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Version: Published Version

The Curriculum Journal ⬛BERA

Fostering teacher agency in school-based climate change education in England, UK

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Abstract

Drawing on conceptualisations of teacher agency through the ecological approach, and in the context of recent policy activity, we explored primary and secondary school teachers' experiences of agency in relation to climate change education in England. Data collection occurred over two distinct but related phases. Firstly, we completed a series of interviews with the same three secondary geography teachers at the outset of their careers (15 interviews during 2020–2022) which included 1 year of Initial Teacher Education and 2 years as Early Career Teachers (ECTs). Secondly, we captured the experiences of further 24 in-service science and geography teachers (with expertise beyond the ECT period) through two online workshops held in November 2022, the first for primary teachers ($n=10$) and the second for secondary teachers ($n=10$). Interviews were held with four teachers (two primary and two secondary) who could not attend the workshops ($n=4$). Our findings underline the importance of structures (e.g. school leadership) and culture (e.g. ideas and values) in fostering teacher agency. Teachers across primary and secondary phases and at different career stages highlighted the value of curricular and extra-curricular spaces for climate change education. If all children and young people are to access effective climate change education, researchers and policy makers will need to further consider ways to ensure teachers can achieve agency, including through access to transformative professional learning which fosters agency in relation to climate change education.

INTRODUCTION

In the context of a rapidly closing window to respond to global climate and environmental emergencies (IPCC, 2023), the importance of education, including formal schooling, is widely understood as central to ensuring every young person can develop knowledge and capabilities to live with and respond to complex challenges (Monroe et al., 2019; Rousell & Cutter-Mackenzie-Knowles, 2020). Understanding the ways in which teachers can develop agency in the context of school-based climate change education is a vital part of realising the role of education in transforming cultures to more sustainable ways of living and being. In this research, we draw on socio-cultural understandings of teacher agency as conceptualised through the ecological approach of Priestley et al. (2012, 2015) where agency is understood as an emergent phenomenon not the capacity of an individual but something which people achieve or do depending on the resources available to them. This paper is guided by the following questions: *How do teachers experience agency in relation to school-based climate change education? How and in what ways can teacher agency be fostered in relation to school-based climate change education?* In response to these questions, we gathered insights from 27 teachers working in England, including both secondary and primary age-phase, with subject expertise in geography and science and at different career stages. This study is timely as data collection occurred during 2020–2022, prior to the implementation in 2023 of a new England-wide sustainability and climate change strategy for education and children's services systems led by the Department for Education (DfE, 2022). This provides an important opportunity to explore teachers existing practice in relation to climate change education prior to the implementation of the strategy. Through this research, we reflect on what can be learnt from the experiences and practices of teachers which might support transformative professional learning (Jones & Charteris, 2017) in relation to climate change education. We begin by providing an overview of the education system in England, including school-based climate change education and the new DfE strategy (DfE, 2022).

CONTEXT

School-based climate change education in England

Education is a devolved responsibility across the United Kingdom (UK). This means that England, Northern Ireland, Scotland and Wales determine their own education policies, including national curricula and assessments, and have their own accountability and inspection regimes. Broadly speaking, in England, the Department for Education mandates the National Curriculum, and students take examinations which are regulated by Ofqual (The Office of Qualifications and Examinations Regulation), a non-ministerial government department. Schools are inspected by another non-ministerial government department, Ofsted (the Office for Standards in Education, Children's Services and Skills). Since 2010, an increasing number of publicly funded schools have become academies that are independent of local government oversight and instead run by organisations with charitable status, funded by central government (West & Bailey, 2013). One consequence of this is that academies are not required to follow the National Curriculum. However, they are subject to the same inspection requirements which mandate a broad and balanced curriculum, and students take

the same examinations as students attending local-authority controlled schools (Howard-Jones et al., 2021). Therefore, whilst academy status may ostensibly provide schools with greater flexibility and freedom, in reality the National Curriculum and examination specifications remain highly influential on the professional choices and lives of school leaders and teachers, if not mandatory (Howard-Jones et al., 2021).

