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Abstract

Purpose: In England, climate change and sustainability education (CCSE) is predominantly taught with a focus on knowledge in school geography and science. However, whole-school approaches to CCSE exist which encompasses curriculum, campus, community and culture. Drawing on conceptualisations of the ecological approach to teacher agency we explored the ways in which the leadership of a whole-school approach to CCSE was implemented across four case study schools.

Approach: Four case study schools were identified as having implemented CCSE across the areas of classroom, culture, campus, and community, with opportunities to share good practice. During visits to each school, we completed a series of 15 interviews with teachers who had roles leading geography (n=4) and science (n=4) curricular; school leaders (n=4) and sustainability coordinators (n=3). We engaged with a range of school curricula and policy materials and toured each site.

Findings

At the heart of an effective approach to whole-school CCSE are leaders who create the conditions for teachers to achieve agency and enact curriculum making as a social practice. School leaders themselves are critical in ensuring the culture, professional norms and expectations are established and nurtured. Overtime, teacher are able to identify and create spaces of agency in relation to CCSE which reach beyond their immediate communities.

Originality

This research brings together teacher agency, curriculum making and leadership practices to better understand why some schools achieve agentic cultures as part of whole-school CCSE.

Keywords: climate change and sustainability education, whole-school approaches, teacher agency, leadership practices.

Introduction

Anthropogenic climate change and environmental crises are leading challenges of our time (IPCC, 2023). Such challenges have complex spatial and temporal impacts which underpin social, education and health inequalities. Concomitantly, education, including formally schooling, is widely recognised as an essential part of a just response to such inequalities. In England, climate change and sustainability education are predominantly focused in school geography and science curricula (Dawson *et al*., 2022), with an emphasis on learning the scientific facts of climate change reinforced in the Department for Education's recent strategy (X and Author 1, 2022). A recent survey of teachers' practices in England underlines the barriers they face in implementing climate change and sustainability education (CCSE), including lack of access to professional learning and limited

opportunities for learning beyond the classroom (Authors *et al.*, 2023). However, across England, some schools have embraced a whole-school approach to CCSE which encompasses the curriculum, the campus (including buildings, school grounds and operations), the community (including working with families and wider groups) and culture (including values of inclusion and care) (Lee and Scott, 2020). Such whole school approaches are recognised as valuable in bringing about change through education in the context of climate change and sustainability issues and concerns (Holst, 2023). Drawing on conceptualisations of the ecological approach to teacher agency (Priestley *et al.*, 2015; Author 1 and X, 2024) and leadership practices and professional norms (Leo and Wickenberg, 2013) we explore the ways in which the leadership of a whole-school approach to CCSE is implemented across four case study schools. This paper is guided by the following questions: *How do teachers experience constraints and enablers to agency in relation to whole school CCSE? What leadership practices foster teacher agency in the context of whole-school CCSE?* In response to these questions, we gathered insights from four case study schools which were identified as broadly enacting a whole-school approach to climate change and sustainability education. This included 15 interviews with teachers and school leaders, including science and geography teachers with middle leadership responsibilities for their subject, school leaders and sustainability coordinators. Data was also gathered from researcher field notes which included site tours and analysis of school materials including curriculum, policy, and website content. This study is timely as data collection occurred during 2022, prior to the implementation in September 2023 of a new England-wide sustainability and climate change strategy for education and children's services systems led by the Department for Education and published in April 2022 (DfE, 2022). This provides an important opportunity to explore existing practice in relation to whole school CCSE at the outset of the publication and subsequent implementation of the strategy. Through this research, we reflect on what can be learnt from the experiences and practices of teachers and school leaders which might support transformative whole school CCSE across the education system. Ahead of setting out our research design, we first consider the broader context of CCSE in secondary schools (for students aged 11–18 years) in England.

