhouse gas emissions as well as to adapt to the impacts of a changing climate. This paper herein refers primarily to the climate crisis as a shorthand for both the climate and ecological crisis.

UK Higher Education Institutions (HEIs) have an essential role to play in fostering such preparation, by engaging staff and students with the climate crisis, the development of and implementation of solutions to address it, and the ability to share that information with others. If students – and staff – are not learning how their subjects are being changed by the climate crisis, they are not learning the knowledge to equip them for the world in which they already live. Such knowledge will require input from all disciplines, the ability to act with others to address the challenges that are emerging, and the personal skills and capabilities to confront those challenges. We recognise that mainstreaming climate change teaching and learning is essential at all stages of education, but here focus on UK universities specifically, given the expertise and experience of our author group.

The speed of the economy-wide transition required to deliver on the UK net-zero emissions legislation means HEIs face a particularly urgent challenge. Learning provision, teaching capacity and graduate attributes must all be aligned with a fast-changing employment market and ever more dynamic student demand. There can be substantial time lags between external signals for change and the ability of HEIs to respond to them, such as through new course provision and staff capacity. This has led to the development of a number of student-driven climate education initiatives within HEIs.[1] In the transition to net-zero emissions in the UK, such time lags create the risk that UK HEIs become out of sync with the needs of both students and their future employers in a time of rapid change.

There is significant evidence of student and employer demand for CCE in the curriculum across disciplines[2,3], and the non-provision of CCE can now be treated as a growing reputational, financial and human resource risk to institutions. Building on existing expertise, and working in a flexible, collaborative way, can strengthen the role of UK HEIs as agents of change. In order to be proactive and reactive to climate change, learning and working which draws on experience from across all disciplines, will enable HEIs to best facilitate such change.

Exploring 'mainstreaming'

While many UK Universities are already taking positive steps to embed climate change education in their curricula (some of which we highlight in this set of case studies), this working paper takes as its starting point the need to holistically mainstream Climate Change Education (CCE). We broadly conceive of 'mainstreaming' as weaving CCE through **all** aspects of an institution, going beyond only offering individual degree programmes or specialist courses on climate change, to embedding climate change into structures and curricula across the board, ensuring all students and staff members engage with the issue. This can supplement efforts to increase consideration of how all academic and professional staff respond to climate change and support students to thrive in a changing world. It can also coincide with dissemination around institutional climate commitments, such as reaching net-zero emissions.

The working paper recognises that embedding CCE at all levels in practice – and identifying the skills, disciplinary and transdisciplinary approaches needed to achieve it – is an ongoing process. That dynamic process should respond to the changing circumstances of our society as it grapples with the climate crisis, and ensure universities can learn from each other on the journey.

To aid this conversation, this working paper and accompanying case studies, explore key issues for UK HEIs to consider when planning how they might integrate CCE across the institution.

WHAT IS CLIMATE CHANGE EDUCATION?

Climate Change Education (CCE) has multiple definitions though it is ultimately concerned with ensuring that learners across all disciplines are aware of, and able to respond to, the risk, uncertainty and rapid environmental and social changes that a changing climate brings. CCE further involves the nurturing of leaders and changemakers able to innovate and lead on this response.[4]

This includes consideration of how climate change is already affecting, and will increasingly impact upon, the industries we work in, the communities we live in, and others around the world. In responding to these impacts, CCE requires a collective effort across all academic disciplines to ensure that actions to address the complex and dynamic challenges we face are informed by the rich, diverse expertise on offer across the Higher Education sector in its entirety.

CCE sits within a broader context of Education for Sustainable Development (ESD) which seeks to equip learners with the transferable skills they need to respond to a wide variety of complex, dynamic challenges including but not limited to the climate crisis.[5,6] Acknowledging the importance of ESD and the ways in which climate change intersects with other global challenges as represented in the 17 Sustainable Development Goals, we remain mindful of the need for brevity in this working paper, and focus more directly on climate change. We therefore conceptualise CCE as "processes aimed at improving the degree to which an education system is prepared for, and is responsive to, the challenges of climate change"[7]. Here, 'system' refers to the whole education sector, including its constituent organisations, rather than purely the curriculum taught.

Whether CCE is a necessary next step to build upon the strong foundations of ESD already established in an institution, or whether it is a valuable entry-point to start engaging with wider sustainability principles, it is necessary to first identify some specific learning outcomes.

