

Sustainability and Climate Change Education: Creating the Foundations for Effective Implementation

Dr Leigh Hoath, Leeds Trinity University and
Heena Dave, Teacher Development Trust



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This report has been produced by the Sustainability and Climate Change Education Working Group. As a diverse group of educators, we believe that we have the expertise to guide the effective implementation of the Department for Education's Sustainability and Climate Change Strategy (2022). We hope that our collective efforts in the fight against climate change have a lasting and positive impact on the lives of children and young people in England.

Our vision

Is to ensure that all teachers and school leaders are equipped to help children and young people take climate action and protect the environment.

Our mission

Is to help teachers and school leaders become experts when teaching children and young people about sustainability and climate change.

We are committed to achieving our mission by:

- Championing a better environment for all life on Earth.
- Being evidence informed. Supporting teachers and school leaders by sharing what we've learned from our research.
- Working collaboratively to solve complex environmental challenges. We will amplify the voices of partners from all sectors and backgrounds. Our work acknowledges that no one person or organisation has all the answers.





Heena Dave
Curriculum Designer, Teacher
Development Trust

As a former Head of Science at Bedford Free School, Heena is an experienced school leader and co-author of 'Cracking Key Concepts in Secondary Science'. She is currently Senior Curriculum Designer at the Teacher Development Trust, the national charity for effective professional development and is responsible for creating evidence-informed learning for school leaders. She previously worked at the Environment Agency as Research Manager and as Head of Programmes and Partnerships for the outdoor learning and environmental education charity Learning through Landscapes. She is currently completing a Doctorate in Education at the University of Stirling on what makes effective environmental education in schools.



Jo Gilks
Early years educator, SENCO
and forest school leader

Jo is an early years educator, SENCO and forest school leader with a passion for nature & permaculture. Jo has worked in many different settings, both conventional early years and progressive outdoor settings across London and Essex. Providing children with real world experiences of the natural environment through play, growing food and learning to care for wildlife is her passion; Her aim is to create equitable, nurturing, inclusive, sustainable education experiences for young children in green spaces in inner city settings where children can learn to love nature.



Dr Leigh Hoath
Associate Professor leading
science education at Leeds
Trinity University

Dr Leigh Hoath is an Associate Professor leading science education at Leeds Trinity University and was a teacher before moving into Higher Education. Leigh holds a prominent role within the Association for Science Education and is a regular contributor to their conferences and writer for their journals. She is an author of science education books and the consultant to BASF, developing their engagement and outreach work. She is an education consultant to the BBC and developed the Blue Planet Live Lesson and teaching resources and more recently led on the development of their latest education campaign, The Regenerators, focusing on climate education.



Patrick Kirwan
BSc PhD PGCE

After a career in science as an epidemiologist, Patrick trained as secondary science teacher with TeachFirst in London. While working in disadvantaged London schools Patrick developed a bespoke award-winning model for a whole school nature curriculum. This fundamentally changed his perception on education. While continuing to teach, Patrick set up the nature aspect of a community social enterprise to share his model with other primary and secondary schools. In school and community settings, he uses nature as a conduit to foster wellbeing, leadership skills, confidence, resilience, environmental awareness and climate action. In March 2021 Patrick founded The Irish Schools Sustainability Network (ISSN).



Dr Geoff Mackey
BASF Corporate Affairs &
Sustainability Director

Geoff was brought up on a small family farm in South Armagh, N. Ireland, he read biology in Liverpool and followed it with a range of post graduate qualifications in Health & Safety and management including a sleepless MBA. His doctorate concerned the strategic business value of social networks. He is a Director of BASF plc, responsible for a service portfolio in UK & Ireland and BASF's Sustainability network in Europe. A Fellow of IOD, RSC and IEMA, he has been within the BASF group for almost 20 years and advises a wide range of strategic and tactical groups inside and outside BASF covering private, public and third sector organizations in arenas including science, environment and further education.



Paul Tyler
Teacher, Kirkhill Primary School

Paul Tyler teaches at Kirkhill Primary School in East Renfrewshire and has been a passionate advocate of teaching Climate Change and sustainability in primary schools. Over 15 years in the classroom he has developed a cross curricular approach covering many aspects of Climate Change and sustainability, and created resources to engage and inspire. He is the author of Topical Science Updates, a monthly science newsletter for schools, which often feature sustainability as a core theme. Paul is also a member of the ASE and a fellow of the PSTT, he writes and speaks extensively about his experiences teaching science.



Carley Sefton
CEO, Learning
through Landscapes

Carley Sefton is CEO of the Learning through Landscapes Trust, the UK's leading School Grounds charity who specialise in curriculum linked outdoor learning. LtL believe connection with nature should be recognised as a fundamental part of education, at every stage, for every child and young person. With over 30 years of experience LtL have levied over £30million into UK schools to transform the use of school grounds, improve biodiversity and nature and to support teachers to develop their outdoor teaching practice. Carley is committed to championing the voices of children and young people from disadvantaged and underrepresented communities and ensuring that they understand their important role in protecting the natural environment. She is passionate about empowering every child to benefit from outdoor learning and play throughout their education.



Ben Rogers
Director of Curriculum and
Pedagogy, Paradigm Trust

Ben Rogers is director of curriculum and pedagogy at Paradigm Trust. He is also a Chartered Science teacher, a member of steering panel of the Education Endowment Foundation's primary science report, on the editorial board for the Association for Science Education's Primary Science journal and a member of Ofsted's science advisory group.



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- Colin Diamond CBE, Professor of Education Leadership, University of Birmingham
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- Dr Paul Vare, Senior Lecturer - Research Development Education and Humanities, University of Gloucestershire

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Designed by: www.avalonswillmott.com

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Foreword

Our children and young people face an unprecedented challenge that is not of their own making. For decades scientists have known what lies on the horizon for humanity if the rising levels of atmospheric carbon dioxide are not addressed. Time and time again, scientific research has shown our global leaders the urgency needed to manage and provide support for the imminent catastrophes that loom as a result of global warming. However, climate literacy should not just be for decision makers of today: it is an essential life skill that our leaders of the future must possess.

Just as we teach our children and young people to look both ways before crossing a road to avoid an oncoming collision, a deeper understanding of the science and impacts of climate change prepares them for an uncertain future. Embedding climate change educational policies and frameworks into the curriculum is a major step towards ensuring that each child has a basic right to understand what their future holds. However, it is not just children and young people who need upskilling; senior leadership teams, teachers and educators in all educational settings also need support, funding, and flexibility to help ensure that climate change is integral to every learner's journey. This should also be implemented in higher education settings, as well as compulsory schooling.

Much of the narrative concerning climate change naturally sits within the STEM subject areas. However, to ensure that we inspire a creative and innovative generation of young people ready to face the issues of climate change, we must be ambitious in our approaches. Championing climate

change across educational cultures, starting from pre-school settings, ensures that the message is as fully embedded and inclusive as other issues like healthy eating and exercise are.

Educators will be our key drivers in inspiring and empowering climate change champions of the future. I know from personal experience that many pre-school, primary and secondary school teachers find the science of climate change not only overwhelming and intimidating but also anxiety inducing. In addition, we need to focus on how we decolonise our narratives and teaching about climate change. There needs to be reflection and consideration on the social inequalities and impacts of climate change not only on nature but also for communities who are most at risk, especially those in the global south. Teachers and educators in all settings deserve and should receive opportunities for professional development that is effective, sensitive, and responsive to the needs of their learners.

This report is a call to action for decision makers to create lasting change for children and young people and the planet they will inherit. If delivered effectively, sustainability and climate change education will be a critical tool for children and young people as they navigate the biggest challenge they will face in their lives.



Dr Anjana Khatwa
Earth Scientist and Presenter



1. Executive summary

Effective sustainability and climate change education is our generation's priority.

According to the latest Intergovernmental Panel on Climate Change report (2022), global warming is leading to the increasingly irreversible destruction of terrestrial, freshwater, coastal and open ocean marine ecosystems. Approximately half of the species assessed globally have shifted poleward or to higher elevations to avoid the extreme impact of rising temperatures in their native habitats. The impact of global warming will inevitably lead to the loss of species, land and habitable areas of the planet which will in turn have serious adverse socioeconomic consequences for coming generations.

Climate change is an educational entitlement that children and young people are now demanding. They must be equipped with the knowledge and skills that allow them to reduce their impact on the planet within their lifetimes and adapt to the changing world we will leave behind.

Who we are

Led by a collaboration between Leeds Trinity University and the Teacher Development Trust, we have brought together the expertise of educators across nursery, primary, secondary age phases and higher education with businesses, the Environment Agency and the charity sector to respond to the Department for Education's (DfE) Sustainability and Climate Change Strategy launched in April 2022.

As a working group, we offer a positive response to the implementation of the DfE's sustainability and climate change strategy. We hope this report will be used to support change in schools by helping create an evidence base which can be used to better inform future practices as processes are implemented and outcomes develop.

Our key findings

We have examined a number of areas we believe are key to the effective and meaningful implementation of sustainability and climate change education. Although predominantly aimed at school settings, the principles are applicable to all age phases and establishments.

This report provides a starting point to create guiding principles and a framework to work from, which can be shaped and moulded to each setting. We know that school leaders will have hard choices to make, driven by priorities such as learning recovery and squeezed budgets. Under this pressure, as in other areas of life, care of the environment often becomes an aspiration rather than a necessity. In order to change this, we ask that school leaders and teachers use this report to guide their approach to sustainability and climate change within their context.

1. Sustainability, climate change and inequality

The first key theme is sustainability, climate change and inequality, which discusses the exacerbated inequalities of socially and geographically disadvantaged communities in the context of climate change. This work should acknowledge the pressing need for the assessment of climate vulnerability and the full comprehension of social justice issues from all school leaders and teachers as a core part of their professional development.