Context

CCSE in England

In England, Education is overseen by both the Department for Education, which mandates the National Curriculum and by two non-ministerial government departments, namely Ofqual (The Office of Qualifications and Examinations Regulation) which regulates the examinations student take and Ofsted, (The Office for Standards in Education, Children's Services and Skills), which inspects school and other education institutions including those involved in teacher education. Whilst the increase of publicly funded schools obtaining academy status means that these schools are independent of local government and do not have to follow the National Curriculum, these schools are still inspected by Ofsted and examinations students sit remain regulated by Ofqual. Climate change and sustainability are broadly located in secondary science (compulsory 11-16 years) and geography (compulsory 11-14 years) (Dawson *et al.*, 2022; Howard Jones *et al.*, 2021). The coverage and scope of climate change and sustainability in school education remains debated as some argue that the socio-economic impacts of climate change are only marginally considered at best and neither does the curriculum grapple with the political, social justice and action-oriented dimensions of CCSE (Dawson *et al.*, 2022; Howard Jones *et al.*, 2021; X and Author 1, 2022). This is problematic as teachers, young people and parents, value schools as a key place for CCSE (Howard-Jones *et al.*, 2021; Author 1 *et al.*, 2022; Gillow *et al.*, 2022).

In April 2022, after over a decade of policy silence, the Department for Education (DfE) published a non-statutory strategy focused on sustainability and climate change in education and

children's services systems (DfE, 2022). This includes a focus on 'Sustainability Leadership, where the strategy states: 'by 2025, all education settings will have nominated a sustainability lead and put in place a climate action plan', and 'we will encourage a joined-up approach to leadership which brings together children, young people and governors' (DfE, 2022, n.p.). Whilst the DfE strategy acknowledges the importance of schools accessing funding, sharing best practice, and developing networks, these priorities within the domain of sustainability leadership contrast with the priorities of teachers, teacher educators and young people (aged 16-18). These groups frequently underline the need for change within the National Curriculum so that CCSE moves beyond geography and science and a predominant concern with knowledge and 'learning the facts' about climate change (Author 1 *et al.*, 2022; X and Author 1, 2022).

Whole-school approaches to CCSE

Whole-school or whole-institutional approaches are recognised as valuable in bringing about change through education in the context of climate change and sustainability (Davison *et al.*, 2013; Holst, 2023). International non-governmental initiatives such as the Green Education Partnership (UNESCO, 2021) advocate an approach which encompasses the four areas of schools, learning, capacity and resilience, and communities. Over the last decade, whole-school approaches to sustainability have increasingly become a feature of school organisation and leadership, including in geographically and educationally diverse contexts from across the United States of America (see for example, Barr et al., 2014; Kensler and Uline, 2017; Seydel *et al.*, 2022). Ideas of integrating sustainability through leadership include creating and sustaining educational partnerships within school communities through a CARE approach, where all members of the school community (including students, teachers, parents) Cultivate and model Awareness, Responsibility and Empathy for their unique social and ecological context (Uline and Kensler, 2021). Uline and Kensler (2021) argue that such an approach enables school communities to develop a deep awareness of human and more than human species locally and globally, which enables empathy and leads to a sense of responsibility which prompts action.

In England, the National Association of Environmental Education (NAEE) highlights a whole-school approach to climate change and sustainability education as encompassing all aspects of school life (Lee and Scott, 2020). Such a whole-school approach is divided across four areas including: curriculum (across all areas of teaching and learning), campus (buildings, grounds, operations, policies, and budget), community (leadership, work with families and engagement with external groups at different scales) and, culture (inclusion and values) (Lee and Scott, 2020). Similarly, The British Educational Research Association (BERA)'s manifesto for Education for Environmental Sustainability (EfES) (Author 1 *et al.*, 2022), co-created by over two hundred teachers, teacher educators and young people (aged 16-18) also foreground whole-school approaches. This includes the important role of the 'campus' as a context for climate change and sustainability education and underlines the important role for school governors and leaders in bringing about change, including by appointing and empowering school sustainability leads. Concomitantly, recent research with teachers in England across a range of subjects underlines that whilst teachers recognised the importance of whole school approaches to CCSE (e.g. using the school grounds), they also report needed support to realise these opportunities as part of their practice (Authors *et al.*, 2023). Similarly, whilst many headteachers are broadly supportive of climate change and sustainability education, their priorities tend to rest elsewhere, particularly post-pandemic, and in the context of severe financial restraint on school budgets (Gillow *et al.*, 2022). Previous research which broadly considers educational leadership of sustainability education underlines the importance of distributed leadership, including that in university settings, which facilitates acts of

initiative, innovation, vision, and courage (e.g. Davison *et al.*, 2013) and in primary school settings, where distributed leadership supported networking and collaboration (Bennell, 2015). These findings underline the need to better understand how some schools in England create spaces of agency in relation to whole-school approaches to CCSE, and to explore the ways in which agency can be enabled and constrained, including the role of leadership.

