Essential Subject Knowledge for Primary Teaching

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Chapter writing guidelines for contributing authors

Introduction
Primary teacher training courses are busy. Trainees cover both 'core' and 'foundation' curriculum subjects in all courses (compulsory). Developing secure subject knowledge for teaching is a core part of training to be a primary school teacher. The teaching time that trainees receive for foundation subjects is not enough. This is due to the curricular demands of the course (there is a lot of content to cover). Nonetheless, trainees need more support to understand the nature of each subject, how the subject developed and the key knowledge they need to teach it.
This book will provide a learning resource for lecturers to recommend. One that provides readers with a deep understanding of the nature of all curriculum subjects and a foundation in essential subject knowledge.

All curriculum subjects will be covered (in alphabetical order), with a chapter on each. Chapters will be equal in length and depth. All subjects will thus be given equal priority. All chapters consider how knowledge is constructed in each subject and how we can start to re-think this and bring in new perspectives.

How will it appeal to trainees?
It a 'one stop shop' that covers the whole primary curriculum. The text they need to 'get to grips' with all subjects and to ensure that they have a foundation of subject knowledge across the curriculum. It will build on the content developed on their courses and enable further thinking and learning opportunities in each subject. Tutors will recommend the book as a tool to ensure that trainees have a full, broad and balanced understanding of all curriculum subjects.

Summary of chapter requirements

- Chapters should be 6500-7500 words in length.
- Links to the CCF should be included at the start of chapters.
- Please see structure guidance below. Chapters should be written in this structure.
- Note that the subheads in blue are required subheads. We hope that this standard structure will bring coherence to the book and will allow trainees to navigate the content with ease.
- Chapters should include required pedagogical features (see below).
- Please include all references at the end of the chapter (Harvard referencing).

Pedagogical features

Chapters in this section must contain:

- Key words
  A list of 5-10 key words for the chapter. This is useful for signposting readers and also for indexing and for search terms online.
- Links to the CCF

Include reference to how the CCF links in with the subject knowledge of your subject. Do include direct quotes from the CCF here if needed. Should list which of the 8 areas the chapter links to and how.

- Reflective question (boxed feature)
  Aim to include at least three of these in all chapters (in any sections, but I imagine that they would work best in part 1). These are simple questions to prompt the reader to think critically. Questions designed to encourage trainees to re-evaluate their understanding. These questions do not need answers. The text should aim to guide the reader in their thinking around the question but should not seek to 'answer' it.
- References

<u>Chapter structure</u>

Chapter title –

↓ Sustainability and Climate Change Education

Chapter author biog –

Nasreen is an Associate Professor of Education at the University of Reading. Previously, she was a primary teacher, predominantly working in urban settings across London and the South-East. She has two years of international teaching experience at the British School in Jakarta, Indonesia. Nasreen was an Advanced Skills Teacher for Mathematics and Science (AST). Nasreen is currently leading on a portfolio of work on climate education and sustainability at the Institute of Education, University of Reading. She has developed a framework for climate education and sustainability for trainee teachers. Nasreen has conducted research in teacher and pupil perceptions on climate change. This research will be drawn upon to frame the current thinking in the field.

50-100 words

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Key words –

Climate, climate change, climate action, sustainability, climate justice, agency, competences, authenticity.

5 to 10 words

Links to the Core Content Framework

ITT Core Curriculum Content Please add up to 3 per chapter.

High Expectations (Standard 1- 'Set high expectations')	
CCF: *LEARN THAT*	**CCF: *LEARN HOW TO***
6. High-quality teaching has a long-term positive effect on pupils' life chances, particularly for children from disadvantaged backgrounds.	• Seeking opportunities to engage parents and carers in the education of their children (e.g. proactively highlighting successes) with support from expert colleagues to understand how this engagement changes depending on the age and development stage of the pupil.

How Pupils Learn (Standard 2- 'Promote good progress')	
CCF: *LEARN THAT*	**CCF: *LEARN HOW TO***
1. Learning involves a lasting change in pupils' capabilities or understanding. 3. An important factor in learning is memory, which can be thought of as comprising two elements: working memory and long-term memory.	Build on pupils' prior knowledge: • Discussing and analysing with expert colleagues how to sequence lessons so that pupils secure foundational knowledge before encountering more complex content. • Discussing and analysing with expert colleagues how to identify possible misconceptions and plan how to prevent these forming.