Climate change has been included in the National Curriculum in England since 1995, however recent analyses of the secondary science (compulsory 11–16 years) and geography (compulsory 11–14 years, optional 14–16 years) curricula underline that climate change has limited coverage. The science curriculum includes the anthropogenic causes of climate change and the effects and mitigation, and the geography curriculum explores human impacts on changing landscapes, environments and climate (Dawson et al., 2022; Howard-Jones et al., 2021). In 2013, in response to complaints of insufficient coverage of climate change, the government published a document which outlined the areas in both the science and geography curricula (for students aged 5–16 years) where climate change should be addressed (Eilam, 2022; Howard-Jones et al., 2021). Nevertheless, the inclusion of climate change in school education remains contested, as scholars argue that the broader socio-economic impacts of climate change are not considered and neither does the curriculum address action, behaviour change and social justice in relation to climate change (Dawson et al., 2022; Howard-Jones et al., 2021). Indeed, little has changed since Chatzifotiou's (2006) study of environmental education in primary education found little undergraduate education or training for teachers. Where training exists, the framing of climate change and environmental education in England is focused on learning *about* the environment, rather than learning *for* the environment (Glackin & King, 2020; Greer, King, & Glackin, 2023). This is problematic as research consistently underscores the need for climate change education to encompass more than knowledge gain and enable people to engage with affective (Höhle & Bengtsson, 2023) and action-oriented (Howard-Jones et al., 2021) dimensions. Failure to do so can lead to increased feelings of helplessness and hopelessness, increasing climate anxiety and apathy (Ojala, 2015).

A new strategy for sustainability and climate change education in England

In England, the Department for Education's (DfE) (non-statutory) strategy published in April 2022 arguably represents the most significant intervention in England focused on climate change education for a decade (DfE, 2022). Key initiatives within the strategy in England include (1) the National Education Nature Park, and associated learning resources (NHM, 2023), (2) the extra-curricular Climate Action Award which recognises and celebrates students who develop 'green skills, champion nature and work towards a sustainable future' (NHM, 2023) and (3) Sustainability Leadership. The implementation of the National Education Nature Park and the Climate Action Awards began in Autumn 2023. In relation to the third initiative, Sustainability Leadership, the strategy states: 'by 2025, all education settings will have nominated a sustainability lead and put in place a climate action plan' (DfE, 2022). At the time of writing, non-statutory guidance had been published with further detail to follow regarding a digital hub and regional engagement and support service, along with continuing professional development resources for science teachers, so that 'all young people receive high-quality teaching on the scientific facts about climate change and environmental degradation' (DfE, 2022; NHM, 2023).

Whilst policy maker attention and associated resource are to be welcomed, a key concern is the emphasis on realising climate change education through science-focused knowledge and understanding. The strategy does not represent climate change and sustainability

education as an interdisciplinary effort. Relatedly, concepts such as climate change and sustainability do not feature in the Initial Teacher Training Core Content Framework (DfE, 2019a) or the Early Career Framework (DfE, 2019b). Furthermore, the strategy does not include fundamental changes to teacher education policy or curricula in England. As research underlines (Greer, Sheldrake, et al., 2023) teachers in England across a range of subjects would like greater access to professional development so that they can develop confidence in relation to climate change and environmental education. For example, whilst the teachers in this study recognised the importance of whole school approaches to teaching climate change (e.g. using the school grounds) they reported needing support to realise these opportunities (Greer, Sheldrake, et al., 2023). Similarly, Gandolfi's (2023) research involving teachers underlined the significant professional and emotional labour which teachers devote to enable school students to meaningfully engage with environmental education as part of formal school education. These examples from the research underline the need to better understand how teachers experience agency in relation to school-based climate change education, and to explore the ways in which the new strategy in England can enable and/or constrain agency.

TEACHER AGENCY AS A CONCEPTUAL FRAMEWORK

Teachers have a key role in making effective decisions about complex human situations and their professional agency is widely viewed as vital. As such, teacher agency has become central to understanding teachers' practices, including responses to policy reform, and encompasses their choices, goals and beliefs throughout their professional lives (Goodson, 2003; Ryder et al., 2018). Much recent research which considers teacher agency is founded upon the ecological approach developed by Priestley et al. (2015). This socio-cultural conceptualisation understands agency as an emergent phenomenon, not the capacity of an individual: agency is something that people achieve or do, not what people possess. Secondly, teacher agency is understood as being dependent on conditions and qualities, including cultural, material, relational resources, and people's ability to use them. Thirdly, teacher agency is recognised as temporal—informed by the past, oriented towards the future, and enacted in the present (Priestley et al., 2015). The ecological approach unites three dimensions of agency, the iterational, projective and practical-evaluative dimensions. Firstly, the iterational dimension is formed of teachers' professional knowledge, beliefs and values along with personal life histories which teachers bring to their professional lives (Biesta et al., 2015; Priestley et al., 2015). Leijen et al. (2020) have described the combination of these two aspects of the iterational dimension as 'professional competence'—where teachers are able to explore and understand the relationship between their professional and personal knowledge, beliefs and values. Secondly, the projective dimension captures both the short- and long-term aspirations teachers have for their practice which are frequently rooted in their prior experiences and beliefs (Biesta et al., 2015; Priestley et al., 2015). Finally, the practical-evaluative dimension identifies the cultural, structural and material resources or conditions which can foster or constrain agency within a teachers' working environment, perhaps depending on the availability of resources including professional trust. The interplay between the iterational, projective and practical-evaluative is both a temporal and relational process, where the conditions, 'influence the decision-making process in professional situations, which draw on accumulated competence and are guided by projective purposes' (Leijen et al., 2020, p. 305). Rushton and Bird (2023, p. 14) 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.