Teacher agency and CCSE

Agency can be broadly understood as a person's capacity to act independently and make their own choices (Ruan *et al.*, 2020). Teacher agency has been the focus of policy makers across the globe (Biesta *et al.*, 2015; Jiang, 2021), with narratives of teachers as agents of change (Priestley *et al.*, 2012), resilient professionals who resist neoliberal agendas of accountability and performativity (Ball, 2003; Bartell *et al.*, 2019) and enactors of social justice (Pantić, 2015). Teacher agency has become a central concept in understanding teachers' practices and their responses to education policy reforms and encompasses their choices, goals and beliefs as enacted throughout their professional lives (Goodson, 2003). This current research is rooted in understandings of teacher agency as an ecological approach (Priestley *et al.*, 2015). Through the ecological approach, Priestley et al. (2015, p.30) articulated three dimensions of agency. Firstly, the iterational dimension, which draws on life histories and professional histories. Secondly, the projective dimension which includes both short and long-term objectives and aspirations. Thirdly, the practical evaluative dimension which identifies a range of resources including the cultural (ideas, values, beliefs, discourses), structural (relationships, roles, power, trust) and material resources (including the physical environment) (Priestley *et al.*, 2015). We suggest that these dimensions can support us to better understand the nuanced and overlapping ways in which teachers' agency can be constrained and enabled in the context of whole-school CCSE. More recently, Author 1 and X (2024, p.267) have underlined the spatial dimension of teacher agency where, 'teachers identify, move between and themselves create spaces of agency' as part of a non-linear entanglement of cultural, material and relational conditions made explicit in the ecological approach. Teacher agency through the ecological approach has previously provided a framework through which to consider individual teachers' experience of agency in relation to climate change education in England (Author 1 *et al.*, 2024). Through a study of 27 primary and secondary school geography and science teachers' experiences, Author 1 *et al.* (2024) underline the importance of school structures (including school leadership) and culture (ideas and values) in fostering teacher agency in relation to climate change education. Teachers highlighted the importance of opportunities for collaboration, within and across subjects and age-phases, involving parents, school governors and the wider community, and the value of both curricular and extra-curricular spaces for CCSE (Author 1 *et al.*, 2024). The importance of a shared vision across the school community, including school leaders was recognised as fundamental to enabling agency (Author 1 *et al.*, 2024).

In summary, the ecological approach to teacher agency, including how agency can be fostered in different spaces, provides useful conceptual frameworks for understanding why some teachers are able to achieve agency as part of whole-school approaches to CCSE in England, in the context of a new DfE strategy, whilst others are not.

Methods

This research aims to explore whole-school approaches to climate change and sustainability education in schools in England which have been formalised through a range of practices and roles including through appointing sustainability coordinators. These in-depth case studies include

exploring teachers' experiences of constraints and enablers of agency, and examining the leadership practices which teachers encounter in relation to whole-school approaches to CCSE. Consistent with our approach to this research, case studies involve the study of an issue through one or more cases within a particular setting, context, or system (Cresswell, 1998) here, four case study schools. Such an approach was appropriate when exploring in detail the complexity of both schools and climate change and sustainability education, including through the perspectives of teachers. Furthermore, this comparative case study approach enables analysis across different school contexts and the opportunity to explore and understand successful practices and distinct challenges which school encounter. The research was approved by an institutional Ethics Committee (25 May 2022) and voluntary, informed consent obtained from participants. The data collection methods and participants are described before outlining the analysis process.

