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UNDERSTANDING
ENVIRONMENTAL EDUCATION
in secondary schools in England

BRITISH
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CONTENTS

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Executive summary

This report presents a review of the state of environmental education in secondary schools in England from a policy perspective. Our review of policy documents extends across a range of contexts including: national government; local education authorities; Multi Academy Trusts; and schools and subject departments. This research was carried out by the King's College London Environmental Education Research Group during 2017-18. The review was funded by a British Academy/Leverhulme Small Research Grant. The review is timely in that it responds to recent curriculum and assessment reforms in England which resulted in the removal of environmental education as one of four core pillars underpinning the National Curriculum (Martin et al., 2015).

The review found that the provision of environmental education in formal schooling is weakly supported by national policies. That is, there is currently a lack of intention or ideological vision for environmental education explicitly articulated in England's education policy. Having no national directive, environmental education across secondary school curriculums is patchy and restricted. The quantity and quality of a student's environmental education is greatly dependent on their GCSE subject choice. That is, where students opt to study GCSE geography (a non-mandatory subject) their exposure to environment-related education is substantially increased compared to students studying science GCSE only.

Further, the quality, and breadth, of environmental education is also influenced by the choice of examination board specification. For the specifications sampled, only two offered explicit opportunities for students to engage in what may be considered 'radical' environmental improvement. These were the Edexel geography GCSE, and the OCR (B) science GSCE. More prevalent was the inclusion of conservative reform approaches predominantly focused on technological solutions. The review also found that due to the examination context in England, environmental education provision is focused on content knowledge acquisition. The current specifications fail to offer students' opportunities to gain skills for, and participate in, social and environmental activism, be that at a local, national or global level.

National policy, in particular National Curricula, greatly influence the shape of environmental education offered at secondary schools. Hence to facilitate wide and extensive change a clear national policy for environmental education is required.

Recommendations

- In lieu of varied weakly framed references, a coherent national policy which sets out a vision for environmental education in secondary schools should be established. The policy would shape future National Curriculum reforms and national assessments.

- The national policy should recognize the multiple dimensions of environmental education (eg *about, in and for* the environment) and ensure that all dimensions are given equal footing throughout a student's school career.

- Young people should be given the opportunity to think broadly about local and global environmental issues and encouraged to develop a sense of ownership and agency. In other words, students should receive a democratic pluralistic education about the environment whereby they have the capabilities and resolve to mitigate environmental inequalities.

Introduction

The purpose of this report is to understand the state of environmental education in secondary schools in England viewed from a policy perspective. Our focus on policy directs attention to 'policy as text' at work across a range of contexts (Ball, 2015). That is, we explore the positioning of environmental education in directives and policies from national government, Multiple Academy Trusts (MATs), Local Authorities, through to school geography and science departments. Further, due to the high-stakes examination context in England, we analyse examination specifications and published resources in an endeavour to understand their interpretation and propagation of environmental education.

In seeking to analyse the state of environmental education in secondary schools, it is first necessary to state our own understanding of the discipline: we regard environmental education to be an opportunity that 'seeks to develop an understanding of the relationships between human culture and our life support system, and emphasises environmental responsibility through social action and personal behaviour' (Scott & Vare, 2018, p. 227). Furthermore, we agree with the definition of Lucas (1972) that environmental education is an holistic education that is: *about, in* and *for* the environment.

This report, funded by a British Academy/Leverhulme award, is timely as in 2014 environmental education was removed as an explicit value underpinning the National Curriculum for England (Martin, Dillon, Higgins, Strachan, & Vare, 2015). Environmental education has since been left to schools and subject teachers, primarily within geography and science, to decide how, when and if it should be taught. With no formal requirement and accountability involved, environmental education in England has received little attention from curriculum developers, or academics concerned with formal schooling. Whilst environmental education is no longer formally recognised, we assert that policy texts still play a part in shaping the quality and the quantity of current practice in schools. However, what these documents communicate is fuzzy. This ambiguous state leaves institutions and practitioners uncertain about the amount and type of emphasis to place on environmental education within teaching and learning. And yet, with mounting evidence that humanity's ecological trajectory is unsustainable (Orr, 2004), environmental education is arguably essential for national, social and cultural well-being, equipping future generations with the skills to participate in debates concerning environmental risks and challenges (Hodson, 2011).

This report is the first of two which explore the current state of environmental education. Taking different approaches, the reports respond to the question: *What is the state of environmental education provision across secondary schools in England?* In doing so, we have sought to understand the interplay of political, institutional and individual power (Ball, Maguire, & Braun, 2012) and its impact on the ways environmental education policy and practice is shaped and implemented. In this report, we set out the current policy landscape in terms of an analysis of national and local environmental education-related policies, examination board specifications, schools' schemes of works, and published textbooks. The second report sets out how policy is understood, enacted and lived by experienced teachers, subject association and learned society staff, and those involved more widely in the environmental education sector. By understanding environmental education from multiple perspectives, our aim is to propose a new direction for its practice. Our second report thus presents a series of recommendations to re-ignite a much-needed debate concerning the future of environmental education in secondary schools in England.