Subject and Curriculum (Standard 3- 'Demonstrate good subject and curriculum knowledge')	
CCF: *LEARN THAT*	**CCF: *LEARN HOW TO***
1. A school's curriculum enables it to set out its vision for the knowledge, skills and values that its pupils will learn, encompassing the national curriculum within a coherent wider vision for successful learning. 5. Explicitly teaching pupils the knowledge and skills they need to succeed within particular subject areas is beneficial.	Deliver a carefully sequenced and coherent curriculum by: • Observing how expert colleagues ensure pupils' thinking is focused on key ideas within the subject and deconstructing this approach. And - following expert input - by taking opportunities to practise, receive feedback and improve at: • Providing an opportunity for all pupils to learn and master essential concepts,

	knowledge, skills, and principles of the subject. • Ensuring pupils have relevant domain-specific knowledge, especially when being asked to think critically within a subject.

Classroom Practice (Standard 4 'Plan and teach well-structured lessons')	
CCF: *LEARN THAT*	**CCF: *LEARN HOW TO***
1. Effective teaching can transform pupils' knowledge, capabilities and beliefs about learning. 2. Effective teachers introduce new material in steps, explicitly linking new ideas to what has been previously studied and learned.	Plan effective lessons by: • Observing how expert colleagues break tasks down into constituent components when first setting up independent practice (e.g. using tasks that scaffold pupils through meta-cognitive and procedural processes) and deconstructing this approach. And- following expert input - by taking opportunities to practise, receive feedback and improve at: • Enabling critical thinking and problem solving by first teaching the necessary foundational content knowledge Model effectively by: • Discussing and analysing with expert colleagues how to make the steps in a process memorable and ensuring pupils can recall them (e.g. naming them, developing mnemonics, or linking to memorable stories). Stimulate pupil thinking and check for understanding by: • Discussing and analysing with expert colleagues how to consider the factors that will support effective collaborative or paired work • Receiving clear, consistent and effective mentoring in how to provide scaffolds for pupil talk to increase the focus and rigour of dialogue

Reflective questions

What is your positionality as a trainee teacher in the teaching of sustainability and climate change education?

What is meant by climate justice? How can climate justice be explored at local level to inform global change?

What does personal action mean to you? How can you build opportunities for your pupils to empower them to take personal action towards a sustainable life?

(questions adapted from Climate Education and Sustainability Framework (Majid et al., 2022)

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Part 1: Exploring sustainability and climate change education

It is said that teaching is a calling and many of us pursue the role because we want to make a different to young people's life. This chapter is unique in its framing of subject and pedagogical knowledge for trainee teachers in sustainability and climate change education. Climate change is the most pressing problem of our time and as a trainee teacher, you are at the forefront of this debate. As a future educator you can inform discussions and policy on changing the curriculum provision in England to embed sustainability and climate change education as a golden thread across all subject.

The existing knowledge in the area needs reframing to support you, as busy trainee teachers and indeed also support busy teachers in England, to support the building of professional learning in the area. Hence, this chapter aspires to provide historical context, linked to education in the context of the sustainability and climate change debate. How it has evolved over time and how you can be supported to build competences and capabilities to teach sustainability and climate change education in an authentic way that intersects all aspects of the English National Curriculum.

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What is sustainability and climate change education?

Climate scientists have been warning of the climate emergency for decades. The comprehensive Intergovernmental Panel for Climate Change (IPCC) reports have brought the science of the climate emergency to the forefront and what actions must be taken to reduce our carbon emissions(IPCC;, 2021). Therefore, the knowledge in the area is vast and trainee teachers need guidance and clear support frameworks to enable them to develop agency in teaching about climate change.

UNESCO's competences for sustainability and the Sustainable Development Goals (SDGs)provide a structured framework to support pupils to develop knowledge, skills and understanding for living sustainable lives (UNESCO, 2017, UNECE, 2012). The notion of 'being' a global citizen is at the heart of developing these skills. This chapter will, therefore, go deeper into the subject and pedagogical knowledge and skills required to nurture trainee teacher's agency for the teaching of climate education and sustainability in an authentic and sustained way. Providing authentic opportunities to develop this work both from the trainee teacher and pupil perspective is essential in gaining lasting impact. Principles set out on 'forms of authenticity' by Barwell and Hauge (2021) will be drawn upon to facilitate understanding in fostering authenticity in the teaching of climate and sustainability.