Data collection

This research formed part of a larger study exploring whole-school climate change and sustainability education across eight schools (see Author 1 *et al.*, 2023). The eight schools were identified from the authors' network of schools and selected to provide a range of engagement with climate change and sustainability education. From these, four schools (Table 1) were identified as having broadly implemented CCSE across the areas of classroom, culture, campus, and community and therefore provided case studies which could generate insights for good practice. The four schools are located across England (east, northeast, west midlands) in rural and suburban areas, serving communities with low levels of socio-economic deprivation, as indicated by Income Deprivation Affecting Children Indices scores (IDACI) and low levels of pupils eligible for free school meals (Table 1). Student populations ranged from approximately 350 (School B) to over 2000 (Schools A and C). All schools are publicly funded, non-selective 'state' schools including three secondary schools (ages 11-18) and one middle school (ages 8-13). Three schools were academy schools which are independent of local government oversight and run by organisations with charitable status. As described above, this means that academies do not have to follow the National Curriculum however they are subject to the same inspection requirements and students in the main sit the same examinations as those attending local-authority controlled schools (Howard-Jones et al., 2021).

During on-site visits to each school (undertaken May-July 2022), we completed a series of 15 interviews (audio-recorded and subsequently transcribed, each lasting 30-60 mins) with teachers who had roles leading the geography (n=4) and science (n=4) curricular; school leaders (n=4) and sustainability coordinators (n=3). Through this approach, we sought to position our interview participants as 'knowing and approving experts' (Edwards and Holland, 2013). Interviews took the form of conversations with a purpose, rather than rigid schedules of questions (see for a recent example, Author 1 and X, 2024). This approach of hierarchical focusing (Tomlinson, 1989) involves commencing conversations with a prompt or general question from the highest level of the hierarchy (e.g. what to people understand climate change and sustainability education to include?) creates open dialogue and avoids leading questions. The purpose is to build rapport, elicit general discussion, after which the interview can progressively focus in on more specific topics, using prompts from lower in the hierarchy: mid-level (for example, what practices are people implementing (or not) in relation to climate change and sustainability education?) and low-level (for example, questions which focus in on aspects of specific practices including assessment and content selection and organisation).

We also toured the school site during each visit, guided by school staff including teachers, school leaders, sustainability coordinators and/or school site staff on walks which lasted 30-45 mins each. These conversations were informal and our reflections from these were captured in researcher fieldnotes written during and immediately following each visit. A key aim for these tours was to provide researchers with more of an opportunity to engage with the school environment and begin to develop a sense of place. Prior and following the school visit the research team engaged with a

range of school curricula and policy materials which were available on the school website. This included texts which outlined a school vision statement or ethos and school curriculum documents and varied depending on what was made publicly available by each school. Therefore, data collected for analysis included interview transcripts, researcher field notes, and curriculum policy and other website content publicly available on schools' websites (e.g. school vision statements, curriculum maps) (Table 1). Of the case studies schools, author one completed one school visit, authors three and four completed one joint school visit and the remaining two school visits were completed by author four.

[Insert Table 1 near here]

Data analysis

A conventional approach to qualitative content analysis (Hsieh and Shannon, 2005) was used through multiple rounds of analysis which took place individually and through group discussion. Researchers identified patterns of meaning across the dataset through process of abduction and retroduction (Edwards *et al.*, 2014) which included the creation of the interview transcripts, collation of the fieldnotes and notes from close reading of a range of documents which were shared across the team of researchers. This provided the opportunity to read the data set both as individual contributions and across the whole dataset. Next, a written summary of each item of data was created, including the identification of quotes recognised as significant, and were compiled in a shared document to further enable group analysis across the dataset. Then, open coding was undertaken of the data compiled in the shared document to identify findings and these were interrogated in the context of the literature which informs this research, including prior phases of research reported which was undertaken with children and young people (Author 1 *et al.*, 2023). This grounded, constructivist approach allows for the development of themes which are then brought into conversation with ideas from the wider literature (Charmaz, 2000). This open approach to identifying findings had the advantage of not imposing theoretical perspectives or the perspectives of other groups on the data. Authors ensured the conclusions were an accurate reflection of the interviews through discussion amongst researchers and by reviewing interview transcripts throughout the period of analysis.