In the context of fostering teacher agency, Priestley et al. (2015) have identified three levels: the macro-level of policy formation, the meso-level of policy interpretation and the micro-level of curriculum enactment. The macro-level of policy formation can be regulated by inputs (e.g. national curriculum documents) and outputs (including inspection bodies) (Priestley et al., 2015). Macro-level policies are then re-contextualised at the meso-level by groups including qualification and assessment bodies, local governments and curriculum developers (Priestley et al., 2015). Schools are the main contexts in which pupils encounter the state, and at the micro-level, teachers enact the curriculum. Such curriculum making is, 'influenced and shaped by the beliefs and knowledge of teachers, the cultures and structures of schools, as well as by external pressures such as accountability demands' (Priestley et al., 2015, p. 153). In summary, the ecological approach to teacher agency, including how agency can be fostered at different levels, provides a useful conceptual framework for understanding why some teachers are equipped to engage in school-based climate change education in England whilst others are not.

METHODS

The data collection methods, participants and ethical considerations are described before outlining the analysis process.

Data collection

Data collection occurred over two phases. The first gathered insights from secondary geography teachers at the beginning of their career through a series of semi-structured interviews over the course of a year of Initial Teacher Education (ITE)[1] and 2 years as Early Career Teachers (ECTs).[2] The second phase broadened the scope to include teachers from geography and science subject specialisms with experience which extended beyond the ECT stage and across primary and secondary phases.

Phase one

A sequence of five semi-structured online interviews (lasting 40–50 min) were completed by Author 1 with three secondary school geography teachers who trained and worked in state-maintained schools in England during 2020–2022, a total of 15 interviews. All participants were recruited from the same 1-year postgraduate Initial Teacher Education programme (Postgraduate Certificate in Education, secondary geography or PGCE). Five participants initially volunteered to contribute, however, three (Danny, Lucy and Paul) completed the series of semi-structured interviews over 3 years (the remaining two participants withdrew after year one of the study). Danny, Lucy and Paul were aged 23–27 years, having completed an undergraduate degree in Geography and at least 3 years of professional experience in roles related to education (e.g. sports coaching and outdoor learning). Video interviews were held online to provide flexibility for participants. Drawing broadly on the iterational, projective and practical evaluative dimensions of teacher agency, participants were asked about when, how, and why they approached topics of climate change in their past and present practice, including teachers' ideas, values and beliefs. Teachers were asked to share the opportunities and challenges they experienced, including the types of support they accessed and how these were identified. Interviews also invited teachers to share examples of who was involved in their

engagement with climate change education and explored what support they would like now and in the future.

Phase two

During November 2022, two online workshops (each lasting 60 min) were held by Author 2 and 3, the first for primary school teachers (10 participants) and the second for secondary school teachers (10 participants). Workshops were advertised through the researchers' professional networks as opportunities for teachers to explore, share and discuss climate change education. Participants' subject expertise included primary science and secondary geography and science. All teachers had completed at least 2 years teaching post-qualification. During the workshops participants were invited to share their practice in relation to climate change education and explore barriers and enablers in their varied contexts. Data was derived from responses provided through the online chat, contributions to shared google slides and researcher fieldnotes. Interviews (lasting approximately 50 min) covering the same themes were held with four teachers (two primary and two secondary) who were unable to attend the workshops.

Ethical considerations

The research was approved by an institutional Ethics Committee and voluntary, informed consent obtained from participants. As the interview phase of data collection with ECTs lasted more than 2 years, consent was revisited with attention to the participants' roles and responsibilities as they moved into full-time teaching. Data is reported using pseudonyms.

