

The Design of the Curriculum for Sustainability and Climate Education in the Early Years

POUNTNEY, Richard <<http://orcid.org/0000-0002-5672-0811>> and TIMMERS, Koen

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Chapter: The design of the curriculum for sustainability and climate education in the early years

Richard Pountney and Koen Timmers

Introduction

There is a growing consensus of the need to equip children with the skills and knowledge of STEAM (Science, Technology, Engineering, Art, and Math) education to respond to the problems facing the world in the 21st Century (Dejarnette, 2018; Herranen et al., 2021). This includes how to promote talk about sustainability and climate in high quality early STEAM experiences for children, in both formal settings such as preschool environments and less formal settings such as home environments (Li et al., 2021). Indeed, the sense that it is a “taboo subject” has been overtaken by events that are directly affecting the daily lives of people and the first and most important thing that people can do is talk about climate to everyone (Maslin, 2021). Furthermore, as Michael Fullan reminds us, the circumstances that we are faced with make it essential that we proactively change the world through learning (Fullan et al 2017), including the ways in which we can actively promote science knowledge in inquiry-based approaches (Lin et al., 2021). Alongside the importance of introducing young children to caring for the planet and in building skills to explore sustainability, is the notion of climate anxiety, and the concern that these problems are beyond the influence of ordinary people. This chapter examines this from the perspective of early years (EY) STEAM education and discusses what schools and teachers can do to prepare for and develop young children’s understanding of and engagement with the issues, and to address their concerns. Approaches that can be taken in the curriculum and pedagogy are presented, illustrated with examples from global movements in education. These approaches are theorised by means of semantic variation theory (Maton, 2013) to identify how the systems of meaning can be made accessible, and how the sustainable development goals (SDGs) of quality education (SDG4) and climate action (SDG13) can be achieved, in an activist curriculum (Pountney, 2021). It offers insights and examples for teachers on the design of the Early Childhood and Care Education (ECCE) curriculum and the means of evaluating it.

The United Nations Action for Climate Empowerment (ACE) has been adopted by the United Nations Framework Convention on Climate Change (UNFCCC) to denote work under Article 6 of the Convention (1992) and Article 12 of the Paris Agreement. The over-arching goal of ACE is to empower all members of society to engage in climate action, through education, training, public awareness, public participation, public access to information, and international cooperation on these issues. However, the idea of climate emergency as a problem that schools and the curriculum need to respond to is challenged by a view of environmental and climate change as distant or future problems, rather than immediate and local ones. Adding to this is the view that climate change is a ‘socioscientific issue’, requiring specialised scientific knowledge and a critical interpretation of the issues (Hodson, 2020). While approaches to developing science knowledge in EY can be very successful (Lin et al., 2021), the notion pervades that the problem of climate change is too complex for young children, requiring highly developed specialised knowledge and skills. This is brought into relief by the fact that climate crisis is a child rights crisis (UNICEF, 2021), in which, according to the Children’s Climate Risk Index (CCRI), an estimated one billion children live in extremely high-risk countries. The ability of children to grow healthy and happy, and avoid illness, disease and even death is, therefore, called into question. Furthermore, efforts to sustain a liveable planet must not only account for the unique needs and vulnerabilities of young people; they must also include them in the solutions. How can the curriculum itself be the means of reshaping and providing this voice?

In England the government’s Department for Education (DfE, 2022) has set out its strategy for Sustainability and Climate Change and for education and children’s services. Drawing on the United Nations’ 17 Sustainable Development Goals (SDG) and UNESCO’s ‘Education for Sustainable Development (ESD) for 2030’ which set out the key role of education in the successful achievement

of the goals the DfE has developed policy to take action, including the professional development of science teachers and elaborating the Science curriculum. The focus on helping learners to meet the challenge of climate change “with determination and not with despair”, to know the truth about climate change, and to become agents of change and to pursue green career pathways in their chosen field, has been welcomed by schools. However, this policy has drawn some criticism that is optional for schools, and only focused on science, neglecting the humanities and the arts, and prescribing the content in order to make it teacher proof.