Report Structure

Following an account of our analyses, we report the findings for each type of policy text. This includes: national policies; MATs, local authorities, and schools' policies; geography and science department's schemes of work; examination specifications and textbooks. Our discussion responds to two questions: *Why should the government be more active in shaping environmental education in secondary schools? What should be included in an environmental education?* We go on to propose emerging recommendations, built on in Report 2.

Analyses

Document analysis

Between mid 2017 and early 2018, documents related to environmental education in England were identified across five areas: national policy; local policy; national curriculum; examination specifications and school schemes of work; and published resources. Following Aikens, McKenzie and Vaughter's (2016) systematic review, the search terms used to identify relevant documents and text for analysis included: 'environmental education', 'education for sustainable development' 'sustainable development education', 'education for the environment', 'conservation education', 'fieldwork' and 'ecology education'. We acknowledge that such a list comprises a broad set of terms, but note that they are not synonymous. Indeed, as explained below, it is important to understand the full range of underlying ideologies which underpin practices within environmental education. Such ideologies are often masked and identified by the language used eg education for sustainable development, conservation education, and so on.

To understand the ideology which underpins the direction of environmental education, and guided by Stevenson's (2007) typology of ideological visions for environmental improvement, we discursively analysed (Burman & Parker, 1993) environmental education-related policies and subject materials. Stevenson suggests that based on the common and critical dimension of political scenarios, the ideologies underlying the different visions of, and means to, environmental reform fall into two broad categories, with each category having two variations on the type of approach adopted. First, *conservative reform (within the current system)* approaches are either technical or political. Second, *radical reform (of the current system)* approaches are either socially critical or alternative, whereby an alternative approach is situated outside the established norms. Stevenson posits that conservative reformers support the priority of economic growth with a view to maintain status quo, whereas radical reformers believe that economic growth should be secondary to environmental quality.

Range of documents

Below we set out the 5 types of document texts analysed.

Document I: National policy

Government policy records available on-line (gov.uk) were identified in the following relevant government departments and non-department public bodies: Department of Education (DfE); Department for Environment, Food and Rural Affairs (Defra); Department for Business, Energy and Industrial Strategy (BEIS); and Natural England (NE). The documents were filtered for those published between 2010-2018 following the election of the coalition Conservative-Liberal Democrat government which prompted a substantial number of policy reforms. Sixteen documents were identified concerning environmental education-related policies, documents and supporting materials. National Curriculum documents, such as the Programmes of Study, were allocated to a separate document group (see below).

Document II: Local policy

Due to the fragmented educational landscape, and in order to capture an insight into local policies, a search for environment-related education policies and practice was completed across multiple websites and documents for Local Government Authorities (LA) and Multi Academy Trusts (MATs) over one month (May 2017). A sample representing a geographical spread (one from each region) were selected of 10 LAs (from 152) and 10 MATs (from 1121). Similarly, for each MAT, one secondary school's website was analysed. For each region and MAT the secondary school analysed was selected based on alphabetical order (eg the school name listed earliest in the alphabet).

Document III: The National Curriculum

As set out in the National Curriculum, the Programmes of Study[1] for science at Key Stage 3 (KS3) (11-14 years) and Key Stage 4 (KS4) (14-16 years) were analysed for environment-related education themes (DfE, 2014). Similarly, the Programmes of Study for geography at KS3 were analysed for these themes. Geography is mandatory up to KS3 only; there is no KS4 geography Programme of Study.

Document IV: Examination specifications

There are three examination boards in England: the Oxford, Cambridge and RSA, known more commonly as OCR; the Assessment and Qualification Alliance (AQA); and EdExcel (Education and Excellence). Each examination board publishes examination specifications for GCSE science, and geography. A GCSE science 'core' specification, that includes aspects of biology, chemistry and physics, was analysed for each examination board. Separate science GCSE awards (for example, biology; chemistry; physics) were not analysed. This was due to the higher uptake by individual students of GCSE core science (67.4 per cent) compared to separate sciences (biology, 25.3 per cent; chemistry, 24.8 per cent, physics, 24.7 per cent), as reported by Carroll & Gill (2017). Similarly, a GCSE geography specification was analysed for each examination board[2]. The specifications analysed were all to be examined in summer 2018.

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1 The Programmes of Study (PoS) apply to all schools maintained by the local authority in England. Examination boards will include all directives from KS4 PoS into specifications.