Findings

Through our analysis, we identified three braided narrative strands (Wall Kimmerer, 2020) of effective whole-school CCSE. Firstly, a shared vision of CCSE as a core purpose of Education, secondly CCSE realised as a whole-school approach through curriculum making, and thirdly, schools enabling collaborative and generative spaces for CCSE. In reporting these findings, we broadly indicate whether the data comes from documents, teachers, school leaders or sustainability coordinators and from which school context.

A vision of CCSE as a core purpose of education

Across the four schools there was a clear sense that a core purpose of education was to enable children and young people to live in a world with much uncertainty and rapid change associated with the climate and environment. This was reflected both schools' public policy or vision statements which present one perspective on how schools conceptualise the value and purpose of education in their communities and contexts but also in the ideas and reflections of teachers and school leaders. For example, school policies included ideas of sustainability being integral to curriculum intent and therefore ensuring children and young people are 'fully prepared for the future on a rapidly changing planet' (Document, School B). Taking another approach, the Headteacher of School D

described how their school had declared a climate emergency, which communicated to the whole school community the importance and urgency of the situation, which required, 'everyone to address this together' (Headteacher) and was integrated in their school improvement plan as an overarching goal throughout the areas of culture and curriculum. Teachers also described how CCSE was a 'cultural pillar' of their schools' approach to education (School C), framing education as, 'understanding the world and the biggest challenge we face…climate change is a whole-world issue' and underlining that teaching climate change had become much more of 'a priority in amongst many priorities' in recent times (geography teacher, School A). At the same time, some teachers viewed CCSE priorities as consistent with their overarching priorities as a subject specialist, rather than perhaps being elevated. For example, a science teacher from School C reflected, 'we aim…that students can make informed decisions about science in the world around them…we don't hold climate science up on the pedestal because it is globally one of the important things that is a challenge for society…it just fits in with the rest.' Nevertheless, these ideas of vision, culture and a 'whole-world issue' are examples of the cultural aspect of the practical evaluative dimension of agency (Priestley *et al.*, 2015), where across the school community there are shared ideas, values and beliefs about CCSE as a core purpose of education which is reflected in the discourse and language of school vision statements and in the experiences teachers and school leaders share. This shared culture is an import part of creating the conditions for agency in relation to whole-school CCSE. Also visible in this theme is the ways in which this culture is implemented in all four case study schools through practices such as mapping CCSE throughout the curriculum and explicitly including sustainability and CCSE in school improvement plans. These are examples of the structural aspect of the practical evaluative dimension of agency (Priestley *et al.*, 2015), such as drawing on the support and trust of key groups such as governors (School B) and leveraging the power of Ofsted through using language of curriculum intent as a rationale for CCSE across the curriculum (School C). We explore the curriculum further in the second finding, which considers clarity and coherence of CCSE implementation.

Whole-school CCSE realised as curriculum making

Having explored the strong and shared vision of CCSE across a school setting, the next aspect we considered was how that vision was realised in practice. In a school setting, perhaps the key opportunity to realise that vision with clarity and purpose is through the curriculum, and the term curriculum was frequently used by teachers, school leaders and sustainability coordinators. For example, there was the recognition that whilst school science and geography are widely understood as being the contexts where climate change and sustainability are taught in England, in reality the curriculum does not afford many explicit imperatives. This required teachers to actively look for opportunities to foreground climate change, and across the data set there were many examples of teachers able to reorient or reframe the required National curriculum towards realising CCSE as a core purpose of education. For example, a (non-specialist) geography teacher from School B described:

> In the curriculum…there isn't much area for climate change…I've been starting to look at where in my teaching I can fit sustainability, can I introduce it more to the children? So, when I do a river project…I now talk more about flooding and I introduce them to sustainable urban drainage systems and now we have a new housing estate next to us and I take them for a walk and show them we have three SUDs out there…this introduces them to climate change, and impacts…and what we can do to adapt to climate change in our communities.