Many teachers, therefore, fear for their active contribution to climate education and feel that a greater emphasis on combining science, technology, engineering, arts and humanities, and maths (STEAM) is needed to sensitise children to their futures (McClure et al., 2017), and their place in a future world. Aligned with this is concern for a whole-school culture in which a coherent curriculum can develop a climate literate society, in which pedagogy is aligned with specific curriculum subjects, including settings beyond the classroom, and professional development for teachers in order to address confidence in delivering sustainability and climate change education, over time (Hoath and Dave, 2022).

In terms of developing an active curriculum in EY climate education, it is important to take account of early STEM learning experiences that are culturally and developmentally appropriate (McClure et al., 2017; Li et al., 2021). However, while activist movements have garnered significant global attention on a range of societal issues, involving collectives of citizens coming together (Niblett, 2017), through transformative activist curricular movements (Gorlewski, & Nuñez, 2020), some of the issues are often controversial. The debate around climate can be seen to divide opinion, and can be the subject of intense public argument, disagreement, or disapproval. This includes whether schools should involve EY children in debates that are political. One viewpoint suggests that controversy is a core part of the learning enterprise, especially in science, and that schools should prepare citizens who can navigate different perspectives and make sense of conflicting arguments on scientific issues that impact their everyday lives (Lin et al., 2021). However, while being able to reason about and act on controversial topics is fundamental to being democratically literate, we have often been reluctant in our schools to engage students in the examination of controversial topics. The need for politically impartial teachers tends to dominate and teachers need guidance on how to teach climate change in a way that is politically impartial whilst remaining accurate about the scientific concepts which underpin climate change and sustainability (Hoath and Dave, 2022). Notable here is that in England the DfE’s guidance on political impartiality in schools (2022) states that teaching about climate change and the scientific facts and evidence behind this would not be considered to be teaching about a political issue.

Developing a curriculum for sustainability and climate education

In this section we explain the global position approaching the issues on sustainability and climate education across all phases in order to set the context for addressing climate change in the early years. The 2030 Agenda for Sustainable Developmentⁱ adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests. SDG13, Climate Action, is a call to take urgent action to combat climate change and its impacts and has five targetsⁱⁱ. Of its targets, 13.3, Education on Climate Change, aims to improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

SDG13 goes naturally hand-in-hand with SDG4, Quality Education, which aims to ensure inclusive and equitable quality education and promote life-long learning opportunities for all. More than any other target, 4.7 touches on the social, humanistic, and moral purposes of education. It explicitly links education to other SDGs and captures the transformative aspirations of the new global development agenda. The target is, by 2030, to ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development.

UNESCO's (2016) Global Education Monitoring (GEM) Report on its programme of 'orienting educating towards sustainability', stated that curricula are the main way knowledge and skills to promote sustainable development and global citizenship are typically conveyed. In terms of sustainable development and global citizenship, the report highlighted the need for relevant content, with a focus on both cognitive and non-cognitive aspects of learning, including peace and human rights education, as well as intercultural education and education for international understanding. The GEM analysis of over 110 national curriculum framework documents for primary and secondary education in 78 countries showed that, over three-quarters of countries had some emphasis on sustainable development issues, but far fewer made reference to terms related to global citizenship (Akar, 2016).

In terms of developing the curriculum itself, Climate education is a recent addition and has mostly been covered, to date, in Science and Geography lessons, and in school assemblies, and rarely discussed elsewhere in the curriculum. While approaches to inquiry-based science in EY have been developed (Lin et al., 2021), Climate education, as a discipline in itself, is scarcely addressed in school curricula (Eilam, 2022). The challenge of developing climate education within school curricula as a disciplinary subject, that is derived from its own disciplinary knowledge and field. The term climate change is one of 15 terms that Eilam finds mainly undefined, limiting the credibility of climate education as a credible and authoritative body of knowledge.