LEARNING OUTCOMES FOR CLIMATE CHANGE EDUCATION

Knowledge

HEIs have a crucial role to play in increasing knowledge about climate change. This should include developing learners' understanding about the causes of climate change, its consequences globally and locally across a range of timescales, the different stakeholders involved, its interlinkages with other sustainability challenges, the variety of solutions available and the implications of choosing between these solutions for social and environmental justice. Whilst it may not be necessary that all students graduate with a deep scientific understanding of the climate system, a basic understanding of why the climate is changing, including the link with ecosystem decline, the severity of the risk it poses and recognition of the need for an urgent worldwide, coordinated response, should be mainstreamed across all disciplines.

In addition to raising awareness of the scientific processes, CCE should seek to develop understanding of how **social norms and practices** are driving climatic changes. Just as the causes of climate change are interconnected, so too are its consequences. CCE must develop learners' understanding of the impacts that climate change **is already having** on the environment, politics, economies and societies and how these will intensify as the global average temperature continues to rise. It should also aim to raise awareness of different stakeholders and their diverse interests, and their varying levels of power and influence.

Developing awareness of **climate solutions** must involve supporting learners in understanding the levers of change needed to achieve societal, economic and cultural change and identifying routes to direct involvement in solutions.[8] This includes providing insights into practices of sustainable production and consumption as well as identifying environmental risks and strategies to manage them. It is particularly important for these learning outcomes to be carefully aligned with the pedagogical approaches which have been proven to develop these types of skills, and which will be explored below.

Understanding climate change may also require asking fundamental questions about the assumptions underpinning disciplinary practice. There are points of alignment with decolonisation agendas here, in respect of attending to and learning from the expertise of indigenous communities, non-western knowledge systems and agency and insights of groups of Earth and Water Defenders internationally. Understanding and learning from the forms of knowledge held by these communities that can offer powerful insights into new ways of thinking about humanity's relationship with the planet.

Attitudes, values and behaviours

In addition to cognitive (i.e. substantive knowledge and process) learning, it is necessary to develop affective and behavioural skills that enable engagement with climate change and its impacts. It is also necessary to consider whether the student personas that we are striving to develop are in line with the "graduate attributes" which many HEIs strive for.

As part of, or in addition to, equipping graduates with the skills to perform "green jobs" which may align with HEIs employability strategies, CCE must address ethical issues such as global equity and resource distribution and should not be shy about teaching "emotional" responses such as compassion. It should also include critical reflection on the consequences that decisions and lifestyles, particularly in the Global North, have on the most vulnerable populations around the world, i.e., those who are least responsible for climate change and least able to adapt to its impacts.

As such, CCE should incorporate *"approaches that cultivate integrated knowledge and global citizenship, while preparing students for curious, well-informed, big-hearted lives".*[9] This should showcase examples of, and provide opportunities for, behavioural change as UK HEIs can facilitate the process of ensuring knowledge, values, and affective responses translate to action.

Competencies

Crucially, CCE should strive to develop skills and competencies that enable the learner to take action and work with others to solve problems, not just to understand them. This is similar to ESD, which seeks to build key competencies such as systems thinking, anticipatory thinking, normative competency, strategic thinking, collaborative competency, critical thinking, self-awareness and integrated problem-solving competency.[10] However, in addition, CCE requires a stronger set of technical competencies if we are to keep the average global temperature from rising more than 1.5°C above pre-industrial levels.[a,5]

CCE should be practical and empowering, both to ensure that we are developing the skills needed to deliver on climate targets, but also to equip students with direct routes to engagement in climate action. This is a key element in removing barriers to successful climate action, achieved by fostering constructive hope and reducing the eco-anxiety which is increasingly prevalent, particularly in younger generations.[11,8]

As wider society is increasingly presented with climate information from different (and not always reliable) sources, and asked to support (either tacitly or directly) different climate policies, CCE can help to prepare learners to critically engage with new information as it emerges and to recognise and advocate against denialism and fatalism.

PEDAGOGICAL APPROACHES TO TEACHING CLIMATE CHANGE EDUCATION

Pedagogical research and practitioner expertise offers some guidance on which approaches have proven successful in developing competencies in line with the learning outcomes identified above. Placing students at the center of the learning process, through a constructivist approach, has been found to be particularly effective. This can build deeper learning through critical and reflexive thinking that integrates the complex and multi-faceted nature of climate change.[12] This enables learners to engage with, and respond to, climate change as a serious "real-world" problem within and beyond the classroom, integrating simultaneous development of knowledge, values and competencies.