This is a fundamental step, upon which all further activity should be based. We recommend that any actions taken be underpinned by a genuinely inclusive approach.

2. Culture

It is essential to develop a culture which ensures that learners possess the knowledge and skills to approach the current and future environmental challenges they will face in their lifetimes. Realistically, this culture takes time to build, but is a worthwhile process. When sustainability and climate change education is approached as a whole-school priority, rich, professional conversations can be facilitated. This will ensure that sustainability and climate change education is not just the responsibility of one teacher but that it is in the hands of every teacher, staff member and child or young person.

To make an effective start, we recommend setting out with a clear vision to enact the methods that will facilitate sustainability and climate change education to secure lasting and self-sustaining culture change.

3. Curriculum

Curriculum is an essential part of the discussion. This section outlines how teachers can support and actively engage with curriculum content in order to increase their knowledge. It is also beneficial to consider the connections between sustainability and climate change and environmental and outdoor education.

We strongly advocate for a coherent and strategic approach when linking sustainability and climate change education to existing curricula to provide a long-term integration of teaching and learning activities that create behavioural and knowledge-based outcomes.

4. Pedagogy

Pedagogy is often assumed rather than explicitly discussed. This section addresses the complexities of teachers, learners and content interaction and the challenges of introducing new contexts or content. For example, there is evidence of a lack of teacher confidence in relation to science-based content, particularly in primary settings. In addition, taking on environmental teaching that goes beyond traditional classroom activity demands different pedagogical strategies.

We recommend undertaking a critical engagement of unfamiliar pedagogical approaches across all subjects in relation to the teaching of sustainability and climate change.

5. Professional development

There is a need for educators to teach aspects of sustainability and climate change that they may not be familiar with. As a result, one of the

most significant actions required is effective professional development.

Evidence-informed mechanisms and principles should underpin high-quality sustainability and climate change professional development. School leaders must recognise that effective professional development is not a quick fix but that it takes time to be embedded before a long-term impact can be recognised.

6. Outreach and engagement

Time and resource-poor teachers are able to tap into a wealth of support available. Two key examples – working with business and working with charities – are explored. Developing these long-term partnerships can enable schools to bring sustainability and climate change examples to life by helping children and young people understand how employers intend to adapt their business models in the future and provide insight into potential employment opportunities available.

We suggest that both businesses and charities can support diversity and inclusion by providing role models and up-to-date knowledge that meets the needs of learners.

7. Overcoming barriers to implementation

There are always multiple competing priorities in schools. However, in order to address the global crisis we face, commitment is needed to effectively implement this strategy. There is a key role to play for organisations, such as subject associations and school governors, to support the prioritisation of this work.

8. Evaluating impact over time: Assessment, monitoring and evaluation

Much of the evaluation of environment, sustainability and climate change education relies on anecdotal, qualitative or small-scale quantitative analysis.

We recommend deeper, robust and evidence-informed evaluation that leans on organisations such as the Education Endowment Foundation to undertake large scale, data-driven studies that comprehensively inform us about the effectiveness of the strategies in place. This should be accompanied by secure assessments in education settings measuring progress in skills, knowledge and behaviour of learners. Outputs should be fed into a cycle of continual improvement to ensure impact increases over time.





2. Introduction

Why are we talking about sustainability and climate change education?

Following a consultation period from November 2021, the Department for Education launched their Sustainability and Climate Change: A strategy for the education & children's services systems in April 2022. There is little doubt that a focus on this agenda is overdue and that the strategy is welcome. The purpose of this report is to offer a response which considers the overarching principles that should underpin the implementation of this strategy into education settings.

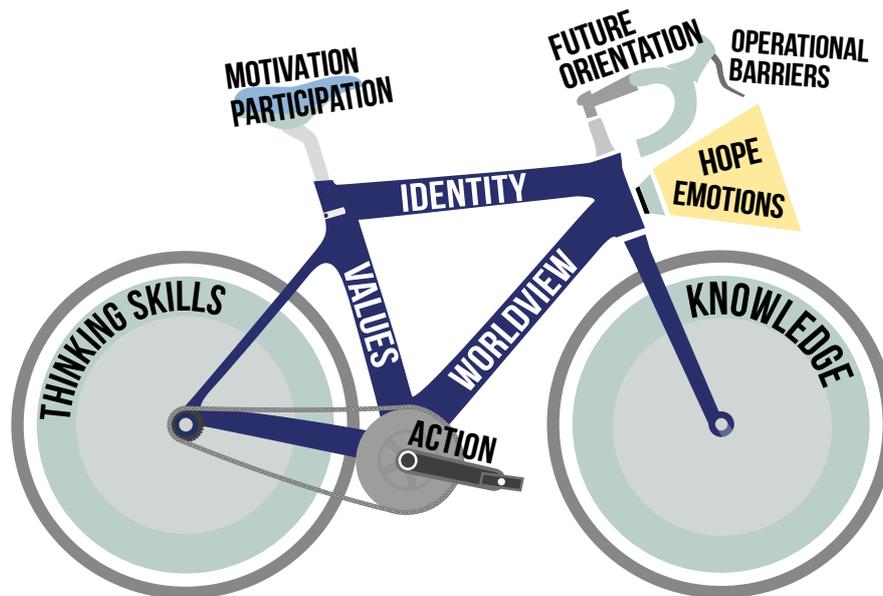
It is worth highlighting that this report only touches the surface of some of the complexities that encompass this topic, for instance the very definition of 'sustainability'. Throughout this report we have chosen to use the term 'sustainability and climate change' to not separate the two areas, which aligns with the strategy in discussion. We acknowledge that much of the terminology associated with these areas is problematic and is often open to interpretation. This issue will be tackled in future discussions as the implementation of the strategy unfolds with time.

We also recognise that education is complex and that although we may be addressing sustainability and climate change, it is difficult to deal with this in isolation. In order for us to reliably suggest first steps, we have drawn upon associated literature

and existing approaches, such as from outdoor and environmental education.

The group that has developed this response represents early years education, primary and secondary age phases, higher education, industry and non-governmental organisations (NGOs). All members have experience of teaching or working in the environmental sector or environmental education, science or relevant industries. Above all, they have a commitment to ensuring that the implementation of this strategy is meaningful and goes beyond learners simply knowing more about sustainability and climate change to also facilitate their education to compel them to take informed action and engage in behaviours that have a positive impact on the planet.

The report only addresses the key themes. These are not exhaustive but have been prioritised to facilitate a timely and considered response. The sections are supported by literature, outline a position in relation to the theme and are critical to ensure effective implementation. The sections end with reflective questions for school leaders and teachers to support them in considering how to approach sustainability and climate change education within their setting.



Cantell et al. (2019) – bicycle model demonstrating the interrelatedness of sustainability and climate change education

The frameworks that support our thinking

We have drawn upon previous research to shape the discussions held as a group and move forward the thinking around strategy implementation. A portion of this research has come from outside the UK. One particular model that informed early discussions came from Cantell et al. (2019) and offers a comprehensive view of climate change education. The study's bicycle model highlights the interrelation of many parts that coexist to achieve something 'that works'. Cantell et al. (2019) urge us to consider the needs of the 'user' in order for the bicycle to work, and this again aligns with our views on sustainability and climate change education. The educators and learners in each setting are the users of this strategy, and so their needs and outcomes should be central to it.

We know that it is idealistic, if not unrealistic, to expect any one person or education setting to achieve this functioning model in isolation. We believe that there should be a collaborative

response to this strategy, not a competitive one. There is a need for stakeholders from all related sectors to work together to bring about effective change. From this perspective, teachers and school leaders are encouraged to view their role as one part of a much wider response in delivering good sustainability and climate change education for children and young people.

This report does not offer a complete guide to teaching and learning the issues of sustainability and climate change in education and it is not positioned as such. Rather, it is a starting point of key principles that inform excellence in practice, encourage meaningful implementation and spark discussion around next steps for change.

The real challenge for educators is to respond in an urgent manner given the scale of environmental degradation we are currently witnessing. We recognise meaningful and effective implementation takes time, but time is a luxury we do not have. Steps that can be taken should be taken now.

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3. Sustainability, climate change and social inequality

Why are we talking about social inequality in relation to sustainability and climate change?

In 2014 the Intergovernmental Panel on Climate Change (IPCC) concluded that climate change exacerbates inequalities. Their report stated that socially and geographically disadvantaged people – including those facing discrimination based on gender, age, race, class, caste, indigeneity and disability – are negatively disadvantaged by climate hazards (Climate Change 2014 Impacts, Adaptation, and Vulnerability Part A: Global and Sectoral Aspects, IPCC).

Some may argue that the IPCC's conclusions are more broadly concerned about the global state of our environment, and that these are not relevant priorities for us in the UK. However, as the Environment Agency (2021) has highlighted, environmental inequalities remain hidden and overlooked within the UK. For example:

- 59% of the highest earning households are within a 10-minute walk of natural green space compared with 35% of the lowest earning households.
- City communities with 40% or more residents from minority ethnic backgrounds have access to 11 times fewer green spaces than those comprising mainly white residents.

As a result, the Environment Agency (2021) concludes that communities in the UK who have

smaller carbon footprints and pollute less than wealthier communities often live in areas of higher pollution which are less resilient to the effects of climate change.

In this section we reflect on these stark findings in an attempt to draw out the main themes emerging from the research to illuminate why these issues need to be understood, explored and examined by the whole school before meaningful sustainability and climate change education can be implemented. It argues for the need of a shift in the way environmental issues are examined and ultimately taught, as Skoufias (2012, p.2) emphasises: “while the eyes of the world have been riveted on polar bears, Antarctic penguins, and other endangered inhabitants of the Earth’s shrinking ice caps, relatively few researchers have turned serious attention to the long-term effects of climate change on human welfare”.

What do we mean by social inequality?