In February 2021 over 7500 teachers across the UK were asked whether they had received adequate training as a teacher, during qualification or since, to educate students on climate change, its implications for the environment and societies around the world, and how these implications can be addressed (Teach the Future, 2021). 70% had received no training on any aspects. In a further surveyⁱⁱⁱ of 503 teachers on climate change and education 92% were concerned about climate change and how they could frame climate change in teaching children. The teachers felt they could frame it in terms of animals, nature, and wildlife (64%), and in relation to health, food, and wellbeing (55%); in relation to the local community (48%), and to science, innovation, and technology (39%). Only 28% felt they could frame their teaching about climate in relation to citizenship and activism, and 11% in relation to politics, economics, and foreign policy, echoing international studies of teachers' knowledge, belief and attitudes about climate change (Seroussi et al., 2019).

These figures stand in stark contrast to the aims of the English DfE Policy Paper on Climate Education (2022) to address the worries that children have about climate change and to inform them of the impact it is having now, and in their future lives. The obvious shortfall, therefore, in meeting the target of providing learning about the natural environment and the causes and impact of climate change and the importance of sustainability, is clear. Similarly, the rhetoric around support for teaching and the training in climate change and sustainability in science teachers' continuing professional development (CPD) is unfulfilled, although tendering for new CPD, and a Climate

Leaders Award, is ongoing. The aim to deliver pilots through a National Education Nature Park, and to develop a Primary Science Model Curriculum to include an emphasis on nature by 2023 remains.

Despite the paucity of resources indicated above, resources for climate education are being developed internationally, such as the Climate Action Project^{iv}. (CAP). CAP exemplifies a curriculum approach to teaching climate change in schools. The aim is to address how to teach environmental awareness and provide resources and initiatives for schools to get involved. CAP, founded by co-author of this chapter, Koen Timmers, in 2017, held the fourth annual six-week event in October 2022 focused on climate change, involving 2.6 million young people across 140 countries. Children worked collaboratively on solutions and meaningful action, to stimulate positive thinking about change. Working with Ministries of Education in 15 countries, the project created a curriculum for climate change, co-authored with the World Wildlife Fund International. Teachers became part of a networked community of practice and were guided by facilitators, and the project made an impact in many countries, culminating in a webinar “Climate Action Day”, involving scientists from across the world. The Earth Project App^v is one example of teaching materials and learning activities aimed at motivating children to reduce their carbon and plastic waste. While, this approach might be characterised as an intervention, in that the effect on the curriculum may not be permanent, it raises awareness of the need for curriculum action.

The case for sustainability and climate education in the early years

While EY is defined broadly as birth to age five, in the UK the term is used to denote a foundational stage prior to full-time and formal schooling and involves two classes – nursery and reception. The tentative approach to covering issues outside the immediate classroom apply here, where young children have limited capacity to understand complex arguments outside their experience, and teachers may struggle to simplify and make accessible the key points. While young children should be treated as capable and confident in understanding complex and abstract issues, as long as they are made accessible and age-appropriate (Dejarnette, 2018; Li et al, 2021; Lin et al., 2021), the belief pervades that young children are unable to reason the controversy or to be involved in a debate around saving the planet. Importantly, young children may be alarmed and distressed by what they see on the news, or indeed have experienced themselves as the result of climate change, including floods, poor air quality and extreme heat, that each constitute adverse childhood experiences that affects learning (Sjöblom et.al., 2022; Siegner and Stapert, 2020). However, one of the most important things a child learns in this early stage of development is about themselves – as self-concept (Sobel, 2002) – in which an important part is a picture of themselves as learners and how they figure out whether it is OK to be curious, to explore, to ask questions and to experiment (Li et al., 2021). Some important areas of learning in EY education include communication and problem-solving skills, and a sense of belonging to family, community, and culture, as well as behaving in acceptable ways and controlling your own behaviour. To support their learning, EY need further opportunities to be in the world doing things and to be actively involved in meaningful experiences. Learning, therefore in this sense, happens best in context, that is, when there is a real need to know. This includes books to look at and read and stories to listen to and people to have conversations with, including time to really get involved and build relationships with other children and adults, including through playful experiences (Vartainen, 2021).