Examples of CCE often centre around experiential learning which enables teaching staff and learners to contribute their diverse expertise to problem solving. This creative, deliberative approach is well-placed to address the complex, multi-dimensional, and unprecedented nature of climate change. This complexity enables insights and synergies to be found across disciplines. Pedagogies such as problem-based, practice-based, enquiry-based, and project-based learning which encompasses the real-life challenges of climate change and puts students at the centre of identifying and evaluating solutions, can help to facilitate interdisciplinary learning.[13,14,15,16]

Solving problems in this way develops employability skills (e.g. critical thinking, citizenship, communication) and provides opportunities for learners to apply technical knowledge to achieve practical solutions.[17] This is particularly beneficial when "real-world" problems are introduced by external stakeholders.[17,18] This requires partnerships within and beyond the university with a variety of stakeholders, which can develop learners' recognition of, and ability to integrate, local knowledge. Practice-based CCE can involve Livins Labs, role-plays, field courses, community projects[19], simulations and games, all of which have proven successful for developing systems thinking and decision making under uncertainty.[20] Furthermore, student-centered CCE creates a more inclusive and empowering learning experience, developing skills such as leadership and teamwork, and providing valuable opportunities for peer-to-peer learning.[21,22,8,20]

Teaching and learning in this way can also facilitate interdisciplinarity, as students are encouraged to draw upon their diverse academic backgrounds and lived experiences, as well as to consult a diverse range of experts and local stakeholders to contribute to problem-solving.[1,5] However, this can present pedagogical and governance challenges, particularly in identifying relevant expertise and incorporating staff input across the traditional disciplinary silos present in most UK HEIs. A transformative approach to embedding interdisciplinarity is therefore crucial to ensuring that our response to climate change makes use of all of the expertise HEIs have to offer.

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a Climate scientists emphasise this is a key tipping point after which climate impacts become more dangerous, unpredictable and difficult to adapt to, with increasingly frequent and severe extreme weather events affecting all sectors and communities

ENABLING ENVIRONMENTS FOR MAINSTREAMING CLIMATE CHANGE EDUCATION

In addition to considering what we need to deliver through CCE, it is important to think about how implementation of CCE in HEIs is shaped by institutional structures, external contexts and, most importantly, HEI staff and students themselves.

As such, an understanding of the key barriers and enablers, both internally and externally, is needed. The extent of this understanding, and actions based upon it, will determine a HEIs ability to mainstream CCE in a way that is timely and overtly addresses the student lifecycle, from pre-entry and school-based learning, through to graduate attributes and employability.

Below, we highlight some of these barriers and enablers at the individual and institutional level in our universities, with suggested approaches to addressing them spanning models and modes of delivery, through to enhancement of collaboration and capacity.

MODELS OF CLIMATE CHANGE EDUCATION PROVISION

Individuals

Research indicates that the presence of climate change in the curriculum often depends on the capacity, interest and enthusiasm of individual staff members.[23,24] However, it also suggests that despite growing demand from students to learn about climate change, and the relevance of CCE to all disciplines, many staff do not feel sufficiently equipped, confident or supported to integrate climate-related content into their teaching.[25,26]

Despite demand from staff and students, many students in UK HEIs currently complete their studies without any exposure to CCE, either because it does not form part of the official curriculum or staff require more support to incorporate it. This is a whole institutional challenge which requires proactive efforts to ensure that staff who are eager to embed CCE in their teaching can receive support and guidance from colleagues in other departments who have already taken this step. Two-way channels of communication to enable staff across HEIs to benefit from each other's expertise and learn from each others' experiences of implementing CCE in a range of contexts also need to be created. As such, a key enabler of CCE is the development of knowledge sharing amongst academics and professional services staff.[22] This includes practical skills and foundational knowledges required to incorporate CCE into a variety of curricula.[27]

Individual staff with a particular interest and expertise in CCE can play an important role in, and benefit from, knowledge-sharing across disciplines and enhancing efforts to embed CCE within their institution. Some individuals might be given opportunities to develop new specialisms in climate-linked research, teaching or professional services such as careers advice.