In alignment with Islam and Winkel (2017) we recognise that many types of inequalities exist when considering the impacts of climate change on communities. As such, we begin to consider the implications of these when embedding sustainability and climate change education into practice. These inequalities include those:

- Based on demographic characteristics, such as gender, race, ethnicity, religion, and age.
- Regarding assets and income.

- Regarding public decision making (political power) and access to public resources, such as publicly financed health, education, housing, financing, and other services.
- We recognise that many of these issues overlap; for example, communities may face inequalities based on demographics, income and public decision making. Given that matters of social inequality are often inseparable, we argue that the concept of social inequality is multi-dimensional (Islam and Winkel, 2017) and that teachers and school leaders should be supported to develop their own understanding of how climate change will impact human society in the UK, which communities will be most affected, and why.

To unpick such impacts more deeply, data shows that inequality propels the disproportionate effects of climate change through three channels (Islam and Winkel, 2017):

1. Increased exposure of disadvantaged groups to climate hazards.
2. Increased susceptibility to damage caused by climate hazards.
3. Decreased ability to cope with and recover from the damage.

A global and local issue

These impacts are brought to life more clearly by the Environment Agency in a 2021 report on the state of the urban environment. The report emphasises that factors associated with deprivation, such as language barriers, ability to earn, old age, and health status, often affect people's vulnerability to other pressures, including those caused by environmental inequalities.

Linking this to the impact of climate change, the Environment Agency's (2021) own analysis has concluded that the changing climate will continue to exacerbate environmental pressures experienced in urban areas, including intensifying the pressures on water quality. Heavy rainfall events following periods of prolonged dry weather are a particular problem because pollutants accumulate and then wash off into water bodies. This type of weather pattern is likely to become more common as the planet warms further (Environment Agency, 2021).

Within an educational context it is important for learners to understand that climate change is not just a distant problem in developing countries. It is, as evidence from the Environment Agency demonstrates, something that is likely to impact communities in the UK. A fundamental outcome of climate action, taken because of high-quality sustainability and climate change education, is to enable all communities to be more resilient and overcome any existing social inequalities.

Considering the issues of social inequality on sustainability and climate change education

The IPCC released a report called the Determinants of Risk: Exposure and Vulnerability (2012) which is helpful for considering the needs of learners. The term 'vulnerability' used in this report in relation to climate change is described by the IPCC (2012) as a combination of "susceptibility" and "ability to cope and recover".

From this perspective, school leaders and teachers should reflect on the extent of climate vulnerability that exists within their school in place of prioritising the creation of a bank of

decontextualised resources. It is likely that schools will encounter different levels of susceptibility and abilities to cope across their school community, and as such we recommended that school leaders explore the concept of climate vulnerability with governors, parents and other headteachers within their community. This includes assessing the extent to which the community has the capacity to (IPCC, 2012):

- Anticipate the risk of climate change impacts.
- Respond to climate change impacts.
- Recover and change in response to climate change impacts.

Ultimately, we propose that the answers to these context specific questions will inform the vision and purpose for the school's sustainability and climate education. Working through this process explicitly will enable school leaders and teachers to gain a clear view of how social inequalities come into play for the children and young people in their schools and is integral to their duty of care.

At odds with this strategic and nuanced approach, many of the activities we see taking place in schools and other educational settings in relation to sustainability and climate change involve individual actions and are often limited in their impact. They may enable learners to feel a sense of progress and action in, for example, standalone ideas not rooted within the curriculum, such as those associated with food packing and wrapping, using sustainably sourced or created products, or more direct approaches to recycling or turning off lights and taps.

We have suggested elsewhere in the report that these initial action steps are very important. We also, however, emphasise that the engagement with taking individual 'sustainable' decisions can

also be problematic for many. When thinking about social inequality, inclusivity must be considered. For example, a child who receives their food from a food bank would face difficulty engaging with 'wrapper free Friday'. Further, the implications of promoting second-hand clothes and thrift stores to children in poverty who are limited in shopping options must also be examined.

Equally problematic is limiting sustainability and climate change education to eco-councils, one-off projects or recycling bins that are never used effectively. Embedding superficial practices is likely to diminish the quality of sustainability and climate change education and will ultimately widen the gap that already exists in vulnerable communities that lack the capacity to adapt to climate change.

In short, we must ensure that all learners are able to engage with the proposed solutions and actions in a way that is inclusive and reduces inequalities. This also means that teachers and school leaders must engage with the issues around representation within the environmental workforce, which has been identified as the second least diverse workforce: only 3.1% of staff are from minority race groups, compared with 19.9% of the general UK workforce (Policy Exchange, 2017). If learners do not see themselves represented in the job opportunities shared with them, they are less likely to aspire to do those roles as adults. This mirrors the notion of Science Capital (see Archer [2013-2018] for example). If we are to make progress in addressing global environmental issues with the required urgency, there is no room for exclusion or obstacles to participation.

A challenging balance

Inclusive sustainability and climate change education which sets high expectations for all children and young people recognises that curriculum and pedagogy need to be closely aligned to the needs of learners. Real challenges exist for schools and educational settings when considering the concept of 'climate vulnerability' in relation to learners that are pupil premium, on free school meals, who have English as an additional language, or those with SEND. As educators, we are faced with the inconvenient truth that climate change is likely to have a greater impact on vulnerable communities. It is because of this that we encourage all school leaders and teachers to begin with the 'why' of sustainability and climate change education in order to deeply consider the needs of all children and young people in their care.

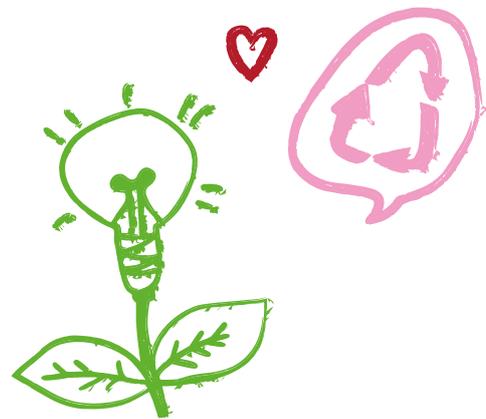


Photo credit: Maximkabb, iStockphoto

Key reflections

- What steps could you take to examine the issues of social inequality and climate change with other colleagues in your school?
- To what extent have you considered the levels of climate vulnerability within your school community?
- When thinking about teaching sustainability and climate change, how could you go about discussing the importance of collective rather than individual action?

Recommendations

- Ensure that all staff understand the issues of social inequality and climate change as a core part of their professional development.
- Consider the 'why' of sustainability and climate change education, making sure that your approach reflects the needs of the learners in your school.
- Assess the extent of climate vulnerability and the community's capacity to respond effectively instead of teaching standalone lessons on sustainability and climate change.

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4. Whole-school culture for sustainability and climate change education

Why are we talking about whole-school culture?

A core purpose of sustainability and climate change education is to ensure that children and young people have the knowledge and skills to effectively adapt to current and future environmental challenges. When thinking about climate change, adaptation can be defined as the successful adjustment to actual or expected climatic effects that work to offset its potential damages (The Intergovernmental Panel on Climate Change, 2007).

However, in securing a better future through adaptation, it is critical that we focus not only on the technological solutions to climate change, but that we purposefully and explicitly build cultural practices that encourage and embed new habits (Heyd and Brooks, 2009, p.280). From this perspective, delivering high-quality sustainability and climate change education in schools is not just about implementing a new pedagogy or enacting a curriculum in isolation, it is about creating a vision and a set of values that permeates every part of school life and motivates climate action beyond the school gates.

Defining school culture and climate

Grissom, Egalite and Lindsay (2021) suggest school climate is a broad umbrella under which school culture falls. They suggest that school climate is made up of the:

1. Physical aspects of schools – for example, a workable and fully funded plan to reduce heat loss within the school.
2. Characteristics of the staff within the school – for example, the extent to which there is a collective optimism in relation to protecting the environment.
3. Quality of relationships between all staff – for example, staff work collectively to improve the school's environmental record.
4. Culture, which is the shared set of beliefs about the organisation – for example, all staff believe in the science behind climate change.

With this nuanced and complex view of school culture, creating a leadership environment and school climate that is conducive to effective sustainability and climate change education takes time to nurture; it can only truly be achieved through continued commitment and the collective action of the whole school community.

The features of a strong whole-school culture for sustainability and climate change education

Research suggests that the features of a strong whole-school culture for sustainability and climate change education cascade from the top down and include:

- A headteacher's personal care and commitment to environmentalism and sustainable development, brought to life through the school's vision, ethos and strategic priorities.
- Effective implementation through environmentally focussed school policies, routines, and practices.
- A cohesive and aligned school leadership team that supports teachers to develop the school's curriculum and pedagogical strategies through professional development and collaboration.
- Modelling distributed leadership and encouraging the active involvement of all school staff and the wider school community to collaboratively create a more sustainable and resilient school estate.

- Developing leaders of sustainability and climate change education throughout the school.
- Establishing the school as an agent for environmental stewardship within the community.

Adapted from Müller, Lude and Hancock (2020) and Sharples et al. (2019).

To fully enact these features, a core aspect of a headteacher's role is to create the foundations upon which high-quality sustainability and climate change education can thrive. Alongside the wider school leadership team and school governors, a headteacher should consider their role in creating the momentum required to effectively embed the knowledge and skills required for meaningful environmental adaptation amongst the whole school community.



How can a strong whole-school culture for sustainability and climate change education be developed?