2 It was noted that the OCR GCSE 'Environmental and land-based science' had been recently withdrawn, with the final exam in summer 2018. Also, the AQA GCSE 'Environmental Science' has since been withdrawn, with the final examination in summer 2017.

Document V: Schemes of work and published resources

Using our institution's Initial Teacher Education (ITE) school partnership contact list, 15 science departments, geographically spread across Greater London, were contacted via email requesting their KS3 and KS4 schemes of work (a scheme of work is the name given to the sequence of lesson topics often listing the lesson objectives and providing activities and links to resources). The science contact was asked to forward the email request to a geography colleague in the school. A follow-up request was sent to schools who had not replied. A total of 11 schools (which included: 11 science departments and 9 geography departments) responded with a range of documents. The majority of documents linked to purchased schemes of work.

Independent and examination board endorsed secondary science and geography (KS3 and KS4) published textbooks and resources were searched at the libraries of King's College London, University College London (Institute of Education) and the National STEM Learning Centre, York. Several (5) books were bought due to their unavailability in the libraries.

Ethics

British Education Research Association (2018) ethical research guidance was consulted. The research received ethics approval from King's College London Research Ethics Committee (Ref: MR/16/17-185). On requesting school documents teachers received written assurance that there would be complete anonymity: names of schools and teachers would not be used and any identifying features in the documents would be removed.

Limitations

This study presents only a small sample of MAT and school websites. Websites are dynamic texts, in that they are frequently changing and we claim only to have established what was published on one particular day. We acknowledge that website analysis is limited by what organisations choose to present and is not necessarily a true representation.

Findings

National policy

An analysis of national government policy documents from 2010 onwards suggests a shift away, and a 'quietening' of, the previous government's explicit sustainable development[3] agenda. From our original research aim of examining the nature of the environmental education offer and environmental perspectives of the DfE, Defra, BEIS and NE, the challenge soon became the identification of *any* tangible environment-related policy. This general quietening concerning the environment is evident in the 2016 demise of the Department for Energy and Climate Change. Created in 2008, the Department then was 'folded' into the Department of Business, Energy and Industrial Strategy (BEIS). Similarly, in 2011, the Sustainable Development Commission, an independent advisory body on sustainable development, was closed by the government and not replaced. The Commission had positioned environmental education as an opportunity to solve larger societal problems such as unemployment and civic responsibilities through, for example, apprenticeships. The Commission's view, that environmental education affords opportunities for social justice, contrasts significantly with views set out in the 2013 Poverty and Social Justice policy paper (Department for Education & Pensions, 2013). Here, methods enabling a fairer society are limited to bland statements concerning 'education' and 'employment', and omit the critical role that the environmental sector could play in the future job market.

Turning to the *DfE strategy 2015 to 2020: world-class education and care* (DfE, 2015) and their white paper *'Educational Excellence Everywhere'* (DfE, 2016), policy and guidance related to environmental education or even environmental education's close cousin Education for Sustainable Development are again remarkably absent. It could be argued that the lack of environmental education policy within the strategy is a result of the government's move to giving more autonomy to the education sector as promoted by the then Education Secretary, Michael Gove (DfE, 2012). However, the strategy does, for example, prioritise 'increasing the take up of STEM study', the need for 'character and skills education' and for young people to become 'active citizens' (DfE, 2015, p.23). So rather than a non-interventionist approach, there is evidence that the DfE does explicitly support the development of particular skills and types of learning and teaching approaches. Seen in this light, the absence in the strategy for an education that engenders an environmental literate society seems remiss.

There is, however, evidence of environment-related education in Defra's policies supported by Natural England.

Defra's 2015-20 Strategy document highlights the need 'to unleash the economic potential of food and farming, nature and the countryside' (Defra, 2016, para. 1) with the requirement for rural areas to offer high quality education and training, for example, by expanding apprenticeships in food and farming. This policy, that prioritises environment skills that serve economic growth, aligns with Stevenson's conservative reforms and in turn sustains the neoliberal status quo. In practice, this policy is supported by funding for educational farm visits and staff training (NE, 2015a, 2015b) and the *Plan for National Parks* that includes an aim to increase young people visiting, volunteering and working in National Parks (Defra/Environmental Agency/NE, 2016). Whilst both programmes are worthy, in that they aim to increase connections with nature, their reach is limited, impacting only a small number of young people.

Defra's (2018) long awaited plan, *A Green Future: Our 25 Year Plan to Improve the Environment,* presents a broad vision for environmental management and stewardship that includes a chapter dedicated to connecting people with the natural world. Analysis of the plan suggests two implicit agendas underpinning the government's increased interest in connecting people with nature. First and foremost, the document presents the natural world through a utilitarian lens, as a tool to improve people's well-being. Well-being is receiving a great amount of attention across all government departments. Reasons for this interest might include the economic burden mental health problems are placing on the British economy (Royal Society for Public Health, nb). For example, the Centre for Mental Health (2010) estimated in 2009/10 these costs at £105.2 billion.