Data analysis

Data were analysed through individual reflections, joint discussions and throughout the writing process. As an authorial team we reflected upon our professional lives and experiences as teachers and education researchers, and how these shaped our engagement with the data derived from interviews and workshops. Abductive analysis of the dimensions of teacher agency (iterational, practical-evaluative and projective) articulated by Priestley et al. (2015) framed our discussions and reflections. Across the data, we sought to understand the ways in which the iterational, projective and practical-evaluative dimensions of teacher agency were evident and the ways in which agency could be fostered or constrained. Our analysis was also informed by existing school-based climate change education in England, including the views and experiences of teachers (e.g. Howard-Jones et al., 2021) and wider literature which considers what constitutes 'effective' climate change education (e.g. Monroe et al., 2019).

FINDINGS AND DISCUSSION

Teachers as frustrated agents of climate change education

During his first year as an ECT Paul describes how excited he is to have the opportunity in the future to redevelop his school's series of lessons focused on climate change and sustainability for students aged 11–14 years (Key Stage 3). Drawing on his professional knowledge

(iterational dimension), Paul intends to make these concepts more tangible by integrating problem solving into his approach which further reflects projective goals:

> I have convinced the department to let me change a sequence of lessons for Key Stage 3 on climate change and sustainability…I am so excited to have this opportunity and I think it has got to be more practically based…teaching the issues as problems which we can explore together and find solutions because it makes it engaging…it doesn't make it abstract and difficult to comprehend, with climate change it is hard for a kid to grasp…it is so complex.
>
> Paul, secondary geography teacher (ECT year 1 interview)

Here, Paul outlines that in the context of climate change education he requires the material resources of a mandatory National Curriculum and the structural resources of his colleagues who he has 'convinced' to let him redesign a sequence of lessons. Furthermore, the projective dimension of agency is evident as Paul recognises and articulates curriculum redevelopment as an important future area of his practice. Furthermore, Paul's described approach, grounded in making climate change and sustainability meaningful to students through examples and problem solving, is consistent with wider understandings of effective climate change education (Monroe et al., 2019). However, in Paul's interview during his second year as an ECT (in the same school) he shares his frustration that he was not able to implement the changes envisaged as part of his daily practice. This frustration is keenly felt by Paul as his students are already experiencing the impacts of climate change:

> I had a struggle to get climate change and sustainability into our year 8 curriculum…there is a bit of it there but it is really watered-down…I redeveloped the scheme of work and used lots of the ideas from my PGCE but when I shared it with my department they said it was far too long…we don't have enough time to do climate change properly, we only have three or four lessons which is nothing…at the school and in the area I work in, the impacts of climate change are real for the kids, their relatives live all across the world and many of them are already dealing with the consequences of climate change.
>
> Paul, secondary geography teacher (ECT year 2 interview)

Here, we can see that Paul's beliefs and ideas about the purpose of geography education, specifically in enabling young people to live with the consequences of climate change, are frustrated—the cultural aspect of the practical-evaluative dimension of agency is hindered. Initially, Paul's colleagues were supportive of his desire to redevelop the curriculum however, Paul's approach was ultimately not implemented because of a lack of time to teach climate change in the way Paul, and the wider literature, understands as effective. The sense that there is insufficient time to teach climate change 'properly' is an example of the macro-policy level of the National Curriculum restricting curriculum development and enactment and reflects a cultural constraint, which hinders the practical-evaluative dimension of agency (Priestley et al., 2015). Paul initially has conditions for agency through the practical-evaluative dimension including a mandate from the National Curriculum and support from his colleagues. However, these disappear when Paul's plan exceeds the allocated time to teach climate change. As Priestley et al. (2015, p. 163) note, 'time is always an issue in poorly resourced public education systems' and whilst globally, schools in England would not be considered as 'poorly resourced', arguably, climate change and sustainability education in England are deprioritised and under resourced. Secondly, Paul appears to have views and beliefs as to what constitutes 'proper' climate change education which are inconsistent with those of his colleagues. This misalignment appears to be a key

factor in removing the structural and cultural conditions, part of the practical-evaluative dimension which enabled Paul's agency.