Müller et al. (2020), suggest that school leaders should undertake transparent self-evaluation when embedding a culture of sustainability and climate change education in education settings. They propose a framework of four stages to help schools reflect upon their current position in the process of integrating sustainability and climate change education. These stages are outlined below:

Stage	Description
0	Intermittent: There are little or no significant activities in the school about sustainability and climate change education. Teachers may individually teach topics in class, but there is no shared commitment within the school and no systematic or strategic steering by the school leadership team.
1	Projects: Collectively the school has started a process to reflect on and consider sustainability and climate change education. Various topics are taught in classes, interdisciplinary cooperation is in place, and initial projects (for example, the creation of a school garden or effective whole-school recycling initiatives) are realised. The school leadership team are beginning to prioritise sustainability.
2	System: The school is systematically oriented towards sustainability and climate change education. It is integrated into teaching and school life in a variety of ways. The teaching staff largely supports the cause and is involved in the development of teaching concepts and projects, such as the construction of a solar plant, the redesign of the school grounds, or cooperation with external partners. The school is managed in accordance with the criteria of sustainability.
3	Profile: As with Stage 2, the school has comprehensively integrated sustainability and climate change education into teaching and school life. In addition, the school has made sustainability a key issue and developed a specific, expressly communicated sustainability school profile that distinguishes it from other schools. They have developed and sustained the capacity and expertise to support other schools in embedding a strong culture for sustainability and climate change education.

Adapted from Müller et al. (2020)

Adopting a framework like this will support school leaders when evaluating and assessing the extent to which there is a sustained whole-school culture for sustainability and climate change education. It will create a shared and concrete language between all members of the school and will help to provide a clear strategic approach towards school improvement.

Key reflections

- To what extent does a whole-school culture for sustainability and climate change education exist within your school?
- What steps could you take to create the foundations for high-quality sustainability and climate change education within your context?
- Which of the four stages outlined above best describes your school? What support would you need to make progress towards the next stage?

Recommendations

- Start by creating and communicating a school vision which explicitly states the purposes and aims of sustainability and climate change education within your context.
- Evaluate the extent to which a strong school culture already exists by adopting and using the four-stage framework.
- Enact your vision by prioritising the effective implementation of environmentally focussed school policies, routines, and practices.

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5. Curriculum for sustainability and climate change education

Why do we need to talk about curriculum?

A curriculum is often viewed by teachers as something that is fixed. However, through the approaches we take to teaching (see section on pedagogy), we can ensure that curricula are adapted to both the needs of learners as well as new educational priorities, such as climate change. This interaction with the curricula is key in relation to teaching sustainability and climate change education if we are to ensure that there is the necessary focus placed on developing learners' understanding of the causes, impacts and actions that can be taken to address the issues. It is also worth noting that the National Curriculum is a minimum entitlement and that as long as political impartiality is maintained (see Department for Education (DfE) [2022, p19]), the content can extend beyond existing knowledge and skills.

Biesta (2010) suggests that school leaders should shift their focus from "How can we introduce these new ideas in the classroom?" to "Why are we introducing these new ideas in the classroom?". This encourages educators to carefully reflect upon and consider the purpose of the curriculum as an important starting point in the design and development of a subject's curriculum. We support this approach as the first step to creating a shared understanding about the purpose of sustainability and climate change education within a school's context.

It is essential to note that making any changes to curriculum, including research into how sustainability and climate change education could be incorporated, is resource intensive. We know that the most effective curriculum is crafted through deep collaboration with teachers, and therefore recommend that teachers and school leaders should consider how sustainability and climate change education could be best implemented within their context by working in partnership across their school community. Such discussions would include curricular conversations that focus on:

- Careful consideration of what resources and funding are needed to embed changes to the whole-school curricula.
- What would be needed to create a whole-school infrastructure for sustainability and climate change curriculum to be rooted within the day-to-day practices of a teacher.
- Creating a strategic, whole-school approach where curricula development is well planned and implemented.

What do we want from a curriculum?

The purpose of a curriculum must be clear. The Secretary of State for Education states in the introduction to the DfE strategy (2022) that learners should "be given the hope that they can be agents of change, through hands-on activity". This extends beyond simply knowing more and remembering more and shifts the focus to how

the curriculum is taught and how it enables learners to become agents of change. To achieve this, it is important to think about the curriculum as a means of bringing about a change in the behaviours we want our children and young people to exhibit in relation to the global environmental challenges we are all presented with. We argue that a curriculum infused with knowledge and skills about safeguarding the environment for future generations is the foundation upon which a climate literate society is created.

Taking a big ideas approach

When considering sustainability and climate change education, our perspective on curricula development has been framed through the lens of the 'big ideas' developed by the working group focus areas from the Intergovernmental Panel on Climate Change (IPCC). These are:

1. Assessing the physical scientific basis of the climate systems and climate change.
2. Understanding the methodology and software for the calculation and reporting of greenhouse gas emissions.
3. Understanding the vulnerability of socioeconomic and natural systems to climate change.
4. Mitigating climate change through limiting or preventing greenhouse gas emissions.

Structuring a school's curricula in alignment with these big ideas enables teachers to more clearly consider:

- The sequencing of learning.
- The prior knowledge of the learners.
- The importance of designing curricula that encompass knowledge and action.
- That curricula review should be focussed and structured within each big idea.

- That learning is aligned to existing global frameworks to move learners from abstract concepts to more concrete environmental realities faced by scientists and policy makers.

A balanced curriculum

The need for learners to understand the environment, how it works and actions required to protect it has been discussed for decades. The principles Hungerford and Volk (1990) position to change learners' behaviour are arguably as valid over 30 years on from their conception as we compile this report today. Italics emphasise our position on each statement.

1. Teach environmentally significant ecological concepts and the environmental interrelationships that exist within these concepts. *We propose that sustainability and climate change cannot be taught in isolation.*
2. Provide carefully designed and in-depth opportunities for learners to achieve some level of environmental sensitivity that will promote a desire to behave in appropriate ways. *There is more than knowing more and remembering more. A change in behaviour is the end point of sustainability and climate change education.*
3. Provide a curriculum that will result in an in-depth knowledge of issues. *Expert subject knowledge is an important and integral component of curricula development.*
4. Provide a curriculum that will teach learners the skills of analysis and investigation as well as provide the time needed for the application of these skills. *Links should be made with industry careers viewed through a 'green lens', ensuring that learners in schools see the curriculum and their activities as directly applicable to the behaviour and skills*

required to create a better environment beyond compulsory education.

5. Provide an instructional setting that increases the learner's expectancy of reinforcement for acting in a responsible way; that is, attempt to develop an internal locus of control in learners. *There is a need for learners to develop their substantive (knowledge of the academic subject) and procedural (how to) knowledge. Both are essential for effective sustainability and climate change education.*

These principles aim to create an environmentally literate society within which we find learners who are scientifically and carbon literate, able to make informed decisions that address the global environmental issues we face. Hungerford and Volk (1990) describe environmentally literate communities as “having a deep understanding of environmental issues with often complex causes and effects – enabling them to make sound decisions in stewarding our air, land, and water”. They are “significantly more likely to engage in a set of pro-environmental activities than someone who is not educated on the environment” and “can and do take simple but important actions such as saving water and electricity”.

Mapping a curriculum with resources

There are a wealth of resources focussed on sustainability and climate change education that already exist, with others being developed in light of this very current agenda. The issue with this is that whilst there is plenty available for teachers to draw upon, if a teacher lacks expertise in this area, their ability to distinguish between the quality of resources is diminished. There are some subject areas that hold a more natural fit than others, for example science, geography and citizenship. However, we suggest that sustainability and climate change education should permeate the walls of subject silos and be meaningfully addressed throughout as many curricula areas as possible.

To support teachers and school leaders to better understand how high-quality resources can be useful in supporting a well sequenced curriculum, we have identified and categorised the availability of resources against each big idea by school stage and phase. This is a starting point which will be reviewed, but we have shared our initial audit on our website www.climate-ed.org.uk to enable and prompt deeper professional conversations within schools on the resourcing of a sustainability and climate change curriculum.



Key reflections

- What steps could you take to create the foundations for a deeply embedded sustainability and climate change education within your context? How is this linked to your school's vision?
- What steps can you take as a teacher or school leader to use a 'green lens' to ensure that the curriculum content and knowledge is supporting learners in conceptual and attitudinal development?
- To what extent do you engage in professional conversations within your school to explore the impact of externally produced high-quality resources in relation to sustainability and climate change education?
- How does your teaching practice ensure that you educate about sustainability and climate change and not just teach about it?

Recommendations

- A school's sustainability and climate change curricula should be linked to the school's vision and purpose of education and be made explicit to all members of the school's community.
- A curriculum infused with knowledge and skills about safeguarding the environment for future generations, whatever the subject, is the foundation upon which a climate literate society is created.
- A coherent approach should be taken to link existing curriculum content with the big ideas of sustainability and climate change.
- Curricula should be sequenced so that learners develop their substantive and procedural knowledge. Both are essential demands.
- High-quality resources to support the teaching of sustainability and climate change should be used to support curricula implementation and teacher workload.

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6. Pedagogy for sustainability and climate change education

The challenges

Teaching about sustainability and climate change involves more than just educating learners on known facts. Much of what learners know likely stems from media content that is often politicised, recognised as a topic of debate or inaccurate. Given these challenges, to promote effective teaching on the subject, teachers may need to embrace unfamiliar pedagogies. The Department for Education (DfE) document titled Sustainability & Climate Change: A strategy for the education and children's services systems (DfE, 2022) is intended to help learners develop a love for their environment.

Achieving this involves a complex interplay of practices designed to encourage children and young people to develop pro-environmental knowledge, attitudes and behaviours. To get to know the environment around them and feel motivated to protect it, learners need to spend time in it and explore it with the support of those with more expertise. This means that outdoor and environmental education weaves an important thread through the teaching of sustainability and climate change that moves into the school grounds, the community and partnerships with an end point of making better decisions on the health of the environment.