Second, the document notes that by cultivating a connection through learning about the natural world, the wider population will have the means and motivation to 'improve the natural world and spread the word about environmental issues' (Defra, 2018, p.82). However, in comparison to the first goal – to improve national well-being – this second intention is arguably underplayed. The reason for the limited emphasis may be that guidance on formal education is outside Defra's remit. Indeed, this might offer an explanation as to the absence of 'environmental education' as a term through the entirety of the document, and the preference for the term 'connection to nature'.

Local policy

None of the local government authority (LA) websites included an aim to ensure environmental education for young people in their mission statement or organisation's objectives. However, three types of environmental education related offers were evident across seven LA websites. First, LAs offered professional development for teachers in 'outdoor learning'. Although 'outdoor learning' referred to teaching occurring outside the classrooms, including visits to local museums and historical sites, the contexts also often related to sites for environmental learning (eg local nature reserves). Second, LA websites often promoted local out of school education providers and sites to visit. The advertised

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3 Environmental conservation/care & sustainable development whilst ideologically different are frequently used interchangeably. This report cites the exact terms and phrases from the original documents.

providers expressed a range of educational objectives, but most promoted 'connecting young people to nature' and natural history (eg local nature reserves, farms, activity centres and local museums). Third, LA websites often signposted teachers to on-line 'Education for Sustainable Development' teaching resources. Whilst these resources offered opportunities to extend the current curriculum, their references were all outdated and were linked to pre-2010 government policies (for example, guidance from the now defunct Qualifications and Curriculum Development Agency).

None of the MAT websites included any reference to education *about*, *in* or *for*, the environment or sustainability. That is, Trust's and school's ethos, mission or value statements made no reference to the environment. Rather, the majority of 'statements' were concerned with developing 'outstanding', and in one case 'competitive', students. There were two exceptions to this, however, where Trust's had highlighted the importance of societal needs alongside individual needs.

Very limited environmental education related activity was disclosed on the sampled schools' websites. However, where seen it was in two indirect forms. First, five schools described residential experiences to field study centres although the status, and articulated focus, of these residential visits varied. Two schools offered Year 7 students outward-bound residential courses. Both were non-compulsory, in the summer term and cost in excess of £200 per student. One school listed a residential visit aligned with their geography GCSE curriculum. For the two remaining schools the opportunity to experience a residential visit was listed in their 'student charter'; details, however, were lacking. Second, under 'extra curriculum offers', schools included the following environment-related education activities: the Duke of Edinburgh programme, and farm volunteering. Across all the sampled schools, references to gardening/horticulture opportunities/clubs were notably absent.

National Curriculum, exam specifications, schemes of work and published resources

Analysis of school departments' schemes of work and published resources show that they are shaped and influenced by the National Curriculum Programme of Studies and the examination specifications. At KS4 this influence was indisputable, with the majority of schools using published textbooks and resources that mirrored the examination board endorsed specifications. Hence, whilst the findings below mainly focus on the National Curriculum and examination specification content they reflect the content of schemes of work, published textbooks and resources used in the participating schools. At KS3, with no formal national assessment and the slimmed down National Curriculum Programme of Studies, schemes of work, particularly for geography departments, showed some variability.

Geography related environmental education

The KS3 geography Programme of Study is a slim 3-page document (DfE, 2014). Climate change, both natural and as a product of human activity, is highlighted but the term 'sustainable development' is absent. The document states that students should understand the key processes (eg weather and climate, urbanisation) through place-based exemplars. The document is broadly descriptive, apolitical and communicating little about environmental improvement.

In practice, the sampled geography department's schemes of work present a range of responses to the mandatory document. Some geography department KS3 schemes are predominantly descriptive, teaching the facts about the issues, often discussed in terms of science or economics. Other departments embed a more critical approach to learning, and teach how issues needed to be understood through an exploration of multiple perspectives. Taking this further, a few departments ensure that whilst students learn about issues, such as flooding, renewable energies and climate change, they are also encouraged, and empowered, to consider their own role and their future actions. All department schemes included 'field work' as directed by the National Curriculum. These activities are mainly planned for the school grounds (eg sampling flora) or local vicinity (eg interviewing local people).