100-200 words

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Why sustainability and climate change education is in the National Curriculum (note sustainability and climate change education is not explicitly set out in the British National Curriculum- I will discuss this in the section to frame how this work could be thread through the teaching across primary schools)? – *Short paragraph to cover this. Do refer to the wording in the National Curriculum itself (permission not needed to quote this).* 100-200 words

Sustainability and climate change education does not feature explicitly within the Primary National Curriculum in England (DFE, 2013). Aspects are featured in the science and geography provision. In Key Stage 1 pupils learn about the weather, drawing upon the seasons and daily weather patterns. In science they explore habitats, thus drawing upon adaptation of plants and animals within their habitats. At Key Stage 2, in science, pupils learn about climate and habitats of plants and animals and how environments can change. Additionally, in geography, pupils learn about climate zones. This level of work does not explicitly feature the principles of sustainability and climate change and how to build habits for a sustainable future. Therefore, there is a push to thread through the principles driving sustainability and climate change education throughout the entire curriculum. This golden thread would aim to support pupils in developing their competences of 'ways of thinking, ways of practicing and ways of being' (AHE, 2021). In a recent survey (Majid, 2022), teachers shared their views on climate change and how they teach about it in schools. When asked which subjects teachers fit climate change work; geography and science were the most common answers. A handful of teachers discussed a more holistic approach on developing this work through the framework of eco-schools and forest school provision. However, these approaches are ones that schools invest into themselves and not necessarily centrally funded to build knowledge, skills and understanding of sustainability and climate change education. Therefore, there is a gap, and this chapter aims to support trainee teachers to understand how sustainability and climate education principles can be thread through all aspects of their curricular provision.

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How has 'knowledge' in sustainability and climate change education developed over time? – *This section is an opportunity to demonstrate that knowledge in the subject is decided upon and changes over time. It is a social construct that evolves and reshapes to consider seminal and contemporary trends. Here, do encourage trainees to think about the things that are not included in the generally accepted 'canon', as well as the things that are. Chapters should provide a clear statement acknowledging the western construct of their subjects' knowledge and explore why trainee teachers should engage in understanding that significant changes must be made in the curricular to acknowledge this construct and reshape the content.*

Perhaps knowledge in your subject is seen differently now than it was a few years ago? Perhaps it is changing rapidly?

It is important in this section that you discuss decolonisation. This whole section should be framed with this in mind. What questions should you pose to the reader to get them to think about this? What assumptions about your subject content should you encourage readers to challenge? 500-700 words

This chapter sets out to frame sustainability and climate change education within the parameters of the National Curriculum for England. The chapter will share an insight into the historical context into this area and how trainee teachers can build their subject and pedagogical knowledge to teach this area authentically.

Sustainability and climate change education has not featured in official curricular in England and therefore the subject and pedagogical knowledge and conceptual ideas cannot be critiqued with a chronological lens. Key international milestones will be drawn upon to understand and frame sustainability and climate change education.

The United Nations first discussed the environment over 50 years ago at its 1972 summit entitled 'Conference on the Environment' (UN, 1973). This led to key principles being adapted by nations to address the environmental emergency. Teacher training was mentioned in this report in recommendation 96C (UN, 1973). Similarly, the Earth Summit, held in Rio in 1992 set out a plan on sustainable development, including training for teachers, entitled 'agenda 21' (UN, 1992).However, 50 years on, the embedding of training for teachers and trainee teachers on environmental issues has not been achieved. Similarly, in the Paris Agreement, article 12 specifically shared the need for 'climate change education, training'(UNFCCC, 2016). Significant mobilisation of 'Education for Sustainable Development' (ESD) principles was achieved during the decade (2005-2014) of ESD (UNESCO, 2022). However, the impact was short lived and in the most recent IPCC AR6 [III]report (Mitigation of Climate Change) states that "Changing from a commercialised, individualised, entrepreneurial training model to an education cognizant of planetary health and human well-being can accelerate climate change awareness and action"(IPCC;, 2022a). In the recent government strategy on sustainability and climate change, the government sets out their key vision to become 'the world-leading education sector in sustainability and climate change by 2030, with an emphasis on 'support for teachers' (DFE, 2022). Therefore, introducing further curricular content in teacher training courses, specifically targeting the climate emergency and sustainability education is a step in the right direction.