Why we need to talk about pedagogy

Although pedagogy is rarely explicitly talked about in the school domain, it is important that consideration is given to the approaches used for teaching and learning with respect to sustainability and climate change education. For this report, we accept Alexander's (2001, p3) definition:

Pedagogy is both an act and a discourse. Pedagogy encompasses the performance of teaching together with the theories, beliefs and policies and controversies that inform and shape it.

We also however draw upon work by Watkins and Mortimore (1999) which positions the learner within the definition of pedagogy.

Although over ten years old, these definitions remind us that pedagogy is more complex than simply that which is taught (the content and curriculum) and that it must also consider the full context of the learners. It is important for teachers to meet all social and psychological needs of their learners when teaching, with sensitivity to the impacts of emerging climate anxiety. As a global issue with decisions being made at governmental levels, it may be possible for learners to feel powerless and disengaged with possible solutions.

There are several foundations underpinning this section which we suggest are fundamental to establishing effective pedagogies for teaching sustainability and climate change education:

1. School leaders and teachers should engage with recognising and exploring effective pedagogies when teaching climate change within their specific subjects.
2. An acceptance that teaching beyond the classroom demands a different pedagogical approach than teaching within it. To teach sustainability and climate change education effectively, thought needs to be given to adopting appropriate pedagogical approaches.
3. It is essential to understand the social and psychological contexts of learners to be responsive to their needs.

Pedagogy and curricula

The DfE has clearly stated that there is no immediate plan to change the curriculum to specifically place sustainability and climate change education within any subject. Within these constraints, we suggest that teachers and school leaders examine and explore their current curriculum through a 'green lens' and use this as the context to teach existing content. For example, when teaching the carbon cycle in science, it could be an important addition to simply make links with increasing carbon dioxide levels in the atmosphere and the impact of this. Alternatively, examining positive and negative impacts that new products have on the environment is a key feature of the design and technology GCSE and this could be granted prominence within all stages of teaching.

We know that this is likely to place additional demands on teacher expertise in relation to subject knowledge and the approaches used for

teaching. It is anticipated (and indeed encouraged) that the strategy also provides the opportunity for additional experiences beyond the classroom. Foreseeing these challenges, our recommendation is that teachers should be given additional support through effective professional development.

If the curriculum content *per se* is not to change then it is essential that teachers learn how to best emphasise and teach the content that exists, with an emphasis on sustainability and climate change. We recognise that for secondary science and geography teachers who undertake field work as part of their curricula, they will have at least some experience of working beyond the classroom. It is imperative for those with more expertise within the school setting to support those who are tasked with teaching sustainability and climate change to ensure that teaching approaches are best aligned with the content taught. Effective environmental education goes beyond traditional classroom-focussed pedagogies that teachers are most familiar with. For many years there has been a call for pedagogies supporting teaching beyond the classroom to be tailored to specific environments (e.g., Eilam and Trop, 2010; Hoath, 2015).

Teacher confidence

We would like to see support around subject knowledge for early years and primary school teachers who may know their learners better, given the time spent together in the classroom. Whilst we have stated that the curriculum is not the only consideration for teaching this context, it is essential that all teachers are equipped with secure subject knowledge. The suggestion that the science curriculum is the natural place for this content makes much sense, however we know from multiple studies across a significant period

(see Murphy et al., 2007; Wellcome Trust, 2019) that many teachers across schools express low confidence in teaching science. Holding secure subject knowledge is an integral part of teaching content effectively and therefore forms one of the overarching priorities if sustainability and climate change education are to be successfully integrated into the classroom. This is not a quick fix and significant resources must be granted to ensure this integration is not a short-term response but a meaningful one which supports the shifts in behaviour needed to address the global issues discussed. Three key factors for consideration by teachers and school leaders are:

- Are teachers fully supported in reflecting on the pedagogical approaches they use in non-classroom-based contexts?
- Is subject knowledge development also supported so the curricula element of pedagogy is secure?
- As there is no singular way to teach this content, how can teachers consider the psychological and social context of the

learners? How can the explicit education of metacognition, social, and emotional learning help teachers to achieve this?

Positive actions

The heart of sustainability and climate change education is showing learners the practical actions they can take to adapt and respond to pressing issues. There are many environmental groups or larger organisations which are working to develop resources and support for schools to benefit the teaching and learning in these areas. They can share expertise with teachers to support their subject knowledge development, for example, the STEM ambassadors programme offers links with universities. Granting learners a voice to be able to 'do' activities seen to positively impact environmental issues is a key part of motivating them. However, for changes to be effective and embedded in the long term, such activities must also be accompanied by shifts in the focus on curriculum content, approaches to teaching and cultural emphasis within the education setting.



Key reflections

- To what extent do you understand the science behind climate change and how this relates to your own subject?
- What steps could you take to develop your knowledge and confidence in implementing different pedagogical approaches in relation to sustainability and climate change education?
- To what extent do you collaborate as a school to explore the research which supports and highlights different pedagogies in relation to sustainability and climate change education?

Recommendations

- Consideration must be given to the ways sustainability and climate change education is taught so the pedagogical approaches adopted are aligned with the curriculum subjects and the teachers' and learners' social contexts.
- School leaders and teachers must engage in a process which critically reflects upon their own confidence in subject knowledge and pedagogical approaches to support the effective teaching of sustainability and climate change education.
- To achieve a sense of action, learners should be encouraged to undertake activities beyond the classroom which bring about sustained improvements to the environment.

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7. Professional development for sustainability and climate change education

Understanding the need

The Teaching the Future survey (Teach the Future, 2021) outlined some of the challenges faced when considering the implementation of high-quality professional development for teachers and school leaders in relation to effective sustainability and climate change education. The survey demonstrated that while 90% of teachers agreed that climate education should be compulsory in schools, they felt overstretched when teaching compulsory elements of the current curriculum and lacked the expertise to effectively educate children and young people about climate change. Moreover, 70% of teachers reported that they hadn't received training on any aspects of teaching about climate change. Such findings highlight that while there is a clear need to resolve this issue, the limitation of restricted teacher time means that teachers' professional development must be designed to impact teaching ability.

What do we mean by professional development?

Collin and Smith (EEF, 2021) define teacher professional development as a structured and facilitated activity for teachers intended to increase their teaching ability. Their emphasis on 'teaching ability' is key:

The focus on teaching is intended to include a broad range of skills including communicating and modelling, exploring ideas, instruction, and assessment.

The focus on ability rather than merely teaching knowledge is intended to distinguish professional development from token training that may not lead to long-term behavioural change.

Investing in high-quality and evidence-informed professional development

If we are to avoid tokenistic training and achieve a long-lasting impact, we must move beyond the idea that sustainability and climate change professional development programmes are a short-term, quick fix designed merely to fill the knowledge gaps in teachers and school leaders in the hope that pro-environmental habits will follow. Zuccollo and Fletcher-Wood (2020) highlight the potential of professional development in having a significant effect on learners' outcomes. However, we argue that this potential can only be realised if professional development is:

- Evidence-informed to create the most impact.
- Designed to elicit changes in teaching ability.
- Equips children and young people with the knowledge and skills needed to take climate action.
- Creates and sustains a whole-school culture for sustainability and climate change literacy.

Effective professional development

To bring these to life, The Education Endowment Foundation's (EEF) evidence-informed guidance report on effective professional development (Collin and Smith, EEF, 2021) suggests:

When designing and selecting professional development, focus on the mechanisms:

Mechanisms are the core building blocks of professional development. They are observable, can be replicated, and could not be removed without decreasing the effectiveness of professional development. Crucially, they are supported by evidence from research on human behaviour and have been found, in contexts beyond teaching, to change practice.

Ensure that professional development effectively builds knowledge, motivates staff, develops teaching techniques, and embeds practice:

The mechanisms that make up effective professional development can be split into four groups: build knowledge, motivate staff, develop teaching techniques and embed practice, each of which fulfils a different role.

Implement professional development programmes with care, taking into consideration the context and needs of the school:

Ensure that professional development aligns with the needs of the school and is supported by school leadership. Gaining ongoing leadership buy-in can facilitate successful implementation. Recognise the time constraints faced by teachers and adapt professional development accordingly. Those designing and selecting professional development should critically assess how a professional development programme will fit in with the school routine.

We recommend that the mechanisms for effective professional development should be applied to and be apparent within all sustainability and climate change professional development programmes. We do not advocate for an approach whereby professional development surrounding global environmental challenges is designed in line with a lower set of standards to that which is offered within mainstream education for teachers and school leaders. Setting our expectations high, we want to ensure that a culture of high-quality, evidence-informed design and delivery of professional development permeates through all offers of sustainability and climate change development for teachers and school leaders.

Exploring professional development for sustainability and climate change education

When considering the underpinning environmental principles of a high-quality professional development programme, Boeve-de Pauw et al. (2022) emphasise the importance of embedding:

- Holism:** Refers to the complex interconnectedness within issues of sustainability, crossing boundaries of social, economic and environmental dimensions, which requires interdisciplinary expertise.
- Pluralism:** Emphasises the importance of diverse viewpoints, opinions and stakes within these issues.
- Action-orientation:** Focussing on meaningful contributions toward solutions to global environmental challenges.

Implementing these principles as part of any high-quality professional development programme is a challenge for professional development designers as the principles examined here must be interwoven with existing mechanisms of effective

professional development across all areas of teaching practice.

As a starting point, we suggest that these principles and mechanisms feed into a professional development programme that all teachers, regardless of phase or stage (including initial teacher training) participate in. A well-designed professional development programme could include:

- Understanding sustainability and climate change literacy.
- Exploring the economic and international aspects related to sustainability and climate change education.
- Understanding the principles of holism, pluralism and action-orientation in sustainability and climate change education.
- Engaging in curriculum development – using what we know about good curriculum practice and what we know about how learning happens from cognitive science and understanding how this can be applied to sustainability and climate change education.
- Practising pedagogies that lead to climate action, for example taking learning beyond the classroom.
- Evaluating and assessing learning in relation to sustainability and climate change education.
- Developing partnerships with local government, businesses and charities to support the delivery of sustainability and climate change education.