However, to mainstream CCE, a "top-down" approach is needed which could involve the incorporation of CCE into institutional programmes of Continuing Professional Development (CPD) for all HEI staff. For example, postgraduate certificates in learning and teaching are often mandatory for new academic staff, with analogous qualifications required for library, careers or student support staff. Integrating CCE into these programmes would establish the importance of CCE alongside other topics, enabling new staff to reflect on climate change as integral to their professional practice whilst providing the time and space for interdisciplinary discussion and peer to peer knowledge exchange (e.g. Box 2).

BOX 2: PEER-TO-PEER TRAINING FOR CARBON LITERACY[21]

Manchester Metropolitan University (MMU) has given Carbon Literacy training to its staff and students since 2012, in partnership with The Carbon Literacy Project, to increase awareness, ability, and likelihood of staff and students to act on climate change. A core challenge of the project has been how to offer training to all members of the University, irrespective of disciplinary background.

To overcome this, MMU developed an innovative peer-to-peer training model, and a digital service for participants to undertake training online through interactive virtual workshops, including discussions and game-based activities. The training is largely delivered by students, who are paid to do so after completing a Train the Trainer programme, and becoming certified as trainers.

Feedback from student trainers shows that this peer-to-peer approach enhanced their sense of responsibility to take action on climate change, enhanced team working, leadership and communication skills, and increased confidence.

Institutions

Mainstreaming CCE in HEIs can take many different shapes, from whole-cohort provision, through to integrating climate change into the existing array of degree streams, core courses and electives across the curriculum. Whichever route is taken, alignment with existing approval, quality assurance and review processes within any given institution is necessary. Different approaches to navigating governance structures will also be necessary for different CCE interventions.

University-wide courses

Effective development and provision of university-wide, credit-bearing courses on climate change creates a high bar in terms of satisfying all the requirements of the different departments and schools it covers. Issues like timetabling, governance, differing fee levels and even direct opposition to inclusion of such 'outside of discipline' provision can all present barriers. It may be possible to overcome these structural barriers with support from senior management, as discussed below.

Alternatively, or in addition, online provision underpinned by well-supported, cross-disciplinary teaching and administration teams can help overcome some of these challenges. For example, the online delivery mode allows asynchronous engagement with content by students across timetables, with the content itself being more likely to complement the various disciplinary streams and their learning outcomes if it is developed by interdisciplinary teaching teams. Administratively, again, support via cross-departmental teams can help ensure consistent visibility, accessibility and quality assurance for all students.

Degree programmes

Mainstreaming CCE in UK HEIs is likely to require all degree programmes to integrate climate change into their 'disciplinary' course provision to some extent, even where institution-wide climate change courses are available.

Embedding CCE throughout degree programmes, to complement disciplinary knowledge, can benefit from the support and input of central teams of education experts, typically found in Centres for Excellence in Learning and Teaching (CELTs) or equivalent groups. These can play a pivotal role in supporting academics to design programmes of study that progressively build students' skills through well-planned activities.

Likewise, team teaching approaches can allow climate change and discipline-specific expertise to be combined into course development and delivery in a way that is robust (in terms of climate science, policy and social understanding)[28] and that integrates with, and has clear relevance to, discipline-specific learning outcomes, particularly for programmes such as engineering that require external accreditation. At an institutional level, this will require the 'home' departments of staff involved to fully support interdisciplinary-disciplinary course development and deployment, and for the cross-institutional finance, administrative and quality assurance systems to work for, rather than against, such collaborative working.

To facilitate this, all new course and programme proposals could, for instance, be required to show how they have – or have not – integrated CCE in an interdisciplinary manner, encompassing climate change mitigation, adaptation and wider social justice issues connected to the unfolding climate crisis and global and local responses to it. For existing courses and programmes, the use of exam boards, programme reviews, and student and external feedback can all provide formal intervention points to further support interdisciplinary teaching.

Co-curricular provision

Mainstreaming climate change within co-curricular provision can foster climate understanding and skills whilst simultaneously providing interdisciplinary connections between students and staff.[29] This includes through inductions, careers service provision, student-led training and alumni events, as well as volunteering and community engagements.

The required capacity-building for CCE therefore goes beyond university teaching staff. Professional staff involved in careers advice, wellbeing support and estates management, among others, will all need to be engaged to provide holistic CCE that is embedded at the heart of the institution.