Structures used to develop sustainability and climate change education are not standardised and hence there is no clear way to monitor the effectiveness. UNESCO, through their work in the decade for sustainable development have tried to establish frameworks such as the Millennium Developing Goals and the Sustainable Development Goals and there are emerging curricular in supporting teachers and schools in developing

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Sustainability and climate change education now – *a brief look (paragraph) at current themes and topics in your subject. Also, a chance to look at any differences in an understanding of this subject across the world.* 500-800 words

Sustainability and climate change education has gained much momentum over the past 5 years. The global pandemic, alongside the visible breakdown of our climate has heightened the need to put decades worth of policy into action. Many definitions exist for ESD. There is no consensus and developing a standardised definition is problematic. Cultural, historical, socio economic and local differences must be taken into consideration when thinking about ESD. For this chapter the definition adopted by the United Nations in their 1987 'Our Common Future' report will be used as a standardised understanding. The United Nations define ESD as:

"*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs*." (WCED, 1987)

Another vital aspect of sustainability and climate change education is how our consumption in the global west may be having a detrimental effect on the global south. This idea links directly to living more sustainably. Therefore, developing skills that support pupils to look at their consumer habits through fact finding around e.g. how items of clothing such as jeans are made or the carbon footprint of their lunch box items can supports pupils' critical thinking and questioning of where the products they are consuming come from. This level of work in schools also builds on the notion of consuming less and supporting local enterprises.

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What might knowledge in sustainability and climate change education look like in the future? – *a short section (paragraph) to consider this. What is next for your subject? It might be that this section is a series of questions posed to the reader – which his fine.* 100-300 words

The knowledge constructs around sustainability and climate change education will continue to evolve and change. One vital component that would be welcomed by teachers is the clear introduction of sustainability and climate change education, as a strand within the National Curriculum. Trainee teachers should develop their subject knowledge in the area by using resources such as the IPCC reports to gather peer reviewed knowledge in the field. UNESCO's Office for Climate Education (CCE) provides excellent resources to support training for teaching. This is an underutilised resource and schools are encouraged to tap into this to support their knowledge, skills, and understand of sustainability and climate change principles. E.g. a recent resource for teachers explaining the IPCC report on 'climate change and land' is broken down in an accessible way for teachers. The facts from the IPCC report on Climate Change and Land are broken down in a an accessible format with summary statements as well as classroom activities that teachers can tap into. This resources in one of many available on the CCE website. (Connors et al., 2021)

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Part 2: Foundation knowledge in sustainability and climate change education 3000 words

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This section is a chance to look at key foundation knowledge that trainees need to teach the National Curriculum. Of course, this will differ subject by subject and thus there is no prescribed structure here.

Perhaps a long list of facts is appropriate? Perhaps a knowledge organiser with some key facts? Perhaps a timeline? Perhaps some definitions? Perhaps summaries of processes (science)? Perhaps a list of materials and approaches? Really, this depends on the subject. It should not, however, be just prose. Have a think about how the knowledge can be structured and presented. A 'fact file' approach/collection of key information is what we are looking for.

Focus on skill sets that frame the knowledge acquisition for a particular subject. Acknowledge any tensions faced with one's own philosophical positioning within the subject and constraints put through curricular content and school structures. How can trainees navigate these to support quality provision?

Note – Images may be needed in this section.

As sustainability and climate change education is not explicitly taught through the programmes of study of England's National Curriculum, this section will set out approaches to learning to support trainee teachers in developing key aspects of climate and sustainability education in their settings. Therefore, this section will start by sharing three core learning aims and outcomes for sustainability and climate change education. It will then go onto share pedagogical approaches that can be used to develop sustainability and climate change education. Up to date research will be drawn upon, including a co-created manifesto (BERA, 2021 , Dunlop et al., 2022) to shape the thinking in this section.

Proposed aims and learning outcomes for sustainability and climate change education

Knowledge	Attitudes, values and behaviours	Competences and capabilities
1. Understanding of the causes and consequences of climate change- having a global and local perspective. (IPCC;, 2022b, IPCC;, 2021, IPCC;, 2022a). Know and understand the term 'Anthropocene'. 2. Linking climate change to sustainability education and creating a solution-based approach to developing this knowledge and skills. 3. Have an emphasis on social and environmental justice- teaching the impact our actions can potentially have on the most marginalised in society. 4. Building awareness of climate solutions through focused research on 'how' to affect change. E.g. insight into sustainable practices at a local,	1. Consider your positioning as a trainee teacher and future educator- how will your attitudes, values and behaviours towards sustainability and climate change education affect the way you engage learners. 2. Consider ethical issues driving the climate debate- e.g. how the consumption habits of the Global North have an impact on the most marginalised populations (Thew et al., 2021) 3. Develop an understanding of the Sustainable Development Goals (SDGs) and how this framework can support you're attitude, values and behaviours and that of your pupils to teach "approaches that cultivate knowledge	1. Engage with competences that will enable trainee teachers to 'critically engage with new information as it emerges and to recognise and advocate against denialism and fatalism' Thew et al. (2021). 2. Engage with UNESCO's key competences that shape trainees' ways of thinking, ways of practising and ways of being for sustainability: 3. Ways of Thinking • Systems thinking competency • Anticipatory competency (future thinking) • Critical thinking competency • Ways of practising • Strategic competency • Collaborative competency