Danny shares a similar experience as a frustrated agent of change when he is unable to incorporate real-world examples when teaching the impacts of climate change during his period of ITE:

> …there's been flooding around where I live and there was a bit of erosion on one of the small rivers that's quite near my house…I was super interested in the images of a real river with real erosion processes present, but I got some feedback on the lesson and the teacher said that she just doesn't think that I should use examples which don't exactly fit with the specification because there isn't time…I should just use a bog-standard image…we don't have time for nuance or showing relevant geographies in the outside world…I think that is a really good example of how outdoor learning, real life learning is actually super hard to bring in to the classroom.
>
> <div align="right">Danny, secondary geography teacher (interview during PGCE)</div>

As with Paul, Danny's 'relevant geographies in the outside world' are met with resistance because the example does not 'exactly' fit the curriculum and, in the view of Danny's mentor, there is insufficient time to go beyond these parameters. Again, this is an example of where the cultural resources of shared beliefs, ideas and values as to how climate change education should be enacted do not exist. At the same time, unequal power dynamics between beginning teacher and mentor do not provide the structural conditions to enact agency as part of the practical-evaluative dimension. As a former outdoor learning teacher, Danny is drawing on his professional competencies as part of the iterational dimension of agency as, whilst he recognises that there are significant challenges in realising his pedagogical aspirations in the present, this does not alter his professional belief that this is a valuable approach to climate change education.

Similarly, teachers from primary and secondary science described limited opportunities for cross-curricular approaches to teaching climate change which they attribute to the tendency in schools to have a siloed and rigid approach to teaching. For example:

> We need to make climate change education a whole school thing, getting all teachers involved and talking about it. I want to find out exactly what the perspective of other teachers is so that it is not just geography and science who teach climate change!
>
> <div align="right">Andy, secondary science teacher (workshop)</div>

> A more flexible approach to what curriculum means would help…we need to integrate with other subjects with teachers working collaboratively and whole school actions which support climate change education.
>
> <div align="right">Jo, primary science teacher (workshop)</div>

Across the dataset, teachers were often able to draw on their professional competencies through the iterational dimension of agency, to *identify* 'spaces for manoeuvre' (Priestley et al., 2012) such that climate change could be foregrounded within the existing National Curriculum. However, as the examples of Danny, Paul, Andy and Jo also show, these 'spaces for manoeuvre' were not always realised. In the following theme, we explore when and how some teachers were able to achieve agency within the existing curriculum with the support of school leadership. These are examples of the structural in the practical evaluative domain, which have the capacity to inhibit or facilitate teacher agency.

The importance of leadership to realise 'spaces for manoeuvre' for climate change education within the existing curriculum

Some teachers who participated in the workshops highlighted the importance of a shared vision between teaching staff and school leaders as a key to enable climate change and sustainability to be foregrounded in the curriculum. Shared visions and professional values were key structural and cultural resources for the practical-evaluative dimension of agency, as Elizabeth, a science teacher with a sustainability focused leadership role across a group of schools (including primary and secondary) described:

> We set about systematically working out what can we do that will have the greatest impact…we have been very intentional about sustainability within the curriculum, particularly in secondary schools around clearly how it's built into geography curriculum, how it's built into science curriculum. In our primary schools we have a specific and discrete block of work that's built into the curriculum. However, the big one which we're tackling now is how do we ensure it is systemically built within the curriculum everywhere? And the challenge there is, well, you can't just keep adding, so what do you take out in order to ensure this is very firmly across the curriculum?
>
> Elizabeth, science teacher (secondary workshop)

Elizabeth went on to argue that it was important that this was done authentically and not in a tokenistic way and underlined the crucial role of professional learning which included time for teachers to plan how to incorporate climate change and sustainability across the curriculum together. Other teachers described how they had incorporated sustainability across all subjects in ways that provided opportunities to connect with families and the wider school community, building relationships and trust recognised as a structural aspect of the practical-evaluative dimension of agency. As one teacher noted 'getting a voice in the leadership team' was an important enabler. Others, who were not on leadership teams talked about the importance of 'asking awkward questions' to hold leaders to account, and in this way found 'space for manoeuvre' to exercise agency within the existing structures of leadership and curriculum.

Teachers with leadership roles found more spaces to manoeuvre, as they had the agency to set the tone, culture and curriculum within their school, or even across a group of schools. For example, Amanda describes:

> Across the Year 5–8 science curriculum I have linked everything we teach to the SDGs and encouraged other teachers to do the same and that way we can bring the focus on climate change within the curriculum that we have.
>
> Amanda, middle school Head of Science (primary workshop)

Amanda is able to incorporate the framework of the United Nations Sustainable Development Goals (SDGs) throughout her primary (Key Stage 2) and secondary (Key Stage 3) science curriculum as a way of foregrounding climate change. This was in common with other teachers who referred to international frameworks such as the OECD Learning Goals, the UNFCCC (and specifically the COP process). Amanda is a teacher with over a decade of teaching experience and is in a subject leadership role and has greater access to the structural and cultural resources and professional competencies which enable her to enact agency in the context of climate change education. As Danny and Paul are at the beginning of their careers and not in leadership roles, the same conditions are not available to them to achieve agency in relation to curriculum development.