Content themes	AQA 2016a (8035)	Edexcel 2016a (A) (2017)	OCR 2016a (Geo A (J383))
Specification aim	This exciting course is based on a balanced framework of physical and human geography. It allows students to investigate the link between the two themes, and approach and examine the battles between the man-made and natural worlds. (p.3)	Geography enables young people to become globally and environmentally informed and thoughtful, enquiring citizens. (p.6)	The specification will introduce and extend learners' insight into and exploration of both the geography of the UK and the wider world. Learners will be equipped with a wide range of geographical skills which will help them become both adaptable and resilient no matter which future pathway they choose. (p.5)
Energy management	Different strategies can be used to increase energy supply: Moving towards a sustainable resource future: individual energy use and carbon footprints. Energy conservation: designing homes, workplaces and transport for sustainability, demand reduction, use of technology to increase efficiency in the use of fossil fuel. (p.23)	Renewable and non-renewable energy resources can be developed. There is increasing demand for energy that is being met by renewable and non-renewable resources. Meeting the demands for energy resources can involve interventions by different interest groups. (p.22)	Energy in the UK is affected by a number of factors and requires careful management and consideration of future supplies: The development of renewable energy in the UK and the impacts on people and the environment. The extent to which non-renewable energy could and should contribute to the UK's future energy supply. Economic, political and environmental factors affecting UK energy supply in the future. (p.8)
Climate change	Managing climate change: mitigation – alternative energy production, carbon capture, planting trees, international agreements; adaptation – change in agricultural systems, managing water supply, reducing risk from rising sea levels. (p.12)	Uncertainties about how global climate change will impact on the UK's future climate, impacts of climate change on people and landscapes in UK, range of responses to climate change in the UK at a local and national scale. (p.15)	Climate change has consequences. Summary of a range of consequences of climate change currently being experienced across the planet. (p.12)
Deforestation	Deforestation has economic and environmental impacts.' 'Value of tropical rainforests to people and the environment. Strategies used to manage the rainforest sustainably – selective logging and replanting, conservation and education, ecotourism and international agreements about the use of tropical hardwoods, debt reduction. (p.12)	Economic and social causes of deforestation: How economic change is increasing inequality in the city and the differences in quality of life. (p.18)	

Table 1. Instances of environment-related education within geography GCSE specifications

At KS4 the geography programme content follows that established by the examination boards. Table 1 presents the aims of the three examination programmes and compares their specifications objectives/statements for three topics associated with environmental education: energy management, climate change and deforestation. From this comparison three observations emerge.

First, it is clear that GCSE geography programmes are largely dominated by a conservative vision (Stevenson, 2007) of environmental improvement. Thus the specifications refer to technological and political approaches, such as,

> Energy conservation: designing homes, workplaces and transport for sustainability, demand reduction, use of technology to increase efficiency in the use of fossil fuel. (AQA, 2016a p.23)

However, there are subtle differences between specifications. For example, Edexcel's (2016) specification includes more socially critical approaches. For example, learners are encouraged to consider and critique the social and societal consequences alongside economic outcomes. Thus the educational objective for the topic of deforestation is described as follows:

> Economic and social causes of deforestation: How economic change is increasing inequality in the city and the differences in quality of life. (Edexcel, 2016a p.18)

The second observation concerns the positioning of humans. The human relationship with the ecosystem took a range of forms across the specifications. AQA (2016a) positions humans as separate from the ecosystem and suggests that humans are at war with the planet:

> This exciting course is based on a balanced framework of physical and human geography. It allows students to investigate the link between the two themes, and approach and examine the battles between the man-made and natural worlds. (AQA, 2016a, p.3)

Edexcel (2016a) presents humans, and specifically the geography students, as global environmental citizens, learning so that they might understand the environment:

> Geography enables young people to become globally and environmentally informed and thoughtful, enquiring citizens. (Edexcel, 2016a, p.6).

The final examination specification, OCR (2016a), is predominantly conservative taking a non-critical approach to learning about the environment. For example, the student is placed in a subordinate role, one to 'appreciate' and 'study' the world:

> Learners will study in depth the diverse and dynamic geography of the UK. They will gain an appreciation of

the changes to the UK's geography and the processes which drive them. This will include the study of the natural landscapes which define the UK, the people of the UK and the environmental challenges facing the UK. (OCR, 2016a, p. 9)

Noteworthy across these positions is the limited provocation to encourage alternative thinking about environmental challenges or to genuinely encourage environmental activism.

The third observation concerns the concept and conceptualisation of climate change and climate management. It is widely argued that climate change is the most important and challenging environmental issue of our time (IPCC, 2014). Whilst all the geography programmes explore climate change, the nature and the depth to which the issue is tackled varies considerably. As a simple illustration of this variance, OCR refers to climate change on only four occasions, AQA on eight occasions, whilst Edexcel includes references to climate change 13 times.

Upon exploring the nature and depth of these references, a variablity in the role of human activity versus natural processes in the cause of climate change was evident. That is, while Edexcel unequivocably states 'Global climate is now changing as a result of human activity' (2016a, p.12), OCR is more non-commital in its view of anthropogenic causation: 'There are a number of possible causes of climate change' (2016a, p.12). To be clear, whilst all the examination boards highlight the range of factors influencing the change in climate it is how, and the degree to which, they are emphasized that is of interest.