Important, here, therefore is that EY is more than preparation for primary school. It aims at the holistic development of a child’s social, emotional, cognitive, and physical needs in order to build a solid and broad foundation for lifelong learning and wellbeing and to nurture caring, capable, and responsible future citizens (UNESCO). UNESCO’s approach is reinforced in the Education 2030 agenda and in particular in target 4.2 of Sustainable Development Goal 4 which aims to: ‘By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-

primary education so that they are ready for primary education.’ In England, the EYFS curriculum covers seven key areas of learning deemed essential for a child’s early years development’ including playing and exploring, active learning and solving real problems, and creating and thinking critically. Expressed as early learning goals (ELGs), Understanding the World, for example, includes understanding the effects of the changing seasons on the natural world around them (Sobel, 2002), and involves guiding children to make sense of their physical world and their community. However, what constitutes the knowledge skills of a curriculum for sustainability and climate change remains weakly defined (Eilam, 2022), especially so in ECCE.

Developing a sustainability and climate education curriculum for the early years

We will now consider two cases in which the curriculum for sustainability and climate education in the early years has been developed over time. The first is the **Steiner Waldorf (SW) Kindergarten**^{vi}. The principles that direct and guide the Steiner curriculum are contained in Rudolf Steiner’s approximately 4,000 lectures and some 50 written works, over a century ago. Underlying his entire philosophy is the primacy of freedom (anthroposophy) in which it is fundamental that the school should serve the child, not the state. Therefore, a detailed and ongoing study of child development is seen as central to the work of Steiner Waldorf schools. The curriculum has been developed to follow closely the way in which the interests and aptitudes of children change with growth (Pountney, 2019). Formal learning does not start in Steiner Waldorf Schools until a child enters Class 1 at age 6. Instead, the Early Childhood curriculum prepares children for formal learning by first providing time and opportunity to develop socially, emotionally, and physically in a creative, secure, enabling and harmonious environment (Vartainen, 2021; Li et al., 2021). The foundation skills in literacy and numeracy are laid through an environment rich in hands on activity and play and where language and communication are enabled through a rich oral tradition.

The SW EY curriculum, therefore, has a rich tradition, and is founded on the outdoors and follows the rhythm of the day, the week, and the year, and reflects what is going on outside. Gardening activity is centred around the cycle of planting, harvesting, and composting. As children cultivate the earth and grow, prepare, and eat the organic food together, they learn about recycling as they compost the leftovers in order to grow more in the future. These activities foster a deep understanding of sustainability and are as pertinent now as they were in 1919, when the first Waldorf School opened in Stuttgart, Germany. Although there is no ‘electronic gadgetry’ or child-facing IT, such as iPads, used, SW kindergartens work with ‘warm technology’ in the form of hand-driven grain mills, apple-juice presses, scales, spinning wheels, hand drills, weaving and woodwork equipment. Warm technology gives the child a true picture of the function of a machine as an extension of their body. It also supports the child’s thinking and physical skills in an age-appropriate way, since thinking in a young child is expressed mainly in physical action as processes are followed through. Seeing processes such as grain to table to compost, or sheep’s wool to yarn and weaving, helps embed an appreciation for the life-giving substances from the earth or environment (Nicol, 2018).

While activities such as a seasonal table are common in EY contexts, in SW kindergarten they take on a symbolic meaning, in that environmentalism is seen by teachers to start there. The seasonal table is where the children learn to care about mother earth as well as to get a picture of that caring. Here the concrete of the outside world is translated into the pictorial, via the stories that we tell and the songs that we sing, and then to the abstract represented by the table and its collection of objects. The craft work that is associated with this provides a visceral experience, related to the child’s senses, of doing things by hand as embodied knowledge.