Previously (Section 'Teachers as frustrated agents of climate change education'), Jo suggested that a 'more flexible approach to what curriculum means' could enable climate change education to include teachers of different subjects working together and to incorporate 'whole school actions'. Through his contribution as secondary science teacher, Andy highlighted the ways in which cross-curricular approaches can foster agency through working with others who have different subject expertise and perspectives. However, as our findings demonstrate, a cross-curricular approach was infrequently reported and where it was evident, it required substantial support from school leaders. This underlines that the National Curriculum in England (particularly in the secondary phase) with its focus on individual subjects, does not provide the structural and material conditions through which all teachers can realise agency as part of cross-curricular working. Looking to the Curriculum for Excellence (Hulme & Priestley, 2021; Scottish Executive, 2004), the Curriculum for Wales (Welsh Government, 2021), and to Northern Ireland with its whole curriculum aims and objectives and skills and capabilities (CCEA, 2007), there are examples within the UK of approaches to curriculum which move towards learning outcomes and capabilities within and beyond subjects. However, it remains to be seen how effective the current implementation of these curricula are in supporting greater cross-curricular collaboration and increasing the conditions through which teachers achieve agency, particularly given the nature and stakes of national assessments at age 16 years. Indeed, Hall and Hampden-Thompson (2022) have argued that whilst there remain pockets of resistance and opportunities for teachers to use their discretion, standardisation and datafication, and an associated shift in responsibility for student outcomes to teachers, results in teachers focusing on a narrowly defined core curriculum.

Creating spaces for climate change education beyond the curriculum

An important space for climate change education identified by teachers in primary and secondary school contexts was that provided by extra-curricular activities, such as clubs which focus on environmental topics. Lucy, a secondary teacher describes how through her Key Stage 3 (11–14 years) geography club, she is able to implement a student-led approach to climate change education, involving debate and discussion with and among students:

> The school leadership encourages teachers to provide opportunities for students beyond the classroom…the first thing the students wanted to do was watch Frozen Planet with David Attenborough and we had this big debate…we had forty Year 7s in one classroom all asking, 'why is this happening? Why are we doing this? What can we do?'…it engaged them in this wider debate…it gave them time to discuss the issues and explore ideas of responsibility and justice and what might happen in the future if we don't act.
>
> Lucy, secondary geography teacher (ECT year 2 interview)

Lucy has the support of school leaders to provide additional learning opportunities for students and Lucy uses this space to enact agency in relation to climate change education, drawing on her own beliefs of what and how students want to learn about climate and environmental issues. In this way, Lucy draws on the cultural aspect of the practical-evaluative dimensions of agency. Danny also describes an Eco-club, which he set up with other teachers in his school with the aim of creating a school garden, where students can grow produce. He describes this as an important opportunity for students to have 'ownership' of their school environment in the context of learning about climate change and sustainability:

> On a small scale, if the students can take ownership over the school as their own environment to look after, then as they grow themselves, they're kind of understanding of their impacts, their understanding of their ecological footprint may grow. So, where you take the school as a small-scale experiment for them to have ownership over…as they get more understanding than that will hopefully spill through the school gates and into their lives.
>
> <div align="right">Danny, secondary geography teacher (ECT year 2 interview)</div>

Danny is enacting agency in relation to how he would like to teach climate change and sustainability through outdoor learning and providing students with leadership opportunities which begin in school but can extend throughout their lives. Danny's desire to incorporate outdoor, practical learning, which he articulated during the interview he completed during his PGCE year with the real-life images of flood erosion, is realised through his creation of an Eco-club. This is an example of the iterational and projective dimensions of agency as Danny is drawing on his professional histories as a student teacher (iterational) and realising this some 2 years after his period of ITE (projective). Through the creation of an Eco-club, Danny has the support of other teachers and the implicit support of school leadership to make changes to the school grounds to create a garden these are examples of the structural (teacher support) and material (physical environment) aspects of the practical-evaluative dimension of agency. Teachers recognised that these extra-curricular activities were not without their own difficulties and could not replace curriculum-based climate change education, as Emma said:

> I've started a 'climate ambassador' role this year, and am working towards the Eco-schools green flag accreditation even though it can be difficult to navigate… but I also want to develop climate education across the curriculum—doing both is needed and important.
>
> <div align="right">Emma, secondary science teacher (workshop)</div>

During the primary workshop, teachers underlined the importance of support from school leaders, including governing bodies and external partners, for climate change-focused extra-curricular activities. For example, 'school governors…and external partners…can be so important in creating networks for climate change education, and signposting leadership support… for activities outside the classroom' and 'climate change education needs the school and wider community to know what it means to educate for sustainability and to be involved and engaged'. Other teachers discussed the challenges with engaging young people, not all of whom were interested in environmental sustainability, or willing and able to dedicate time to extra-curricular activities. These contributions from teachers in primary and secondary contexts underline how important school leaders are in creating the structural conditions through which teachers can achieve agency (through the practical-evaluative dimension) in relation to climate change education in extra-curricular as well as curriculum contexts. Consistent with previous research (e.g. Batchelder et al., 2023) school leaders can provide the structural (trust and relationships), material (time, resource and staffing) and cultural (shared vision) conditions which foster the practical evaluative dimension of teacher agency in relation to climate change education. Whilst extra-curricular activities provide an important space where structures such as the National Curriculum can frustrate, such opportunities are not universal unless they are adequately resourced (through funding and access to professional learning) and prioritised by policy makers. Even then, they do not provide a quality climate change education for *all* children and young people.

Having considered the ways in which teachers can be frustrated agents of change and explored the ways in which leadership can create 'spaces for manoeuvre' within the curriculum, we return to the policy context in England. We reflect on how this study of teacher

agency in the context of climate change education can develop our understanding of the ways in which new policy initiatives such as the strategy can facilitate and/or inhibit teacher agency.

Policy opportunities to foster teacher agency in climate change education

Our findings highlight both constraints (e.g. inflexible and siloed National Curriculum) and enablers (e.g. leadership and shared professional vision) of teacher agency in the context of climate change. Given that the DfE (2022) strategy is a significant intervention and commitment of resource by policy makers in England, what might these findings mean in the context of this new strategy? Firstly, teachers in our research highlighted the importance of climate change education moving beyond the domains of geography and science and for opportunities to work collaboratively across subjects or in a whole school approach. Within the strategy, teacher professional learning is framed as 'development' limited to science teachers 'teaching on the scientific facts about climate change and environmental degradation' (DfE, 2022, no page). Whilst necessary for quality climate change education, a focus on knowledge is not sufficient. An emphasis on scientific facts underplays the importance of humanity and socio-economic structures, networks, ethics and conduct (Eilam, 2022) and is contrary to the cross-curricular and interdisciplinary approaches which have been underlined as constituting effective climate change education with the wider literature (Rousell & Cutter-Mackenzie-Knowles, 2020). This suggests that as the strategy is currently articulated, there will be little support for teachers to work collaboratively across subjects and age-phase expertise in ways which draw on the social, political, economic and affective dimensions of climate change. Furthermore, the strategy does not include changes to the National Curriculum which might increase the visibility of climate change and sustainability topics or highlight ways to integrate these across the curriculum as part of a whole school approach. Therefore, it is likely that teachers will continue as both frustrated agents of change, identifying 'spaces for manoeuvre' within existing constraints of the National Curriculum and who rely on school leaders who have many competing concerns to provide the material, cultural and structural conditions of the practical-evaluative dimension if they are to achieve agency. As outlined in Section 'A new strategy for sustainability and climate change education in England', the strategy has a welcome focus on sustainability leadership however, given limited detail on the resource that will be available to education settings to implement this aspect of the strategy, it is challenging to assess the extent to which this will provide the conditions and shared professional vision teachers in our study identified as being necessary to achieve agency.

Secondly, turning to the Climate Action Award and, given the value teachers placed on extra-curricular spaces, we suggest that this initiative provides pockets of hope and possibility for effective climate change education. For example, this new award underlines the importance of providing young people with opportunities to design and implement real-life research which supports action in relation to climate change and sustainability. For example, 'Problem solving and researching a local issue in a sustained partnership' envisages young people undertaking a research project in collaboration with scientists in response to a local issue focused on climate change and/or biodiversity loss (NHM, 2023, no page). Arguably, this award provides teachers with a framework to implement climate change education through extra-curricular activities—potentially providing the conditions in terms of structural and cultural resources that teachers in our study (e.g. Danny, Emma and Lucy) created for themselves. Furthermore, the approach taken through the Climate Leaders Awards appears to be consistent with research of Monroe et al. (2019) whose work highlighted