This example of curriculum practices at the lesson or classroom level, where an individual geography teacher has the agency to (re)orient the geography curriculum to realise CCSE is arguably enabled by a shared vision of CCSE as a core purpose of education (cultural aspect, practical evaluative dimension) as well as the relationships and trust of the wider school leadership (e.g. headteacher, subject-leader) to do so (structural aspect, practical evaluative dimension). Furthermore, what is being enabled, is an understanding of curriculum as a social practice, which is continuously 'made' by people, including teachers working with children and young people. This idea of curriculum making (Priestley *et al.*, 2021) is very different to an idea of curriculum as a rigid and bounded 'document' to which to adhere, such as a national curriculum or exam specification. Moving from the classroom to the whole school, teachers and school leaders from all four schools described how as part of a coherent and consistent endeavour, they had examined their curricula and mapped out where CCSE was present, where could be strengthened and how it could be a visibly interwoven strand or priority. For example, the sustainability co-ordinator at School A articulated how they had identified environmental and sustainability education (ESE) as a 'curriculum strand', and that they had explicitly chosen the term ESE so that it broadens the concept to include but go beyond climate change and also moved away from 'ideas of capitalism and western notions of development inherent in ESD'. Taking a different approach, School B shared how they had mapped their curriculum against the Sustainable Development Goals, taking these as a stimulus to prompt and encourage teachers to consider how their different subjects connect with this framework. Providing an overview for staff of where CCSE was visible in the existing curriculum and where it could be 'more joined-up' was a key starting point for School D, as this provided everyone with an opportunity to move beyond 'compartmentalised and repetitive teaching' and instead 'develop knowledge and experiences from different subject perspectives, over time' (Headteacher). In these ways, CCSE can be realised differently through the social practice of curriculum making. This requires both the cultural and structural aspects of the practical evaluative dimension of agency, but it also requires the material dimension of resources (e.g. staff time) and the physical environment (e.g. opportunities to learn beyond the classroom). Arguable, curriculum making also draws on the projective dimension of agency, where teachers can identify ways in which they can achieve agency in relation to CCCSE in the short term (e.g. a single lesson) and longer term (e.g. school improvement plan). In our third finding, we build on these ideas of shared vision and curriculum making to consider how schools enable collaborative and generative spaces of CCSE.

Creating collaborative and generative spaces of CCSE

Across the four schools, a key quality which we discerned was the ability of staff in varied roles to identify, access, move between and create spaces for CCSE which are collaborative and generative. For example, a science lead and sustainability coordinator at School B, outlined:

> Myself and my colleague…we go and find the partners and the skills and resources we need, we make connections on social media and I just email people and ask…I got in touch with the local council and met the education team and now they are creating a resource for…schools on the impact of climate change in our local area, what the council is doing and what people can do…that is my role, to find the people and resources I need for my department and school and pupils and then I try and connect other people so they can access them too.

In this excerpt, this teacher outlines how they can identify spaces of agency (e.g. via social media) and access spaces of agency by developing relationships with local decision makers (structural

aspect of the practical evaluative dimension). Furthermore, through the material (resources) and structural dimensions (relationships) this teacher is able to create spaces of agency for others through the co-creation of climate change education resources authentic to their local area. The sustainability coordinator at School D also underlined the importance of the support of their headteacher in enabling and strengthening spaces of agency by having an overview of the school community and making connections between different groups:

> Having the Head [teacher] on board is very useful, he is not driving it but he is supportive…he connects my ideas and initiatives with others…for example the careers team, who have a focus on green skills and green jobs…and the head of MFL [Modern Foreign Languages] who you might not expect…but who is really passionate and has loads of ideas… And that's what you need, kind of need that you need that passion, and the kids need to see that passion, too.

Here, the headteacher creates spaces of agency by supporting staff to make connections between different sites of CCSE across the school, especially aspects such as a focus on careers and MFL, which are perhaps less visible than science and geography lessons. The headteacher at School D themselves articulate their leadership role in identifying and creating spaces of agency for CSSE saying, 'you need make it explicit initially and direct people, but then overtime…it becomes part and parcel of life…a mantra…part of the school culture.' These findings are consistent with previous research which has considered geography and science teachers' experiences of agency in relation to climate change education in schools in England, including underlining the importance to realise 'spaces for manoeuvre' for climate change education within the existing curriculum and creating spaces for climate change education beyond the curriculum (Rushton *et al.*, 2024). Overall, these findings provide insights into some of the braided strands of whole-school approaches to CCSE which enable agency in a wider context which research has consistently underlined is restrictive (X and Author 1, 2022). In the following discussion we consider what these case study school might tell us about leadership of whole school approaches and how these practices and professional norms might be nourished in other settings so that agency can be achieved.