Spiritual, moral, and ethical education underpins the SW kindergarten curriculum, in which spirituality fosters aspects of social and ecological responsibility, humanity, values, empathy, acceptance, curiosity and interest. The theme of sustainable living combines a range of outdoor and craft activities to bring together aspects of science, geography, social science, technology, craft, art, and design. In early childhood and the lower school, the emphasis is on developing a healthy relationship to nature through direct experience, close attention, and vocabulary, with children using recall, literacy and artistic expression to represent and consolidate what they have learned. Practical work using locally available natural materials is developed as children learn about the cultural history of local land use, the professions involved in working directly with nature and the tools used, vernacular architecture, and the care and cultivation of our environment. These activities not only lay a foundation for responsible and sustainable behaviour and understandings about the relationship of human societies to their geographical spaces but build a basis for subsequent scientific and economic understandings.

The second example is of a curriculum developed more recently, since 2013, and focuses on curriculum integration. **XP in Doncaster, UK**, is a small multi-academy trust, that follows a curriculum based on cross-curricular, project-based learning, where the curriculum is taught via 'expeditions', that last 6-12 weeks. In recent curriculum planning, the schools have decided that climate change is an existential threat and an imperative part of the curriculum. Founded on Kurt Hahn's philosophy of outdoor education and experiential learning (Veevers and Allison, 2011), XP has identified 'Climate Emergency' as one of 3 key 'strands' in their curriculum and teachers have designed expeditions in all years of the secondary and primary schools that address this theme.

In the Foundation 2 class of EY, children in the Trust schools (age 4-5) took part in the expedition "Who is in the woods?", where children produced the artwork for a public display board in a local wood, featuring the animals that can be found there. Children learned about the woods, what animals live there, exploring how the woods make us feel and encouraging people to explore there. The first week of the expedition was the "hook week" where children visited the woods and explored what they could see, hear, and smell. They collected materials for displays and the classroom environment including leaves and twigs for their reading tree, and for models of trees, and clay models of animals. Story books, including "After the Storm" by Nick Butterworth, were used to explore the life cycle of the oak tree, and the habitats that animals need. As part of the school ethos of caring for the world, the community, family, crew, and ourselves, the children developed 'pledges' on a pledge tree to make the world a better place. These pledges included 'turn taps off', "turn lights off", and "sweep leaves". The celebration of learning was the unveiling of the information board followed by a picnic for the children and parents.

The approach taken across XP schools involves the community and does good for the community. Hoath and Dave (2022) refer to this as outreach and stress the need to make this meaningful. This is a form of service learning, where children are stewards of the community, of the planet and each other. Learning in this context deepened through an active and inquiry-based approach that promotes both science knowledge and problem-solving skills in young children (Lin et al., 2021). The design for learning of the integrated curriculum at XP connects and contextualises subjects through learning expeditions to deepen learning, and to make knowledge more powerful (Pountney and Said, 2018).

Climate education in the early years as a system of meanings

The definition of the curriculum as a system of meanings is consonant with the notion of curriculum of and for knowledge, and of disciplinary knowledge as a specialised language, which in the context

of EY needs to be culturally and developmentally appropriate (Li et al., 2019; 2021). While sustainability and climate educational knowledge remains ill-defined (Eilam, 2022), and its knowledge structure horizontal and segmented, (Bernstein, 1990) its capacity to develop as a bona fide educational field remains limited. This is not to say that the scientific knowledge we have of climate change is limited – quite the contrary, it is a hierarchical and specialised knowledge structure – rather that when climate education knowledge is recontextualised in school settings it becomes descriptive and everyday with a weakened power to explain. The embodiment of knowledge, as in the SW kindergarten translates this knowledge into feelings and is focused on the individual. In contrast, the focus on activism, community and equity in the XP foundation class translates this knowledge into a powerful form that is a focus on community (Pountney and McPhail, 2019).