national, and international level. "Act locally, think globally"	and global citizenship, while preparing students for curious well- informed lives" (UNESCO, 2017) 4. Use the BERA manifesto- co-creating with young people, teachers, and researchers to promote shared attitudes, values, and behaviours in the teaching of sustainability and climate change education (Dunlop et al., 2022, BERA, 2021)	• Integrated problem-solving competency • Ways of being • Self-awareness competency • Normative competency 4. Support pupils in developing routes into climate action. This will support the development of resilience and wellbeing and reduce eco-anxiety. Draw upon the work of Walshe et al. (2022) to support the development of eco-capabilities through nature connectedness.

Table 1: Adapted from Thew et al. (2021) and Majid et al. (2022)

The above aims and learning outcomes are shaped to support trainees in building their knowledge, attitudes, values, behaviours, competences, and capabilities. These six areas will support trainees in understanding how to develop content to support their pupils in understanding the core principles of sustainability and climate change education. The pedagogical approaches will share concrete examples on how these aims and learning outcomes can support pupils learning outcomes for sustainability and climate change education.

Systems Thinking

The notion of systems thinking and a systems approach is a core principle driving all aspects of sustainability. Therefore, understanding how to develop a system's thinking approach for all aspects of sustainability and climate change education is vital for successful engagement and change.

Simply put, a system is a sum of its component parts where each part works within the system to achieve set objectives. A systems approach seeks to look at a problem as a whole system, seeing how different parts of the system interact and hence influence each other. Therefore, a systems approach is a powerful way to monitor and understand the causes and effects of our actions within a system. A systems approach requires individuals to identify parts of a systems to understand their interconnected relationships. Systems thinking also requires anticipatory thinking, where individuals use the evidence gathered within a system to model how behaviours may change or respond to a modification. Therefore, a systems' thinking approach is integral in shaping pupil understanding of the complex aspects of our climate emergency. E.g., schools can engage in carbon literacy project to firstly understand how the school works as a system and pupils can then use this information to model ways of reducing the school's carbon emissions by looking at local produce for the school canteen or reduction of food waste etc. This would lead not only to an improvement and efficiency

in the school's use of resources but more importantly would collectively support the reduction of emissions locally and nationally. A 'systems thinker positions themselves so they can see both the forest and the trees and keep one eye on each'(Richmond, 1994).

Pedagogical approaches that can be used to develop sustainability and climate change education

(i)Teacher Positionality	**(ii) Climate Justice**	**(iii)Climate Action- personal and collective.**

Table 2 illustrates titles of sessions that trainee teachers could develop, over time to support the development of sustainability and climate change education (Majid et al., 2022)

It is suggested that trainee use the outlined model in table 2, adapted from Majid et al. (2022) to deliver sustainability and climate change education. It is worth noting that understand one's own positionality within this work is vital to build confidence and secure subject knowledge in teaching the complexities of sustainability and climate change education. The area of climate justice has a key part to play in this field as climate justice cuts across all aspects of life on a local, national and international level. Our histories are intertwined and hence in a post -colonial world, the reshaping of reality must acknowledge the inequalities faced by many due to the legacy of colonial practices. Research shows that this is a particularly complex area of teach due to the emotive and controversial nature of the discourse. Teachers are reticent to engage in such debate and thinking within the classroom so as not to come across as 'preachy'(Majid, 2022). Therefore, teachers need appropriate instruction and resource to teach this area well. Finally, climate action is put forward as a third and arguably most important component of pedagogy to support pupils to take action to live more sustainable lives. Each section from table 2 will now be taken individually to provide context on how these complex ideas can be shaped and taught authentically to primary pupils.

(i) Teacher Positionality

Teacher identity is complex and evolves and develops over time. The notion of positionality is valuable to understand what knowledge, understanding and lived experiences have been experienced to help shape a trainee's teachers understanding of sustainability and climate change education. This starting point can then be used to start discussions with pupils on sustainability and climate education. There are many ways to build this approach, examples are shared in table 3.