As highlighted above the sustainability and climate change domain is expansive and therefore designing professional development will require a collaborative effort between:

- Industry and business - who will likely know the most up to date technical solutions.
- Subject associations and academics – who have the expertise to support curricular and pedagogical knowledge.
- Professional development charities and organisations – who have the expertise in designing and delivering high-quality professional development.

Given the importance of partnership working, we advocate for a triangulation of efforts between multiple sectors to support teachers' development to create a world where teachers are better equipped to support the next generation of learners to face and solve complex environmental and interconnected problems.

We also acknowledge that there is progress to be made before our vision for high-quality professional development becomes a reality for all teachers and school leaders in terms of funding, time and resources. We encourage school leaders to act as critical consumers, requesting that providers deliver programmes that embody the mechanisms and principles of effective professional development in relation to sustainability and climate change.



Creating the foundations for high-quality sustainability and climate change education professional development

Effective professional development takes time to embed. In the context of school reform, Darling-Hammond (1999) explains, “different reforms are rendered effective or ineffective by the knowledge, skills, and commitments of those in schools. Without know-how and buy-in, innovations do not succeed”. As a result, it is important that alongside the delivery of any professional development, school leaders focus on creating the foundations upon which sustainability and climate change education can thrive. As Archie (2001) notes “while often assumed that teacher training is a missing piece of the puzzle for high quality, comprehensive environmental education programmes in schools, perhaps what is needed is a broader perspective on teacher training enabling teachers to develop motivation and commitment, as well as opportunities where they learn and practice strategies that will help them negotiate the barriers they perceive as most

strongly constraining them from implementing sustainability and climate change education”. The results of a study conducted by Ernst (2009) offers the following guidance for laying the foundations for the effective implementation of professional development in schools. These include:

- Directing efforts and rewarding teachers already using some other form of environmental education.
- Using evidence of positive outcomes in efforts to raise awareness of successes across the school.
- Including opportunities for developing teachers’ environmental sensitivity and environmental literacy knowledge and skills.
- Considering teachers’ perceptions of barriers to sustainability and climate change implementation and working with teachers to identify strategies for negotiating those barriers.
- Include school administrators in professional development and/or capacity building efforts toward a school climate supportive of sustainability and climate change.



Key reflections

- To what extent has your school started to examine the professional development needs of all staff in relation to sustainability and climate change education and what steps could you take to start or accelerate these discussions?
- How can you ensure that you embed the EEF's mechanisms for effective professional development when considering buying or procuring professional development externally to ensure value for money?
- What impact would you expect to see because of teacher professional development in relation to sustainability and climate change in your setting?

Recommendations

- It is important that there is a triangulation of efforts between sectors in the design and delivery of effective professional development for teachers and school leaders.
- Effective professional development should be based on evidence-informed mechanisms and principles that underpin high-quality sustainability and climate change education.
- Effective professional development takes time to embed. As a result, it is important that alongside the delivery of any professional development, school leaders focus on creating the foundations upon which sustainability and climate change education can thrive.

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8. The importance of outreach

What do we mean by outreach and engagement?

The importance of school outreach is widely accepted by school leaders and involves working in a range of areas with organisations beyond the school for the benefit of the school community. When thinking about sustainability and climate change education, this could involve a local garden centre providing vital discounted equipment needed to improve the biodiversity of school grounds or a charity supporting curriculum implementation through enrichment opportunities. However, participating in outreach alone is insufficient in achieving well thought out sustainability and climate change education; high levels of engagement should also accompany this strategy. High engagement between external partners and teaching staff within a school is evident when continued collaboration and professional challenge lead to better outcomes for learners.

What are the benefits of outreach?

The Business and schools: Building the world of work briefing paper (2012) by the UK Commission for Employment and Skills outlines the wide-ranging benefits for schools working in partnership with external organisations. This includes:

- Improvement in school performance – for example by increasing the motivation of learners in relation to taking action to protect the environment.
- Improving the employment prospects of young people – for example, by providing opportunities for learners to put into

action their environmental skills within a different context.

- Enrichment and enhancement of the delivery of education – for example, by sharing real-world environmental solutions.
- Providing quality work experience opportunities – for example, by raising awareness of the profile of ‘green careers’ in the sector.
- Increased teacher expertise – for example, by partners sharing cutting edge advancements in reducing carbon emissions.

What are the challenges of outreach?

On the surface, engaging in outreach appears to be a straightforward and effective factor in contributing towards sustainability and climate change education. However, Flowers and Chodkiewicz (2009) remind us that despite the best of intentions, the reality is often a failure. This is because realising the benefits of outreach requires time, collective commitment and a clear understanding of the purposes of the outreach. Uzzell (1999) suggests that sustainability and climate change education is generally based on a top-down approach to teaching and learning, where schools do not work closely with their communities, and fail to create opportunities for children to learn by engaging in direct environmental action. Uzzell (1999) developed a framework which described the relationships between schools and communities. He identified four types of relationships where in each category the school acted differently, as can be seen in the following table:

Category	Description
1. An isolated island, working on its own	This kind of relationship saw the school undertake environmental education only within the school. This meant that activities or projects occurred only within the classroom or the school grounds and did not engage with the local community.
2. Inviting the community into the school	The second kind of relationship was where the school invited members of the local community (businesses, charities or other agencies) to discuss or take part in specific topics or projects.
3. Being a guest in the local community	The third kind of relationship involved teachers and students going outside to visit a site, to address specific local environment issues or to act in the local community. Schools, while acting as guests in the community, controlled the activities they undertook, which could include class visits to centres, facilities or natural habitats.
4. Working together with the community as a social agent	The fourth kind of relationship was where the school participants went into the community and worked together with groups from outside the school to achieve significant change on an environmental issue. The difference from the other relationships was that the explicit aim of this collaboration was to bring about change as a result of school involvement. The key here was seeing partnerships as a way of taking actions that achieved both transformative learning for learners and teachers and brought about more fundamental and deeper change on environmental issues in the local community.

Uzzell (1999) adapted by Flowers and Chodkiewicz (2009)

We suggest that for schools to realise the full benefits of outreach and engagement with partners, school leaders should consider the extent to which they exist as social agents who shift learning from simply obtaining knowledge within the school to also include action within the community. We acknowledge that approaching outreach in this way is resource intensive. To mitigate these challenges, school leaders could consider the resources already in place when organising trips and residentials and consider whether some of these resources could be reallocated to outreach that involves collaborative efforts from the wider community to effect significant change on a local environmental issue.

Exploring the importance of working together with the community, Monroe et al. (2015) utilised Uzzell's (1999) framework to study seven environmental educational programmes that engaged children and young people. Their analysis concluded that the key ingredients for creating community action programmes include the following:

- A collaborative partnership among agency staff, community organisations and educators around an important, locally meaningful environmental issue that engages learners through partnerships facilitated by a visionary boundary broker who has credible relationships with each lead partner.
- Importantly, Monroe et al. (2015) identified two types of partners as essential to complement educators who wish to work on the complex issues surrounding climate action:
- Agencies or businesses that provide priorities, history, resources, and management know-how.

- Community organisations or charities that provide relationships, context, on-the-ground realities, and local opportunities to make a difference.

Working with businesses

Many businesses view sustainability as an increasing priority and their focus is often about striving to have a minimal negative impact – or potentially a positive effect – on the environment, community, society, or economy. In other words, it is a business that “meets the needs of the present world without compromising the ability of future generations to meet their own needs” (WECD, 1987). The Brundtland report (WECD, 1987) emphasised that sustainability is a three-legged stool of people, planets, and profit, and the challenge is to balance all three.

The benefits of collaborations between education and businesses are multifaceted. There is an opportunity for learners to examine sustainability in action through the demonstration of good environmental practice as well as exploring real life processes and systems involved in sustainability. Learners can also develop a better understanding of the contributions technology is making to reduce the impact of carbon emissions on the environment and the roles that exist to support this. This can lead to increasing the tangibility and reality of sustainability and climate change education.

There are also benefits to the business. Organisations may achieve their own sustainability goals by giving back to the community through employee volunteering, charitable donations or educational and community engagement. For a

business to be truly sustainable, it must sustain not only the necessary environmental resources, but also social resources, including employees, customers (the community), and its reputation. By engaging with schools, businesses can drive better sustainable outcomes for their own organisations, creating symbiotic relationships.

Working with charities

There are a significant number of charitable organisations willing to work with schools and other educational settings on several topics that focus on sustainability and climate change. Furthermore, there is an increase in the charitable organisations offering support to schools. This is positive and provides much needed resources for teachers who are lacking in subject knowledge confidence and wish to receive support with making their curriculum come to life, and who want to provide their learners access to views beyond the classroom.

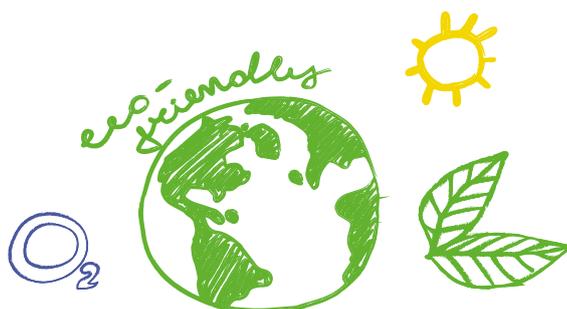
There are also many practical elements that charitable organisations can support in relation to sustainability and climate change education. As well as supporting schools to take environmental action, they can provide expertise on how to protect the environment or encourage investment in pro-environmental behaviours for the future. They also have the knowledge to support applications for grants to provide support with

resources and equipment to enable education settings to do more.