Considering sustainability and climate education as a discourse, one can examine the language and children's access to and use of this language as a literacy. Climate literacy, therefore, mediates young children's capacity to engage with understanding the causes and effect of climate change, while being mediated by young children's cultural and intellectual development (Li et al., 2019) and how they encounter the world and develop a sense of their place within in it (Sobel, 2002), for example. While attempts to set out a climate literacy statement such as the that by the Earth Day Project^{vii} are activist in the sense that they are a call to action, they stop short of providing a semantic schema for conceptualising and understanding sustainability and climate issues. One approach that is gaining ground is Maton's (2013) semantic dimension of Legitimation Code Theory. This theory differentiates two dimensions of meaning: the first is closeness to context (semantic gravity) and the second is the degree of conceptual complexity (semantic density). Learning activity in climate education is characterised by a closeness to context, and the practicalities of doing, as in both EY settings above. Maton (2013) refers to this as a strong form of semantic gravity, (SG - the relative context dependency of meaning). The young child talks about her concrete actions, the things she made, and her preparation, and explores this through activity, including play (Vartainen, 2021). The teacher introduces various concepts including 'habitat', and the 'language' of the environment. One analysis of this point in the exchange is a weakening of the semantic gravity (becoming more abstract) and a strengthening of what Maton conceptualises as semantic density (SD - the relative complexity of meanings). For example, the notion of 'seasons' is dense and abstracted because it references not only the concept of weather but also of time. In this sense, the teacher's use of the word 'climate' is quite vague and circumspect (it is mainly tacit) and its broader inferences may be lost on the child. In the language of older children discussing the environment (as in the development of the information board in the woods) one can observe a less-gradual decrease in semantic gravity (the conversation becomes more abstract and further from context more quickly) and a steeper increase in semantic density (there is a more rapid rise in the complexity of the language used). These can be shown as semantic waves and make accessible the deepening of knowledge as cumulative knowledge building.

Conclusion

In this chapter the curriculum for sustainability and climate education has been discussed and its context within the SDGs and global movements has been set. Two case studies that exemplify how this can be realised in early years have discussed ~~featured~~ featuring the preparation of students to learn through, and from, an integrated, or embedded, environmental curriculum approach. Climate change has been shown to be an interdisciplinary curriculum topic requiring an interdisciplinary problem-solving approach to the curriculum (Lin et al., 2021). This requires a whole-school approach (GEM, 2016, p293) that provides all children, beginning in an appropriate way in early years education (Li et al., 2019) with climate education and greens skills, critical for their adaptation to and preparation for the effects of climate change. It invokes the idea of future citizens informed by a

curriculum that is deep, as well as broad. It raises the question of whether education is preparation to take action that emerges, not from a common-sense understanding of everyday life, but rather from a deep understanding, love and respect for the world - one that is underpinned by a level of civics knowledge that provides the intellectual basis for engaging in public discussions and planning citizen action (Jerome, 2018). This requires teachers to be mindful of the language used and young children's access to this language to develop understanding.

The case for EY school settings being responsible for developing the knowledge, skills and dispositions for active citizenship remains to be fully made. What is clear is that schools ~~who~~ that are active in curriculum creation empower their teachers as activists. This posits the school as both democratic and open, in the sense of having boundaries that are fluid and permeable to the concerns of society (Pountney and McPhail, 2019). The open flow of ideas is thereby, important in order that people can be as informed as possible, in which they have faith in the individual and collective capacity of people to solve problems, and, ultimately, that they have concern for the welfare of others and the common good. This rests on the principle that democracy is not so much an 'ideal' to be pursued as an 'idealized' set of values that we must live by and that must guide our lives. Moreover, to achieve this EY teachers need to nurture democratic and caring classroom communities, where 'to be a teacher is to be actively engaged in a social movement that is shaping the future of our society and our world' (Gorlewski & Nuñez, 2020, p.14).

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ⁱ The 2030 Agenda for Sustainable Development, <https://sdgs.un.org/2030agenda>

ⁱⁱ SDG 13 Climate Action, 5 targets. <https://sdg-tracker.org/climate-change>

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- iii Teach the Future <https://www.teachthefuture.uk/teacher-research>
 - iv Climate Action Project <https://www.climate-action.info/>
 - v The Earth Project App <https://earthproject.org/>
 - vi Early years in Steiner Waldorf <https://www.steinerwaldorf.org/steiner-education/early-years/introduction/>
 - vii Earth Day Climate Literacy <https://www.earthday.org/campaign/climate-environmental-literacy/>