Activity	How this will support pedagogical insight	Examples of types of activities.
Showing video footage.	Videos are a great way to start conversations to engage pupils and to assess their insight and understanding into the complexities of sustainability and climate change education.	David Attenborough's Witness Statement. Newsreel from Newsround on recent climate breakdown news (UK temperatures on Tuesday 19th of July 2022) Sharing Dr Ella Gilbert's videos, explain complex climate science in a way

		that can be easily understood.
Understanding what 'Anthropocene' means sharing the team and its etymology with pupils	Discuss Anthropocene is an unofficial term used to describe the period of rapid change over the past 50 years that has resulted in significant changes to the earth's climate. Do consider framing this carefully as it is not an officially recognised term across the scientific world. Therefore, scientists are still debating this.	Share the etymology of Anthropocene originates from the Greek terms for human:(anthropo) and new (cene). (Crutzen and Stoermer, 2000, Waters et al., 2014, Ruddiman et al., 2015, Edwards, 2015) As the debate continues whether this era in the earth's history should be called the Anthropocene, it could be out to a class to debate, using evidence they have gathered from a range of sources. As a teacher, you could play 'devil's advocate' in substantiating the claims or dismissing them.
Using imagery to start conversations about sustainability and climate change education	Use the 'Climate Stripes' to understand the change in global temperatures since the late 1800s.	Use the climate stripes (Hawkins, 2021)

Table 3: sharing activities linked to developing positionality in developing foundation knowledge in sustainability and climate change education

(ii) Climate Justice

Climate Justice is an integral component of foundational knowledge in understanding sustainability and climate change education. The intersectionality of climate justice and how our actions impact on others plays a key role in building knowledge and understanding of the complex domains of sustainability and climate change education. The understanding of climate justice reinforces the notions of a systems thinking approach to understanding the complexities of sustainability and climate change education.

Trainee teachers are encouraged to look up The Sustainable Development Goals (SDGs) as set out by the United Nations (UN;, 2015). There are 17 goals that intersect and provide a framework to empower each citizen of the world to come together to enable a more sustainable approach to living. The 17 goals are underpinned with 169 targets and 232 unique indicators. Trainees are encouraged to study the SDGs carefully and use the goals as a framework to develop conversations about sustainability and climate change education. Table 4 provides examples of building climate justice into your curriculum.

Activity	How this will support pedagogical insight	Examples of types of activities.

Introducing the SDGs	This is a global framework to embed sustainability and climate change education. Therefore, understanding the 17 goals, the 169 targets and 232 indicators will build trainee teachers' foundational knowledge. Look at the SDGs as 17 key societal indicators that act like a system- how does one interrelate to the other and link up as a system. Therefore if we have a positive impact on one SDG, this can have a knock on positive on another. However, if we have a negative impact on one SDG through our action, this can have a detrimental effect on others.	Trainee teachers are encouraged to make links with their local Development Education Centre. Details canbe found here: Consortium of Development Education Centres (CoDEC). Firstly introduce the SDGs to students- this can be done via: • Whole class discussion, each table is goven a couple of SDGs to look into and then share their research back to the class. • Develop a learning trail across the school grounds with the SDGs- pupils walk the trail to start developing an understanding. The trail can act as a continuous learning resources outside of class time for pupils to embed their understanding of the SDGs. • As a whole school approach- chooses the most relevant SDGs and link them with each year group- this way each year group will focus on one SDG and look at it, over an academic year, in depth.
Oxfam Resources	Have a look at the comprehensive set of resources, developed by Oxfam on Climate Justice and use these to develop pupil understanding	Look up the comprehensive range of resources from Oxfam (2022)to develop a layered and progressive insight into climate justice issues across the globe.
Using imagery	Use imagery to debate and make sense of the complex issues around climate justice	Use images from The Guardian to look at food consumption from around the world to debate distribution of

		resources, ethics and fairness of this (Menzel, 2013)
Indigenous practices	Much can be gained from the knowledge and insight that indigenous people hold. At COP 26, indigenous communities had a platform to inform conversations to find sustainable solutions to achieve the Paris Agreement. Therefore, understanding the voice of indigenous communities will support the shaping of knowledge and understanding of work on climate justice.	Introduce the word indigenous and get pupils to provide insight into what they think this means. Can they give examples of people they might know identify as coming from indigenous communities. Why is the knowledge of indigenous communities important in tacking climate change and living more sustainably. Case study on a chosen indigenous tribe to provide greater depth in pupil understanding of the skills, knowledge and understanding that can be gained from the community. Have a focus on climate activists from indigenous communities such as Carlon Zackhras from the Marshall Islands.