Making outreach meaningful

As explored, outreach with businesses and charities in relation to sustainability and climate change education is crucial, but should not consist of isolated activities. It is imperative that any external organisation supporting children and young people does so based on the school's needs and not its own. It is crucial to align external input that is clearly linked to outcomes (in terms of environmental knowledge, attitudes or behaviours) with the curriculum. In addition, any environmental or climate focussed learning should be seen to integrate with the learners' lives both physically and socially.

Ultimately, to achieve high-quality outreach, school leaders should consider Uzzell's (1999) framework to create collaborative partnerships among agency staff, community organisations and educators around an important, locally meaningful environmental issue. Alongside this, school leaders should consider the bicycle model (Cantell et al., 2019) as outlined in the introduction of this report in order to explicitly prioritise their outreach based on a broader set of outcomes – such as action, motivations, emotions and values associated with addressing global environmental issues – to create a more comprehensive approach.



Key reflections

- When using external organisations, to what extent do you ask them to support specific elements of your learners' needs rather than have them deliver set workshops?
- How can you reach out more to your local businesses and charities to develop longer term relationships to benefit teaching and learning?
- On what basis do you select which organisations support your school externally? How are you ensuring this effectively achieves community outreach and engagement?

Recommendations

- Businesses need to better recognise their role in preparing young people for the modern world by connecting with the education system, engaging with school and colleges, and helping young people to understand the opportunities available to them.
- Charities and business should follow the best practice models in place to offer bespoke and aligned support for schools through dialogue with teachers and school leaders.
- Charities and business have a role to play in supporting diversity and inclusion through the role models they offer to learners in education settings. This should be a priority consideration when working in school settings.

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9. Overcoming barriers to implementation

The challenge of implementation

Any implementation of a strategy for sustainability and climate change education will take place within the context of a much wider and complex school system. Within this system, a range of priorities and initiatives will compete for the scarce resources of a school leader or a teacher, driven by a collective mission to improve outcomes for children and young people. In the implementation of any strategy or initiative, there will always be organisational barriers to overcome. The purpose of this section is to explore some of these barriers in the hope that we can facilitate and encourage professional conversations within schools, catalysing the collective efforts of the school community that work to overcome these obstacles.

Sustainability and climate change education is a critical priority for our generation; as the far-reaching review by Dasgupta (2021) reminds us, we know that we have collectively failed to sustainably engage with nature. At the heart of the problem lies deep-rooted, widespread institutional failure. In his closing remarks, Dasgupta (2021) urges rapid and urgent change especially in transforming our finance and education systems to sustain the planet's resources for future generations.

“Ultimately this change will not come if we wait for some other person or some other time. We are the ones we've been waiting for. We are the change that we seek” (Barack Obama, 2008).

Competing priorities

Embedding a sustainability and climate change education strategy, as with any approach, finds itself competing with the other school priorities. Successfully implementing sustainability and climate change education requires school leaders to explicitly acknowledge these priorities and consider, through collaboration, how they can be managed. At the top of a school leader's agenda is likely to be safeguarding and ensuring a focus on behaviour. It is the curricula, teaching and learning that will ultimately underpin the successful implementation of a range of school improvement strategies.

To achieve these there will be a significant commitment of time, resources and collective sense-making to develop and implement a carefully sequenced and coherent high-quality curriculum that promotes diversity and inclusivity. All these activities require a commitment to professional development throughout the school year. This is not an exhaustive list and there are of course additional priorities for school leaders, such as those related to financial and people management, premises and health and safety, governance and community engagement.

With schools already busy with ongoing day-to-day activities, it is important that school leaders create time and space to consider the implementation of sustainability and climate change education.

Some actions that school leaders could consider include:

- Avoiding rushing into delivery by following the Education Endowment Foundation's (EEF), *Putting Evidence to Work: A School's Guide to Implementation* (Sharples et al., 2019) to explore the steps towards the effective implementation of sustainability and climate change education.
- Creating an implementation team made up of staff at different levels within the school who have the collective responsibility to consider implementation through the lens of the EEF's guidance (Sharples et al., 2019).
- Treating implementation as a process, not as an isolated event (Sharples et al., 2019). Implementation teams may want to consider short-term goals alongside longer-term outcomes. For example, ensuring there is coherence in the content between the science, geography, PSHE and citizenship curricula could be an important first step for a school.
- Making use of school governance structures. Prioritising sustainability and climate change education within the maelstrom of competing concerns requires the effective use of a school level strategic plan which ensures that sustainability and climate change remain a priority. Governors have an important role to play in supporting and challenging school leaders to ensure that sustainability and climate change remains an important focus within the school, not just within curriculum and in teaching, but in areas such as premises management and procurement.

Teacher subject knowledge

While all English primary teachers have a GCSE science qualification (or equivalent), only 43% of primary school science leads have a science A-level and many primary teachers lack confidence in their science content knowledge (Wellcome Trust, 2017). This may result in class teachers and science leaders not having up-to-date knowledge about the environment, climate change and sustainability. We have advocated for the content of sustainability and climate change to be taught across the curriculum; however, a significant proportion of the knowledge is science related which is likely to present itself as a real issue for all teachers, and particularly primary school teachers.

To help overcome this, initial teacher training (ITT) will be a part of the solution. In a report on the science content in primary ITT (Wellcome Trust, 2017), the Wellcome Trust found that insufficient time is dedicated to science on ITT. Further, ensuring that teachers possess adequate content knowledge is largely the responsibility of the trainees. The ITT system in the UK is currently in a state of flux. With the introduction of more prescriptive and defined ITT routes resulting in a potentially more centralised ITT curriculum, it is difficult to ascertain the emphasis which will be placed on trainees and early career teachers when developing the pedagogical approaches demanded by effective sustainability and climate change teaching. Any focus on sustainability and climate change education within ITT will itself require those 'teaching teachers' to themselves develop the requisite subject and pedagogical knowledge about sustainability and climate change, so that they can sufficiently train these teachers effectively across the relevant phases. Although

this statement directly relates to ITT, we are certain that the issues are pertinent across many stages, where even experienced teachers have insufficient time or expertise to examine the latest climate science.

Some actions in response to these challenges of subject knowledge could include:

- Curricula in ITT should be addressed in the same way as in schools, meaning a strategic and coherent approach to linking existing content is needed.
- Time should be found through professional study strands of ITT courses to engage with the interdisciplinary approaches that can be taken when looking at the issues and solutions around sustainability and climate change.
- Where possible, relationships with expert departments within larger universities should be established to best support the subject knowledge elements of sustainability and climate change.

Maintaining political impartiality

Sustainability and climate change may generate a level of passion and conviction in both teachers and learners, which could be seen as positive considering the importance of this issue. However, it may also raise challenges to successful, accurate and impartial teaching. Passionate teachers may be drawn into a political discussion of climate change and stray from a scientific and accurate approach. On the other hand, a misplaced desire to present information impartially may lead to teachers spending valuable classroom time discussing unscientific alternative perspectives on climate change. Teachers may also need guidance on how to teach climate change in a way that is politically impartial whilst remaining accurate about the scientific concepts which underpin climate change and sustainability.



The Department for Education's guidance on political impartiality in schools (2022) states that: Teaching about climate change and the scientific facts and evidence behind this would not constitute teaching about a political issue. Schools do not need to present misinformation, such as unsubstantiated claims that anthropogenic climate change is not occurring, to provide balance here.

However, where teaching covers potential solutions for tackling climate change, political issues may arise. Different groups, including political parties and campaign groups, may have partisan political views on the best way to address climate change.

This part of the topic should be taught in a balanced manner; teachers should not promote any partisan political views discussed with learners.

Some strategies we include here to support teachers in maintaining political impartiality are as follows:

- Having a secure subject knowledge which can underpin and focus the discussion without being drawn into political opinion.
- Using high quality resources to navigate curriculum development, such as those from the Intergovernmental Panel on Climate Change (IPCC).
- Using pedagogical approaches which create collaborative discussions enabling creation of collective responses linked with acting as a school community and supporting a sense of empowerment as an organisational community.



Key reflections

- To what extent have you considered how your own worldview influences the way you think about, plan and teach content within the classroom?
- How can you prioritise the implementation of this strategy to recognise the issues outlined in the Dasgupta (2021) review?
- What are the barriers specific to your setting and how can you take steps to mitigate and overcome these?

Recommendations

- Notwithstanding other needs, implementation of this strategy is imperative in addressing the global crisis in relation to sustainability and climate change.
- A commitment of time and resources is needed to support this implementation over a significant period.
- Settings should work closely with subject associations and governance structures to support short and long-term implementation of sustainability and climate change education.

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10. Evaluating impact over time: Assessment, monitoring and evaluation

What do we mean by assessment, monitoring and evaluation?

Assessment, monitoring and evaluation are complex interrelated concepts and so it is important to create a shared understanding of each. For the purposes of this report, we adopt the following definitions:

- **Assessment** is a process for determining and addressing learners needs or gaps to better understand how to support their progress.
- **Monitoring** is the ongoing, systematic collection and analysis of data as a programme progresses. It is aimed at measuring progress towards the achievement of programme objectives.
- **Evaluation** is a process for determining whether a programme has met its expected objectives and/or the extent to which changes in outcomes can be attributed to the programme.

(Adapted from the National Library of Medicine, 2010)

Why are we talking about assessment, monitoring and evaluation?

A vast amount of evaluation that has taken place with respect to environmental, outdoor, sustainability and climate change education has often focussed on qualitative or limited quantitative studies supported by anecdotal evidence. If we are to undertake a whole-school approach to sustainability and climate change education it is crucial that we examine the efficacy of any such programmes through more robust, rigorous and trustworthy means to fully understand the progress learners have made over the course of their study. As such, we have an ethical obligation to examine what works for our children and young people and use high-quality data and information to develop evidence-informed programmes which elicit progress and are effective in protecting the environment.