Lastly, it is significant to note that both the AQA and Edexecel specifications list strategies or methods to mitigate climate change; OCR does not include such discussions (see Table 1). Further, while the methods listed focus on technology developments and international reforms (that is, conservative reforms within Stevenson's (2007) typology), Edexcel additionally highlights the socially critical reform that individuals and local communities play.

Science related environmental education

Set over 13-pages, the KS3 science Programme of Study's four sections are: working scientifically: biology; chemistry; and physics (DfE, 2014). Environment-related topics are located, in a limited capacity, across the biology and chemistry sections. In the biology section, environment-related statements are: 'independence of organisms in an ecosystem', 'how organisms effect, and are effected by, their environment', and 'the importance of maintaining biodiversity' (DfE, 2014, p.7). The emphasis is on understanding the interrelationship between living and non-living things and their dependence on one another. In the chemistry section, environment-related statements are: 'earth as a source of limited resources and the efficacy of recycling' and 'the production of carbon dioxide by human activity and the impact of climate' (DfE, 2014, p.9). Significantly, although key ideas and content are addressed (and indeed the role of human activity in environmental

change is noted), the specific terms of climate change and sustainable development are absent throughout the entirety of the document.

In practice, school science departments' KS3 schemes of work and the published textbooks, follow the science Programme of Study with limited deviation resulting in restricted exposure to environment-related issues. The biology environment-related content focuses on: feeding relationships, predator-prey relationships, organism competition and adaptations. On average, across KS3 the total allocated teaching time for this content is 8 hours. The lessons are often designed to focus attention on scientific language and knowledge acquisition. However, in response to the working scientifically statement: 'use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety' (p.4), several departments have included a fieldwork lesson into their scheme of work. Frequently planned for the school grounds, students are to measure vegetation (using quadrats and transects). The textbooks exemplify environment-related topics often using non-native organisms such as the lion's food web and the polar bear's adaptations. On occasion, native species to England were included, for example the oak tree and its biodiversity (Gardom Hulme et al., 2016, p.187).

The chemistry environment-related content across the teaching schemes is similarly limited. That is to say, on average across KS3 5 hours of lessons are focused on environmental chemistry. For example, an 8-hour Year 8 scheme of work for the module titled 'earth and resources', assigned one third (approximately 20 minutes) of the penultimate lesson on 'reducing the impact of combustion on the environment'. That said, there was one example whereby a science department had created a 21-hour Year 8 module titled 'energy changes and energy resources' combining the topics: energy, energy resources, photosynthesis, respiration and sustainability. This final topic, sustainability, planned for 2-hours focused on understanding the scientific research and the future technologies related to the problems of pollution, global warming, over-population and non-biodegradable waste. Using Stevenson's typology, this approach was strongly aligned with 'technical' improvement.

Unlike that for geogaphy, the science Programme of Study in England is mandatory at KS4. The document is 18-pages in length. Building on KS3 environment-related topics, there is again an emphasis on 'the importance of maintaining biodiversity' and 'material recycling'. The term 'climate change' is explicit but, as detected in the geography GCSE specifications, an element of caution is introduced concerning its legitimacy, where students are asked to study: 'evidence, and uncertainties in evidence, for additional anthropogenic causes of climate change' (DfE, 2014, p.13). Whilst required, attention might be needed to ensure that the current emphasis on evidence does not compromise the significance of the urgency of climate change. Distinct from KS3, the KS4 Programme of Study invites more criticality of scientific and technological developments, for example encouraging deliberation of 'positive and negative

human interactions with ecosystems' (p.9) and 'ethical considerations of modern biotechnology' (p.10). That said, there is no reference to science (outcomes) in terms of social, environmental or political justice.

Whilst the science KS4 curriculum clearly shapes the science GCSE programmes, variation was observed between examination board approaches to environment-related themes. Table 2 compares the three examination board objectives/statements for the topics: energy management and climate management, two topics that align closely with environmental education. Applying Stevenson's typology to these extracts, overall, GCSE science programmes are dominated by a conservative vision for environmental improvement. It is not surprising that in the study of science, technical responses to environmental problems are privileged. For example,

> Examples of mitigation include: using energy resources more efficiently; using renewable sources of energy in place of fossil fuels (see resources of materials and energy); reducing waste by recycling; stopping the destruction of forests; regenerating forests; developing techniques to capture and store carbon dioxide from power stations. (AQA, 2016b, p.62)

However, looking closer at the OCR science programme and particularly at the topic of energy management (see Table 2), students were invited readily to consider environmental improvements beyond technological advances and political approaches. That is, the specification calls for scientific progress to be understood from local and national levels alongside multiple perspectives (including supply companies, media and environmental groups). Uniquely though, the programme introduces students to the possibility of more radical environmental reforms by encouraging students to consider alternative approaches in the form of 'drastic lifestyles changes' (OCR, 2016b, p.92).