Management structures

The senior management of UK HEIs represent a fundamental enabler of mainstreaming CCE in their institutions. A lack of understanding of the essential need for CCE at senior management level can become a barrier that prevents management and curriculum policy committees from substantively engaging with the area. In addressing this, we can draw lessons from successful initiatives to mainstream issues of Equality, Diversity & Inclusion (EDI) into university governance and management structures, which often include establishment of EDI committees and working groups at multiple levels of governance.[30]

A high level 'climate committee' could help centralise and coordinate efforts to develop CCE at an institution-wide level and give validation and institutional backing to the efforts of groups of individuals. Such a group would need a named lead or 'champion' to ensure a clear point of contact centrally. Identifying this lead could usefully draw on established internal structures around sustainability champions and committees. The lead would be supported by named leads within each specific department, as well as essential services such as estates, catering and Human Resources, who would have responsibility for facilitating discipline-focused CCE practice; reporting on progress, and linking to a wider community of practice across the institution.

Informal Collaborations

Informal collaborations between individual academic staff and students can also help overcome inertia and move institutions towards mainstreaming CCE[1]. For example, the University of Bedfordshire's Sustainability Forum – an informal collective where each member defines their contribution, and no discipline or career stage is privileged – has organised annual day-long or half-day events for students, staff and external stakeholders to examine a key climate or societal challenge and its local expression.[29]

Such events harness the expertise and energy of a core group of committed colleagues to fast-track the embedding of CCE: gaining buy-in from a range of university stakeholders, modelling authentic learning approaches and generating new curriculum content. This serves to overcome strategic, administrative, and operational barriers which may prevent the adoption of CCE into all but the most specialist environmental courses.

EXTERNAL ENABLERS

Policy

A fundamental enabler of mainstreaming CCE in UK HEIs is a clear and comprehensive government strategy for delivering the transition to net-zero emissions.[31] This should include long term government funding and regulatory measures, addressing Higher Education, other industries, and wider society.

BOX 3: CHALLENGES IN STUDENT-LED CLIMATE EDUCATION[1]

In many universities, climate education is demanded and led by the student population. In both the University of Oxford and the University of Glasgow, students have mobilised to harness the expertise within university departments to provide grassroots climate education to students, as well as people outside of the university. The aim has been to broaden the offering of climate education beyond those who were directly studying climate change within their degree programmes.

However, barriers exist to student-led climate education, in terms of funding and capacity. Neither initiative received University funding, and in The University of Oxford's case, ran for several years on goodwill from academics, before corporate funding allowed the organisers to offer financial compensation to academics for delivering lectures. Pulling from the same pool of academics each time the course ran also meant that burnout was high. The University of Glasgow now provides compensation for the students involved in design and delivery; however, the course content still requires the goodwill of academics.

These barriers and the growing number of students enrolling on such courses show the essential need for institutional backing to student groups filling a gap in the provision of Climate Change Education.

Such an economy-wide strategy, with multi-year spending commitments, would provide confidence and stability to employers across all sectors, and in all UK regions, that there will be future demand for knowledge and skills aligned with the net-zero transition. This will focus investment, on the priority areas for industry collaboration with UK HEIs, such as programme development, work placements and co-created short courses, and increase awareness of the need to realise a net-zero-aligned future workforce.

A national net-zero strategy that addresses skills and education needs can also provide a steer to funders, awarding bodies and senior management within HEIs on the expectations of HEIs to support the net-zero transition. This would shape recruitment, training and promotion policies within individual institutions to further facilitate enhanced CCE capacity, following a similar model as the NHS 'Fit for the Future' plan and its reflection in health-related training provision in UK HEIs.[32]

Schools

HEIs have a role in preparing the next generation of school teachers, such as through post- graduate certificates in education (PGCEs), for primary and secondary education provision. Our students (and staff) are often also products of this pre-tertiary provision. It is important therefore to emphasise the need for embedding CCE at all levels of formal education.

While this working paper focuses on universities, for CCE in HEIs to be most effective it must build upon strong foundations developed throughout primary and secondary school. This would promote a 'scaffolding approach' where students entering HEIs already have a basic, yet fundamental, understanding of climate change.

Within the current national curriculum, content on climate change is largely confined within science and geography teaching, hindering interdisciplinary learning. Furthermore, whilst the current curriculum does provide knowledge of why and how the climate is changing, it does little to support students to identify and engage in practical solutions, envisage positive futures, contest climate misinformation, and develop coping strategies to respond to an uncertain future.