This is not a simple task and requires extensive academic expertise. While it would not be appropriate here to provide a full critique of sustainability and climate change research and evaluation, we do aim to present some of the challenges educators face when considering the impact of sustainability and climate change education. We do need to look to international research in this area due to a lack of quantitative and controlled studies within the UK.

Unravelling the complexities of measuring outcomes within sustainability and climate change education

If we accept that at the end of a programme, we will measure progress made in relation to environmental knowledge, concern and behaviours, we also need to explore the problematic arena of what leads to this progress. In doing so it is vital that educators are able to pinpoint the exact active ingredients of a programme that will lead to progress. The EEF (Sharples et al., 2019) describes this in the following way:

It is easier to implement an intervention if it is clear which features need to be adopted closely (that is, with fidelity) to achieve the intended outcomes. These features are sometimes called the 'active ingredients' of the intervention. A well specified set of 'active ingredients' captures the essential principles and practices that underpin the approach. They are the key behaviours and content that make an intervention work.

Problems and confusion arise here because environmental-based education programmes differ drastically in their active ingredients. As Collado, Rosa and Corraliza (2020) suggest, the evidence supporting the effects and benefits of nature-based instruction on pro-environmentalism is unconvincing. This is mainly due to a lack of controlled experiments which in turn hinders causal claims and the provision of intervention guidelines. The researchers presented a controlled experiment examining the impact of a nature-based environmental education programme on children's environmental attitudes and behaviours included in the school curriculum. On average,

environmental behaviours remained virtually the same when compared to the control group.

A further study by Goodwin et al. (2010), undertook a randomised control trial of 448 primary school students and their families in 27 primary schools in Vale Royal in the north west of England. The study explored whether environmental citizens can be encouraged, and revealed no statistically significant differences between schools in the intervention groups compared to those in the control group.

Whilst neither of these studies showed any difference to the control group it is vital to emphasise that both programmes had interventions with very different active ingredients. Furthermore, it is unclear to what extent these active ingredients were informed by evidence. For example, the first was based on exposure to nature, not action, and the second was based on video lessons.

Whilst we do not accept randomised control trials as the only method to evaluate a programme, they are an important component. We advocate for research designs in teaching and teacher education work that brings together strengths across disciplinary traditions, including causal analysis and fine-grained observations of classroom instruction as highlighted by Blazar and Pollard (2022). However, studies like those highlighted above demonstrate that sustainability and climate change education is not straightforward. To be more certain of intent, implementation and impact, we suggest that:

- Programmes should be clearly defined and designed in line with the evidence.
- Active ingredients should be clearly stated and shared at the outset of each programme.

- The programme must be delivered to a high-level of fidelity to the active ingredients.
- The programme should be evaluated ideally using mixed methods to fully understand its impact.

Importantly, all sustainability and climate change programmes should encompass each of these steps – individually, they are all essential. On further reflection, we must acknowledge and accept that programmes or practices implemented historically may not be aligned strongly enough to a robust, rigorous and trustworthy evidence base. While this is not an issue for school leaders and teachers to act upon, we recommend that organisations such as the Education Endowment Foundation (EEF) should be actively involved in understanding and devising interventions that work and can be tested. This will ensure that we are able to support teachers and school leaders to make the best use of their scarce resources and to fulfil our collective obligation to the high-quality education of learners.

What are we seeking to measure?

The Department for Education (DfE, 2022) has committed to assessing the impact of their sustainability and climate change education strategy. This will be done through the introduction of an annual climate literacy survey to benchmark progress in improving the climate knowledge of school leavers. However, as we have indicated throughout this report, while knowledge is a critical component, it is not a key determinant of climate action; one will not simply lead to another. Schaffrin (2011) challenges this over-dependence on knowledge alone by emphasising the combined importance of knowledge, environmental concern

(comprising individual attitudes and intentions towards the environment) and behaviour.

If we are to truly understand the impact of sustainability and climate change education, we should not assume that knowledge is a proxy for climate action. It is crucial that we systematically examine the journey a learner takes as they move from knowledge to action. This will enable us to monitor more precisely the extent to which we move towards our end point of adapting towards a changing climate, giving us richer evidence about what works best to bring about changes within different groups of learners. This does not mean that knowledge is inessential, but rather that there needs to be a more balanced judgement made to understand that a child or young person with deeper knowledge, increased concern, and who exhibits pro-environmental behaviours is more likely to carry with them into adulthood the continued motivation to protect the environment.

What steps can school leaders take towards assessment?

Once outcomes are clear it is important to utilise a mix of summative and formative assessment in evaluating programmes. To effectively assess, we need to be clear about the anticipated and expected outcomes, the starting point, and progress markers along the journey from the start to each assessment point. This mirrors effective classroom assessment in almost all subjects.

As we have already suggested, time to embed the principles outlined in this report is needed and it should be clear that if the implementation of this strategy is to be successful then a clear vision with predetermined milestones must be established. This will allow for a rigorous approach

to determining how well the implementation has been embedded, from which next steps can be discussed and identified. At an educational setting level, it is essential that there is no sense of failure if things do not move as quickly as planned on paper. Whilst urgency in terms of action is required, we refer to the need for it to be balanced with true growth. The culture within the school must value progress, recognise what has been achieved, and be clear about how to continue moving forward.

Leaders must also reflect carefully on the social context of the setting they work in. It is important, as with all other sections of this report, that there is a flexible approach to evaluating sustainability

and climate change learning within the setting. It is important that strategies are also appropriate for the learners being taught.

Ultimately, the call here is threefold. There needs to be a considered and secure approach adopted within settings related to both learner progress in skills, knowledge, and behaviour; the implementation of sustainability and climate change education within a setting must also be assessed; finally, there should be a national endeavour from bodies such as the EEF to support the data and evidence-driven analysis of progress in a way that occurs for other subject areas.



Key reflections

- What assessment practices do you use in your setting already which would allow progress in skills, knowledge and behaviour in relation to sustainability and climate change education to be identified and used to inform future practice?
- What expertise do you have in your setting to create the plan for implementation and monitor the success of this in an iterative way over a sustained period?
- To what extent do you work in a culture which allows an honest appraisal of progress to the long-term end point rather than achieving a milestone irrespective of genuine success or quality?

Recommendations

- Support from organisations such as the EEF to undertake genuinely evaluative studies is needed in this area.
- There needs to be an evidence-informed approach of evaluation of the longer-term impacts of a comprehensive sustainability and climate change education programme.
- Active ingredients must be identified at the start of implementation to support effective assessment and evaluation throughout the process.

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11. Conclusions and recommendations

This report should act as a starting point for action, but our recommendations are not exhaustive.

There is a great deal of work to be done to bring sustainability and climate change education to the agenda across education settings in a meaningful and impactful way.

Our recommendations are:

1. Assess social inequality and its impact on sustainability and climate change education

The exacerbation of social inequalities driven by climate change is clear. The need to address diversity within the environmental sector is stark and staff should ensure issues of social inequality and climate change are an integral aspect of their professional development. Climate vulnerability is an area to be assessed as a priority.

2. Build a whole-school culture to support effective implementation

The importance of a whole-school culture which respects and responds to the climate crisis is essential for effective change. Education settings need a clear and articulated vision for enactment through the effective implementation of policies, routines and practices.

3. Create a coherent curriculum to develop a climate-literate society

The curriculum is the backbone of any educational setting, and we argue this should be infused with the knowledge and skills needed to develop a climate literate society. There needs to be a coherent approach taken to linking existing curricula content with sustainability and climate change, with the sequencing of substantive and procedural knowledge supported by high-quality resources.

4. Develop an effective pedagogy to deliver in a range of settings

There is a need for critical engagement with not just the content taught but also the method of teaching. There is a need for the close alignment of pedagogical approaches with specific curriculum subjects and the social context of the learners. School leaders and teachers should reflect on their confidence in their pedagogical approaches to best support the effective teaching of sustainability and climate change-related education. This should include teaching in settings beyond the classroom, acknowledging the demands of these spaces.

5. Invest in the long-term impact of professional development

In some cases, teacher confidence in this complex subject matter may be low. In order to deliver

sustainability and climate change education that produces a lifelong impact on learners, effective professional development is key. To achieve this, school leaders must acknowledge that impact will only be achieved over time.

6. Leverage the value of partnerships and outreach programmes

The potential benefits of working collaboratively are vast and we wholeheartedly encourage the development of long-term relationships that recognise the needs of the educational setting and its learners. There is a clear role for the business and charity sectors in preparing children and young people for the world of work and showcasing effective sustainability in action, and this best practice is achieved through dialogue and curriculum focussed support. These sectors must not underestimate the value they bring and the potential they offer in terms of role model diversity.

7. Identify and overcome barriers to implementation

We have identified the challenges associated with each of the key themes throughout this report. We are very much aware that, with increasing pressures on time and budget, it is difficult for education settings to introduce yet more content into their teaching. It is essential for leaders to allow time for effective implementation through resourcing and a strategic plan to create secure infrastructure. We know that there is no easy answer to these issues raised. However, we are resolute in the need for them to be addressed with some urgency.

8. Critically evaluate and improve impact over time

Embedding sustainability and climate change education into curricula is not a short-term action; it is an approach that will need to be developed as knowledge, resources and statutory teaching requirements evolve. There needs to be an effective evaluation of the impact of the integration of sustainability and climate change education which considers short, medium and long-term assessments and monitoring. This should focus on the knowledge, attitudes and behaviours of learners.

In this report we have outlined the views of many stakeholders and positioned a need for meaningful change through the coherent and considered implementation of a strategy to support this. We recognise the pressures within the education system and have attempted to be pragmatic and realistic in our recommendations. The reflections and recommendations within this report have the ability to support a sustained approach to the teaching of the global issues raised within it and we are optimistic that there can be a positive change with a collective commitment to this framework.

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