Discussion

Looking across these findings, the role of leadership in creating conditions for agency is evident. Therefore, we argue there is value in reflecting further on the practices of leadership in these schools to better understand learning which can enhance whole CCSE across the education system. A key leadership practice evident in these findings is cultivating a culture, where CCSE is a core purpose of education, and where there is a strong sense of direction, with examples of practice which are powerful and inspiring to others. This aspect of leadership includes school leaders and other office holders, such as governors or trustees, working visibly and proactively as advocates for the value of CCSE across their school community. This could be through public declarations of a climate emergency, or by integrating CCSE as part of the school improvement plan or by appointing a school governor with responsibility for CCSE. It also requires teachers and other school staff to model examples of good practice in and beyond the classroom, which give tangible examples of what is possible in a particular context at a given time. This could include working with teachers across different subjects to integrate CCSE across the curriculum or leading climate and sustainability focused extra-curricular initiatives. These ideas of culture and vision are consistent with the cultural aspects of the practical evaluative dimension of agency, where shared ideas and beliefs are key

enablers of agency. Another key practice of leadership is using the oversight which that role affords to make connections between people and activities across a community and enable agency by establishing positive and trusting relationships. This is especially evident in School D, where the headteacher is almost creating 'corridors' of CCSE across the school community, similar to nature corridors, which connect wildlife populations otherwise separated by human activities or structures which could lead to reduced biodiversity through isolation. Similarly, making connections (or corridors) across subjects through CCSE curriculum making also requires leadership which has clarity of vision and sense of purpose. As well as cultivating a sense of vision and culture, effective leadership of CCSE provides teachers with opportunities for professional growth, as curriculum makers, and in developing education which realises their vision they have for the children and young people they teach. In these ways, through leadership, headteachers open and sustain spaces and opportunities for teachers to identify and create spaces of agency for themselves and others. Whilst these leadership practices have distinct aspects, another quality is the integrated or braided nature of these practices – culture cannot be created or sustained without making connections, and sustaining spaces of agency requires a clear sense of purpose and direction.

These findings are consistent with previous research from the Swedish context, which considered the professional norms which guide school leaders' leadership of change related to Education for Sustainable Development (ESD) (Leo and Wickenberg, 2013). This includes, creating and nurturing ESD as a common vision of the school, enabling a leadership culture which involves initiatives led by staff and students and ensuring there are structures and resources which support this culture and associated professional norms. Leo & Wickenberg (2013) also underline the importance of policy documents associated with ESD as key structures which can support culture change and professional norms. This is echoed in our findings, as some teachers noted the positive influence which the recent DfE sustainability and climate change strategy (DfE, 2022) in strengthening the wider commitment (sustainability coordinators in School B and D) whilst also noting that the strategy did not go far enough in their view. Leo and Wikenberg (2013) argue that professional norms are established when school leaders, teachers and students experience expectations from each other and from the wider policy context which support establishing whole-school sustainability education. Establishing culture through professional norms and expectations are the mechanisms of leadership.

Reflecting on the four case study schools included in this study, there are some characteristics to note regarding their contexts. These schools are all located in rural or semi-rural areas, which may provide at least an implicit impetus in relation to the school communities' connection to place and therefore potentially more oriented towards environmental, sustainability and climate concerns. Furthermore, all four schools have significant 'buffers' in terms of taking risks as they are not serving socio-economically deprived communities which may have complex and urgent needs which take precedence over potentially more distant environmental concerns. Relatedly, all four have current Ofsted ratings of 'Outstanding' (three schools) or 'Good' (one school) which arguably reduces the sense of scrutiny from the inspectorate, and this may also be strengthened by three of the four schools being academies which therefore do not have to follow the National Curriculum. However, the spectre of Ofsted accountability-regime was evident in some of the contributions from teachers and school leaders, with CCSE sometimes framed as a lever to demonstrate to Ofsted that their curriculum could demonstrate the required 'intent, implementation and impact' (Ofsted, 2023) (e.g. school leader, School B) but also experienced as a concern that their curriculum would have 'too much' climate change content, 'but then the challenge of Ofsted, and that judgement from above coming in, looking at our curriculum and…the fear of being judged that we are overdoing climate change at the expense of a broader curriculum' (subject lead for geography, School D). This further underlines the innovation of these schools who,

despite the limited policy context and competing pressures, persist with a whole-school approach to CCSE.