As such, the UK Government and the devolved administrations should initiate a review and update of their primary and secondary education curricula in the light of the declared climate emergency. The UK's co-hosts of the United Nations Framework Convention on Climate Change (UNFCCC) 26th

Conference of the Parties (COP26), Italy, have committed to putting compulsory climate change education at the heart of their school curriculum and commitment.

Employers

There are various examples of employers and skills agencies working with UK HEIs to provide facets of CCE that serve workforce needs.[33] These range from guest lectures by practitioners and resource co-creation, through to green careers fairs, field trips and living labs, design sprints/ hackathons, projects and placements.[17] Such academy-employer collaborations can occur at a range of academic levels, over different durations, and via both in-kind and direct funding (e.g industry-funded studentships[34]). Existing, and new, relationships of this type can enable improved alignment between HEI-provision of CCE and the needs of the net-zero transition more widely.

Likewise, improved collaboration with industry bodies, trade unions, recruitment agencies and external research providers has the potential to enable HEIs to provide CCE that takes full account of spatial and temporal demands, as the transition to net-zero accelerates nationally and globally. Comprehensive local and national coordination of collaborations between universities and external partners, such as via Local Enterprise Partnerships (LEPs), can enable mainstreaming of CCE, enhance the employability of graduates, and help reduce regional inequalities in provision, as outlined in the recent report from the UK's Green Jobs Taskforce.[35]

Educational Unions and Professional Bodies

The status of climate change has been rising in the formal and organised activities of Higher Education trade unions, which provides a further enabler for mainstreaming CCE. This includes the main UK union for academic, academic-related and professional staff, the Universities and Colleges Union (UCU), but also the HE-active bodies of Unison, Unite, the GMB, and those in devolved administrations, such as the EIS (Educational Institute of Scotland).[b] Whilst UCU has not sought to specify curriculum content, it is calling for additional resource and priority to be given to addressing climate change.[36] This includes greater opportunity for all staff to access CPD on the issue – academic, professional and vocational – which can act as an important enabling factor for organisations to improve their CCE.

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b Further boosting demand for climate education, the Trades Union Congress has committed to education for sustainable development being embedded across the education system by 2030.[38]

The National Union of Students', via their arms-length charity 'Students Organising for Sustainability UK' (SOS-UK), supports and promotes students to campaign for greater inclusion of CCE in the curriculum. Its flagship accreditation scheme 'Responsible Futures' promotes more substantial uptake of the United Nations' 'Education for Sustainable Development' principles.[37] The scheme does not require teaching of particular curriculum topics, but provides a framework for evaluating and improving curriculum provision.

Professional and awarding bodies can likewise give a powerful steer on the alignment of HEI learning provision with the demands of addressing climate change. Not all courses have professional accreditation, but in some fields, such as medicine or architecture, it is only possible to practice professionally when holding a degree that is accredited by the professional body. Accreditation requirements can as such present a significant lever for reform of provision or curricula. Even where accreditation is not necessary for the practice of a profession, an overt requirement to demonstrate integration of CCE into student learning and graduate attributes, from professional or awarding bodies for degree programmes, can be a powerful external enabler for internal curriculum reform and investment in CCE.

SUGGESTIONS FOR MAINSTREAMING CLIMATE CHANGE EDUCATION IN UK HEIs

Our current moment in time requires bold, rapid action to tackle the climate and ecological crisis at all levels of society. This presents an unparalleled opportunity for HEIs to rethink how our institutions and systems of education can respond to the needs of students and staff, and the conditions of the wider world that we seek to understand and impact through research, training and teaching.

The following suggestions present a starting point for capitalising on this opportunity by embedding climate change education into all university structures, and directing the talent within our institutions towards the creation of a resilient and zero-carbon future.

- **Building internal capacity:** All HEIs provide CPD on climate change, and paid training time, to their staff.

- **Ensuring alignment and leadership:** All HEIs produce an institutional strategy for their climate change education provision, to include its alignment with national and global climate targets and action, and its links to the 'invisible curriculum' of the institutions' non-teaching operations.

- **Partnerships for curriculum development:** HEIs to partner with industry, central government, local government and third sector organisations to enable provision of CCE that takes full account of spatial and temporal demands and opportunities in the UK's net-zero transition.

- **Aligning assessment and outcomes:** HEIs to work with funding and regulatory bodies, unions, professional and awards agencies to ensure staff capacity and graduate attributes fully align with the demands of addressing climate change.

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