Content	AQA (8465)	Edexcel (1SC0)	OCR (J260)
Energy management	Describe the main energy resources available for use on Earth (including fossil fuels, nuclear fuel, biofuel, wind, hydroelectricity, the tides and the Sun); Evaluate the use of different energy resources, taking into account reliability, cost and impact on the environment. (p.127)	Describe the main energy sources available for use on Earth (including fossil fuels, nuclear fuel, bio-fuel, wind, hydroelectricity, the tides and the Sun), and compare the ways in which both renewable and non-renewable sources are used. (p.51)	Citizens are faced with complex choices and a variety of messages from energy supply companies, environmental groups, the media, scientists and politicians. Some maintain that renewable resources are capable of meeting our future needs, some advocate nuclear power, and some argue that drastic lifestyle changes are required. Decisions about energy use, whether at a personal or a national level, need to be informed by a quantitative understanding of the situation (p.92) Decision about the use of crude oil must balance short-term benefits with the need to conserve this resource for future generations (p.64)
Climate management	Climate change: impacts and mitigations: Steps can be taken to mitigate the effects of climate change by reducing the overall rate at which greenhouse gases are added to the atmosphere. Examples of mitigation include: using energy resources more efficiently; using renewable sources of energy in place of fossil fuels (see Resources of materials and energy); reducing waste by recycling; stopping the destruction of forests; regenerating forests; developing techniques to capture and store carbon dioxide from power stations. (p.62)	Evaluate the evidence for human activity causing climate change Describe that these effects may be mitigated: consider scale, risk and environmental implications (p.52)	Scientists aim to reduce emissions of greenhouse gases, for example by reducing fossil fuel use and removing gases from the atmosphere by carbon capture and reforestation. These actions need to be supported by public regulation. Even so, it is difficult to mitigate the effect of emissions due to the very large scales involved. Each new measure may have unforeseen impacts on the environment, making it difficult to make reasoned judgments about benefits and risks. Describe how the effects of increased levels of carbon dioxide and methane may be mitigated, including consideration of scale, risk and environmental implications (p.52) Decisions about protecting and conserving biodiversity are affected by ecological, economic, moral and political issues (p.47).

Table 2. Instances of environment-related education within science GCSE specificaitons

A comparison of environment-related offers across geography and science

The analysis of curriculums and associated documents reveal several issues with the current environmental education offer in England. Whilst environment-related content is incorporated across KS3 and KS4 geography and science curriculums, it is more evident within geography than science. The implication here is that students will have limited exposure to the discipline: geography is only mandatory at KS3, and moreover the subject usually only receives 1-2 hours of curriculum time per week (compared to 3-4 hours for science). This lack of exposure has been further exacerbated following the removal of the national KS3 assessments – which historically took place at the end of Year 9 – as many schools (including several in the sample) have compressed the KS3 curriculum from three years into two so that GCSE preparation commences at the start of Year 9. Whilst this would not be an issue were it a mandatory subject, geography is an optional GCSE subject (compared to science which is mandatory alongside maths and English). Currently, around 50 per cent of young people in England study GCSE geography[4] – leaving half the population with a very reduced environmental education after Year 8.

Second, there is duplication of content across geography and science curriculums. This included: ecosystems, feeding relationships, waste and recycling and the water cycle. Whilst in general, the subjects dealt with the content through different approaches – for geography the emphasis is 'placed based' and for science the emphasis is on scientific theories and concepts – explicit connections between the two curriculums are not evident in any document.

Third, given that climate change is arguably the biggest issue facing the planet it is somewhat surprising how little curriculum time the topic receives across both the geography and science schemes of work and specifications. The limited time is futher exacerbated by the narrow focus on evidence for climate change. Whilst important to understand data and scientific reporting, there is currently a dominance, and an imbalance, towards debating whether anthropogenic climate change exists, rather than a focus on the complicated (scientific) mechanisms involved and the current, and possible future, mitigation approaches required.

Finally, and building on the last point, in terms of Stevenson's typologies, the geography and science curriculums offer students a limited vision of the approaches for environmental improvement. The majority of mitigation approaches concentrate on technological advances with some, but limited, discussion of the role of legislation. That said, subtle differences are revealed between different examination specifications that expose the potential opportunities for the inclusion of more socially-critical and alternative approaches to environmental reforms.

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4 Cambridge Assessment, for example, reports only 41 per cent of students taking the subject at GCSE (Carroll & Gill, 2017).