Table 4: sharing activities linked to climate justice in developing foundation knowledge in sustainability and climate change education

Climate Action- personal and collective

There is growing evidence that young people are experiencing 'eco anxiety'(Dunlop et al., 2022, Whitehouse and Jones, 2021), where they share a concern for the planet and yet feel quite at odds in what actions they can take to support a more sustainable future. In a recent study Majid (2022), the data suggest that pupils did share anxiety around the climate breakdown but positively did go onto list ways they can take actions to build more sustainable lives. Actions such as planting more trees, walking more rather than driving to places and having more meat free meals, were some examples shared. Therefore, it is integral to build concrete ways to support pupils to take action to build more sustainable lives. This will not only support the building of sustainable habits but also supports pupils in engaging in solutions and direct actions to combat the climate emergency. One way to facilitate this is engaging pupils with nature to develop sets of skills that build resilience, nature connectedness and support pupil wellbeing. The recent work on eco-capabilities, developed by Walshe et al. (2022) supports the notion of using nature and the arts to build 'eco'capabilities' that engage pupils in becoming more resilient whilst taking action to build a more sustainable future.

Activity	How this will support pedagogical insight	Examples of types of activities.
Using the school outdoor space	Using the outdoor space as nature trails- linking this to any aspects of the learning, set out by the National Curriculum to support building of 'green skills'	• Developing an eco-trail around the school to support science work on biodiversity. • Rewild parts of the school estate to support reintroduction of wildlife- Watch the growth, over time and the repopulation of the area, over time. The data collected could be used in mathematics and science lessons.
Using the school outdoor space	Growing own food- using the seed to crop concept to facilitate learning in all aspects of the National curriculum	• Monitor the growth of seeds for science • Look at the crop yield by using different types of organic fertilisers- different approaches to growing (e.g. no dig method).
Carbon literacy projects	Utilising data from the school site to support the school to become net zero. This approach support pupils in developing skills they can transfer to their everyday life and future sustainable practices.	• Facilitate this through a structured programme such Green School Project.
Getting involved in charity work	Engaging with global issues through charity work. This will elevate the work from a local level to national and international action	• Pupils could get involved in rewilding local spaces through getting involved with ecological groups locally. • Pupils could fundraise to plan trees internationally or help clean up oceans.

Table 5: sharing activities linked to climate action that can be taken at a local level to develop foundational knowledge in sustainability and climate change education

My final through in this section is the engage your pupils and get them involved to support you in co-constructing curriculum outcomes. Emerging evidence in sustainability and climate change work demonstrates that engaging the young generation is vital to develop approaches that will have long term impact. I would therefore ask that you read Dunlop et al. (2022) manifesto sharing how the pupils can be supported to engage in environmental issues and support the development of curricular content. Although this manifesto was con-constructed with secondary pupils, the principles are very relevant for all age groups.

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Part 3: Understanding the development of children's knowledge in sustainability and climate change education 1000-1500 words

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This section should start with a brief explanation of the purpose of the section – to show trainees how their subject knowledge is important to enable them to plan properly sequenced units of learning and teaching. Perhaps it would work to include a reflective question here – 'How can you learn about xxx, before you understand xxx?'

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Include an example of a sequence of lessons that shows how children's knowledge acquisition should be carefully planned and considered. Framed under headings - Year group; example of learning; skills developed; next steps.

Sustainability and climate education are emerging areas for primary schools and as such there are no statutory guidelines in the progression of knowledge and skills across the primary age range. However, as demonstrated in Table 1, broad scaffolded structures can be deployed to support the development of knowledge, attitudes, values, behaviours, competences and capabilities. It is advised that trainee teachers draw upon the Programme of Study in each subject area they wish to embed sustainability and climate education and see how the progression of skills can be achieved. The example in Table 6 illustrates how the area of nature connectedness can be explored across the primary age range.