two overarching strategies which increase the success of climate change education programmes. Firstly, focusing on personally relevant and meaningful climate change information which makes specific references to relevance within learners' lives and secondly, using student-centred, active and engaging teaching methods. Examples of active and engaging teaching methods included role-plays, the use of visual imagery and inquiry-based activities such as student investigations. Furthermore, the collaboration with scientists which is a feature of the Climate Action Award is consistent with two further themes which Monroe et al. (2019) identified as consistent with effective climate change education. These include opportunities to interact with scientists and experience the scientific process and to design and implement school or community projects which address climate change.

Teachers in our study underlined the importance of collaborative learning which included time for reflection. This is consistent with research which has explored how teacher agency can be strengthened through different types of reflection (Leijen et al., 2020). Drawing on the work of Leijen et al. (2020) we highlight the importance of providing teachers with opportunities for *reflection on action*, where they can build professional competence in relation to climate change education, through consideration of both practical experiences *and* theoretical discourses within their specialism and climate change education more generally. Arguably, the interviews provided spaces for teachers to articulate and reflect on their practice, whilst the workshops afforded teachers with opportunities to share and engage with the experiences of others. To further enhance agency, teachers require opportunities for critical reflection, which can support them to take a critical perspective on their professional competence and purpose (Leijen et al., 2020). As we have noted, this approach to teachers' professional learning is not evident in the current DfE (2022) strategy, which arguably limits the extent to which teachers can achieve agency in relation to climate change education.

CONCLUSION

This study considered the experiences of teachers who were enacting (or seeking to enact) agency in the context of climate change education in schools in England. They are a group of teachers who understand the implications of the climate and ecological crises, and who are exercising agency to respond to these global challenges through formal education. We do not claim that these teachers are representative of the teaching population. However, we argue that their experiences are important to consider when seeking to understand how to foster teacher agency more broadly. This is critical given the urgency of the climate and ecological crises facing the world (IPCC, 2023) and given that teachers in England would like more support (Greer, Sheldrake, et al., 2023; Howard-Jones et al., 2021).

Our findings underline the importance of school structures (including school leadership) and culture (ideas and values) in fostering teacher agency in relation to climate change education. Participants (e.g. Elizabeth) recognised that a shared vision of the importance of climate change education between school leaders, teachers, students and the wider community is needed if teachers are to achieve agency. Teachers across phases and at different career stages highlighted the importance of opportunities for collaboration, within and across subjects and age-phases, involving parents, school governors and the wider community (e.g. Amanda, Andy and Danny). The value of both curricular and extra-curricular spaces for climate change education were recognised (e.g. Emma), with those at the beginning of their career (e.g. Danny and Paul) less able to achieve agency in relation to curriculum development whilst at the same time able to identify spaces of agency and realise that agency through extra-curricular activities (e.g. Danny). In summary, teacher agency can be fostered where there is a shared vision of the value of climate change education and where there are opportunities for multi-faceted collaboration.

Drawing on teacher agency through the ecological approach as a conceptual framework we have been able to look across the education system to consider the conditions required for teachers to achieve agency and understand the constraints and enablers they experience. This takes our understanding beyond a focus on the experiences and views of cohorts or individual teachers and therefore the 'development' that they might require. Drawing on the work of Leijen et al. (2020) and Jones and Charteris (2017), future studies could consider approaches to transformative professional learning which foster teacher agency in the context of climate change education, including the agency of school leaders. If all children and young people are to access effective climate change education, we underline the need for opportunities for researchers and policy makers to collaboratively consider ways to ensure teachers can achieve agency, including through access to transformative professional learning, which fosters agency in teachers and school leaders throughout their professional lives.

CONFLICT OF INTEREST STATEMENT
No potential conflict of interest was reported by the authors.

DATA AVAILABILITY STATEMENT
Research data are not shared.

ETHICS STATEMENT
Institutional ethical approvals were obtained prior to the commencement of this study (6/08/2020 & REC1627; Department of Education Ethics Committee University of York REF 21/22). All research participants consented to take part.

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ENDNOTES
[1] In England, Initial Teacher Education refers to an undergraduate or postgraduate programme of study, usually a partnership between schools and universities which on completion accredits individuals with Qualified Teacher Status.

[2] In England, following completion of ITE, individuals complete 2 years as an Early Career Teacher which includes continued mentoring.

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