Discussion

This report set out to understand the state of environment education in secondary schools in England viewed from a policy perspective. In general, environmental education in formal schooling is weakly supported by national policies. That is, there is a current lack of intention or ideological vision for environmental education explicit in England's education policies. MATs, LAs and individual schools rarely articulate mission statements or organisational values reflecting pro-environmental improvement or responsibility. Having no national or local directive, environmental education across secondary schools is patchy and restricted. This study's findings suggest that the quantity and quality of a students' environmental education is greatly dependent on their GCSE subject choice alongside the exam board specification studied.

The key questions

Why should the government be more active in shaping environmental education in secondary schools?

There has not always been a national environmental education vacuum. England has had a variety of national directives for environmental education (Martin et al., 2013; Scott & Reid, 1998). Dependent on the historical and political context, different levers have facilitated the rise and fall of policy directives.

Viewed from a global level, the case for a government's resolute engagement in shaping environment education is undisputable. Human activity is ecologically unsustainable, and the loss of biodiversity, climate change and air and water pollution are worsening and leading to worldwide inequalities. It is incumbent upon a government to ensure that all people collectively understand how to repair our planet.

At a national level, it might be suggested that a government would be wise to additionally care about environmental education for more instrumental reasons. That is, the OECD's Programme for Student Assessment (PISA), the international survey which evaluates education systems worldwide, has commenced the Global Competence assessment. Competences include: 'examining local, global and international issues' and 'taking action for collective well-being and sustainable development' (OECD, 2017, p. 11). Following the Brexit result perhaps Global Competence is not something an English government wants to be seen to fail on? Additionally, at a national level, the Green Economy is expanding at a rapid rate requiring 21st century skills such as creativity and flexibility. To ensure the nation remains economically competitive, a progressive environmental education programme would ensure an appropriately skilled labour force.

At an individual level, environmental education is also utilitarian, offering practical skills and training, for related careers, at home and in the garden. But more importantly, environmental education is democratic, in that it offers an opportunity for all to participate in socio-environmental issues faced today and in the future. A government needs to ensure that citizens are able to make informed socio-environmental decisions, from which political party to vote for through to which food is 'eco-friendly'.

What should be included in an environmental education?

The study reveals that, in general, geography and science department's schemes of work closely follow the National Curriculum's Programmes of Study and, at KS4, the examination board's specifications. However, current policy guidance is lacking when it comes to achieving the aims set out above for an enriched, engaging environmental education that gives people agency. That is, from this review of the type of environmental education offered, subject department's schemes of work illustrate a preoccupation with facts and subject acquisition. Driven by the current assessment system that privileges this type of knowledge, current lessons and textbooks have been designed accordingly. However, for a rounded environmental education to be achieved, curriculums need to be taken outside the classroom and must encourage environmental and community activism. Whilst 'field work' is listed in geography and science schemes of work, it is not always evident that this activity has much to-do with the environment *per se*, rather a technical skill required for an exam. Although these differences are at times subtle, if students are to learn about their environment, in their evironment and engender a sense of ownership for their environment, such learning aims will need to be made explicit.

By using Stevenson's typologies of environmental improvement, we have revealed that students are exposed to environmental education that, for the most part, is conservative in the way of reforms, and narrowly focused on technology approaches. The problem here is two-fold. First, the dominance of a conservative reform ideology reinforces knowledge acquisition for scientific endeavour, rather than encouraging environmental/social activism. Second, as Stevenson (2007, p.143) contends, 'to be consistent with democratic principles students should be exposed to the plurality of environmental ideologies, and that through a process of inquiry, critique and reflection they can be assisted to develop and defend their own set of environmental beliefs and values'. That is, for a democratic education young people require access to multiple viewpoints and a range of perspectives. Predicted outcomes and possible interventions concerning environmental improvements need to be shared and challenged. There is a need, as citizens, to understand that there are no environmental fixes and that all solutions have social, political, environmental impacts. However, as Stevenson (2007, p.143) cautions, exposing students to multiple

perspectives will not be enough, rather 'students also need to be competent to implement or act on their choice, otherwise they will not consider themselves capable of rectifying environmental injustices, and therefore will not experience an authentic choice on these issues'.

Hence, environmental education needs to be broad and actively engaging; a position the policy landscape in England has some way to go to achieve.

Recommendations

We recommend that:

- In lieu of varied weakly framed references, a coherent national policy which sets out a vision for environmental education in secondary schools should be established. The policy would shape future National Curriculum reforms and national assessments.

- The national policy should recognize the multiple dimensions of environmental education (eg *about, in* and *for* the environment) and ensure that all dimensions are given equal footing throughout a student's school career.

- Young people should be given the opportunity to think broadly about local and global environmental issues and encouraged to develop a sense of ownership and agency. In other words, students should receive a democratic pluralistic education about the environment whereby they have the capabilities and resolve to mitigate environmental inequalities.

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