Example:

Year Group	*Learning outcomes*	*Activities to develop the skills and understanding*	*Next steps*
Year R	*Building nature connectedness through using the outdoor space for learning outcomes.*	*Nature trails- walks outdoors and connecting wit the natural space. Using the materials collected to build display and create artwork.*	*This approach could be used to build collaborative art work e.g. a class nature collage.*
Year 1	*Building nature connectedness through using the*	*Building science knowledge of common plants during outdoor learning opportunities.*	*Using the senses to explore feelings- what can you see, hear,*

	outdoor space for learning outcomes.	*To be developed throughout the year to compare and link with seasonal change.*	*smell, feel in the outdoor space.*
Year 2	*Building nature connectedness through using the outdoor space for learning outcomes.*	*Develop work on habitats, understanding key aspects of habitats and how animals and plants co-exist. How we impact on habitats and what we can do to reduce this impact.*	*Use the local detail around habitats and explore broader habitats such as the oceans- how marine life is impacted from climate change and what we can do to build awareness.*

Table 6 illustrating how a sequence of lessons can be developed on nature connectedness.

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Part 4: Developing your knowledge of sustainability and climate change education further 500-1000 words

Some reading to support your development:

This book provides a contemporary lens from climate activists across the world on their vision for a better future.

The Children of the Anthropocene: Stories from the Young People at the Heart of the Climate Crisis. by Bella Lack (Author)

If you wish to develop a deer insight into indigenous knowledge and the work they are doing to support the work on social and climate justice, this is a good read.

As Long as Grass Grows: The Indigenous Fight for Environmental Justice, from Colonization to Standing Rock by Dina Gilio-Whitaker

Open Online Courses

Communicating Climate Change for Effective Climate Action- University of Glasgow

https://www.futurelearn.com/courses/communicating-climate-change-raising-engagement-for-climate-action

This site gives you details of all online courses available on climate change

https://www.my-mooc.com/en/categorie/climate-change?search%5Blocale%5D%5B0%5D=en

The UN E Learn platform on Climate Change has a range of courses you could take to further your knowledge and understanding.

https://unccelearn.org/

Websites recommendations

University of Reading's Partnering for the Planet site has a range of resources for both primary and secondary teachers to support the development of sustainability and climate change education.

https://www.reading.ac.uk/planet/

The Green Schools Project – this is an excellent organisation supporting schools in developing carbon literacy. You can certainly get their support to build carbon literacy skills with your pupils.

https://www.greenschoolsproject.org.uk/

Earth Warriors is a site that supports teachers with developing climate and sustainability education using the outdoor space. There is a cost involved in using their resource but it is worth a mention here.

https://www.earthwarriorsglobal.com/

United Nations site for climate change

https://unfccc.int/

UNESCO's Office for Climate Education- this is an excellent site with a range of free, accessible resources for teachers

https://www.oce.global/en/resources/ipcc-summaries-teachers

Specialist organisations to be part of

Eden Project Change Makers CPD- there is a cost involved with this. Details can be found here

https://www.edenproject.com/learn/schools/teacher-training-and-school-development/eden-project-changemakers-cpd

Other helpful national resources

UCL Centre for Climate Change and Sustainability Education

I would encourage you to join the mailing list for this centre as they have a seminar series and will be providing free CPD for teachers. https://www.ucl.ac.uk/ioe/departments-and-centres/centres/ucl-centre-climate-change-and-sustainability-education

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This section is for you to share sources of further learning and information on your subject. Do start this section with mention of and information about subject associations.

This section will include listings of a number of websites.

Do include information about any recommended books. The books should be selected for their use in supporting trainees to build their own knowledge of the subject (it is not about children's learning).

Do include recommendations of films/television programmes that you would recommend for general interest in the subject. These can be fictional if they are appropriate. They do not all need to be documentaries.

There are a great deal of resources available to build the knowledge and understanding of climate and sustainability education. The details provided below share a selection that is hoped to provide further critical knowledge and understanding in the field.

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End the chapter with references (Harvard style please).

Breaking up the prose

Tables/lists/diagrams etc are a really good way of displaying learning. Some readers will get more from these than from the block prose. Do find opportunities in the chapter to display content in these different ways. Include bulleted lists and flow charts etc where you can.

The page design will include boxes, icons and other features. So, although we do not envisage that many images will be needed, the book will include visual content throughout.

A note on permissions

Please ensure that you look through the SAGE permissions guidance:

https://uk.sagepub.com/sites/default/files/sage_books_author_permission_guidelines_0.pdf

If you have any queries at all, please contact the Commissioning Editor (Amy Thornton). Please note also that the use of case studies almost always requires permission. Likewise, the use of examples of children's work will require permission. Please use anonymised/generated examples (not real) where you can to illustrate points.

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