Conclusion

Looking across the whole-school approaches to CCSE through these four case studies, we conclude that at the heart of an effective approach to whole-school CCSE is where leaders create the conditions for teachers to achieve agency and enact curriculum making as a social practice (Priestley *et al*., 2021). Leadership of CCSE requires the contribution of varied members of the school community, nevertheless, school leaders themselves are critical in ensuring the culture, professional norms and expectations are established and nurtured so that they flourish. Reflecting on the comparative nature of this research which has drawn learning from across four case study schools, we are reminded how valuable collaborative opportunities for school teachers and leaders are in the context of whole-school approaches to sustainability. We argue for policy makers and those who make decisions about school funding and the professional learning of teachers and school leaders to continue to make space for low-stakes, comparative learning between and across schools which can continue to share good practice and address challenges. Such collaborative professional learning could have value across a range of spatial scales including local and regional hubs and national and international networks, and examples of these exist (e.g. Learning for Sustainability Scotland) which should continue to be valued and strengthened. Further educational research across national contexts is needed to better understand the purposes, practices and futures of school leadership in the context of complex climate and ecological crises. Looking to the future we also reflect on how can we reclaim ideas of curriculum as a social practice at the heart of effective whole-school CCSE from those who have a more instrumental view? Do we need a (re)newed conceptualisation of leadership in the context of whole-school CCSE which captures the braided and collective nature of many of the leadership practices visible in these four schools? Arguably these questions are beyond the scope of this study and are priorities for future research. And yet, Kulnieks *et al.* (2013) remind us of the value of indigenous knowledges and ecological practices, such as gardening and gathering, in the context of environmental education leadership. Perhaps future research and practice could consider the ways in which the social practice of curriculum making could be reimagined through practices gardening and gathering which are cyclical, reciprocal, encompass the more-than-human world and are attentive to place? How might this shape and inform leadership practices and norms which enable such an approach?

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School code	Overview of case study school	Data collected
School A	Non-selective academy school located in the rural east of England; pupil roll of ~2000, aged 11–18 years, of mixed gender; lower than national average free school meal population and IDACI score of one. Ofsted rating: 'Outstanding' (2020).	• Geography teacher interview • Science teacher interview • Sustainability coordinator interview • School leader interview • Site tour notes & researcher field notes • School overview researcher notes [Total 4 interviews]
School B	Non-selective community school in rural northeast England; pupil roll of ~350, aged 9–13 years, of mixed gender; lower than national average free school meal population and IDACI score of one. Ofsted rating: 'Outstanding' (2021).	• Geography teacher interview • Science teacher & Sustainability coordinator interview (same participant held both roles) • School leader interview • Site tour notes & researcher field notes • School overview researcher notes [Total 3 interviews]
School C	Non-selective academy school located in suburban northeast England; pupil roll of ~2000, aged 11–18 years, of mixed gender; lower than national average free school meal population and IDACI score of one. Ofsted rating: 'Outstanding' (2022).	• Geography teacher interview • Science teacher interview • Sustainability coordinator interview • School leader interview • Site tour notes & researcher field notes • School overview researcher notes [Total 4 interviews]
School D	Non-selective academy located in the rural west midlands of England; pupil roll of ~1600, aged 11–18, of mixed gender; lower than national average free school meal population and IDACI score of three. Ofsted rating: 'Good' (2021).	• Geography teacher interview • Science teacher interview • Sustainability coordinator interview • School leader interview • Site tour notes & researcher field notes • School overview researcher notes [Total 4 interviews]

Table 1. Overview of case study schools