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Beyond the Fossil Era

Potential for a pedagogy of sustainability

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Abstract

Education has the potential to play a critical role in the sustainable transformation of society which is needed to limit the consequences of the multiple ecological crises society is facing. While this has been recognised internationally at least since 1992, not a lot has been done within the Danish educational system to address issues of climate change, biodiversity loss, and sustainability within education policies and practice. And big questions remain concerning the development of a 'pedagogy of sustainability'. How to not only teach about sustainability but also develop teaching methods that develop the necessary competencies among students to be democratic agents of change. This thesis examines the study material *Beyond the Fossil Era* as an example of such a teaching method. By bridging literature on the concepts of education for sustainable development, action competence, futures, utopia, and hope, it explores what can be learned from the material's use of imaginaries as a creative teaching method and a way of fostering hope and action competence. Through observation of the practical use of the material as well as surveys, stories, and interviews, it finds that the material has potential as a way of opening new 'avenues for action' and inspiring new ways of teaching and learning. Its potential lies both in its imaginative aspects and its description of different change-bringing forces, an element that can be developed further to strengthen the action competence approach within the material.

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1. Introduction

The formal education system is a core institution in society which is generally used as a "vehicle of social reproduction and maintenance" (Sterling, 2021) to teach children and young people about the dominant logics of society and equip them with the skills and competencies deemed necessary to function in and contribute to society. Paulo Freire argues that education functions as "an instrument which is used to facilitate the integration of the younger generation into the logic of the present system", but also points out that it can be "the practice of freedom" in which people learn how do deal critically and creatively with reality and how to participate in the transformation of their world (Freire, 2014). Thus, Freire argues, there is no such thing as a 'neutral' educational process: upholding the status quo and preserving conventional norms, values, and knowledge is just as political as education which critically questions and challenges dominant logics.

Another point that can be drawn from Freire's argument is that all education processes are intrinsically linked to change, both at the personal level where children and young people develop a variety of intellectual and practical skills and abilities, thereby 'growing' as persons, but also at a societal scale where education can be an instrument of social change and a means to achieve different political goals. In the words of Stephen Sterling: "There is no change without learning, and no learning without change" (Sterling, 2021).

Nonetheless, despite the growing consensus that we need to achieve an unprecedented transformation of society in order to secure a liveable and sustainable future for all (IPCC, 2021), education plays only a limited role in policies, plans and strategies concerning climate and the sustainable transformation of society. And despite the international recognition of the critical role of education in the sustainable transformation of society at the Rio Earth Summit in 1992 as well as in the following declaration by the UN of the "Decade of Education for Sustainable Development" from 2005-2014 (UNESCO, 2019), Danish education policies and practice address issues of climate change, biodiversity loss, and sustainability only to a very limited extent and almost exclusively as a topic of natural science (Carlsson & Lysgaard 2020). The Danish educational policy concerning the fulfilment of the goals of the UN Decade of ESD has even been described as "largely disjointed, half-hearted and vague" (Rolls et al, 2014, p.257).

In this perspective, Jeppe Læssøe, Emeritus Professor at the Danish School of Education, University of Aarhus has called the educational sector a 'sleeping giant' in relation to the 'green transformation' of Denmark, arguing that the central barriers to sustainable transformation are primarily mental, social, and cultural rather than technic-scientific and consequently emphasising the central

role of education in promoting social and cultural learning and development (Læssøe, 2016). However, Læssøe also points to the lack of engagement or even scepticism within the educational sector concerning the development of an 'environmental pedagogy' or 'pedagogy of sustainability' stemming both from a general lack of time and resources to integrate new subjects into already crowded teaching hours and a general perception that issues of the environment, climate, and ecology belong to the natural sciences and therefore can be delegated to science teachers (Læssøe, 2016). In addition, environmental problems and sustainability are still politically contested subjects, which make some educators wary of turning their education into a moralistic promotion of certain policies and behavioural changes (Læssøe, 2016). This is a legitimate concern, but it is also important to remember Freire's point that *all* education processes are inherently political and that the education systems of today are shaped by and embedded in the economic growth-focused modernization development paradigm of the current political and economic systems (UNESCO, 2021; Sterling, 2017) at the root of the ecological crises.

Stephen Sterling, Emeritus Professor of Sustainability at the University of Plymouth, argues that since our educational systems are implicated in the multiple crises society is facing, "without meaningful rethinking, they will remain maladaptive agents of business as usual, leading us into a dystopian future nobody wants" (Sterling, 2021). To avoid this and instead effect a large-scale paradigm shift both within education and within society at large, Sterling argues that education itself must be the subject of change (Sterling, 2021). That there is a "need for *unlearning*, *re-learning*, and *new learning* as a necessary response to a deeply changing reality" (Sterling, 2017, p.37, emphasis in original).

This relationship between education and 'the future' as well as the rethinking of education is at the core of the work of *The International Commission on the Futures of Education*, established by UNESCO in 2019 and charged with the task of looking at 2050 and beyond to rethink how knowledge, learning, and education can address present and future challenges and opportunities (UNESCO, 2021). When it comes to the ecological crises and climate change education, the commission, similarly to Læssøe, argues for the need to move beyond natural science teaching in order to cultivate "the full breadth of competencies necessary to engage students in effective action" (UNESCO, 2021, p.34).

This leads to the question of the composition of such competencies and, even more important, how to cultivate them? In the report *Education for Sustainable Development Goals - Learning Objectives* from 2017 UNESCO sought to answer at least the first part of this question by presenting eight "key competencies for sustainability" necessary for learners of all ages worldwide to "engage constructively and responsibly with today's world" (UNESCO, 2017, p.10). These

competencies include systems thinking, critical thinking, collaboration, and problem-solving competence as well as the ability to "understand and evaluate multiple futures" and "to create one's own visions for the future" – described as 'anticipatory competency' (UNESCO, 2017, p.10).

A similar approach to the question of necessary competencies to "engage students in effective action" is the action competence approach, which has been a key concept in relation to environmental and health education at the Danish School of Education, Aarhus University since the 1980s and 1990s (Mogensen & Schnack, 2010, p.60). It does not refer to a specific competence among others, but rather to an educational 'ideal' or 'approach' that seeks to develop the competencies that are necessary for becoming active, democratic citizens in a complex society riddled with uncertainty and conflicting interests. In the words of Mogensen and Schnack the approach is "closely linked to democratic, political education and to a radical version of the notion of '*Bildung*'" (Mogensen & Schack, 2010, p.60).

While action competence is not a specific competence, this rather broad approach can still be divided into four components, the first being *knowledge and insight* about climate change, environmental problems, etc., and the second *commitment* referring to the encouragement of pupils to transform such knowledge into action. The third component is *visions* and deals with "the development of pupils' ideas, dreams and perception about their future lives and the society in which they will be growing up" (Jensen & Schnack, 2006, p.481-482). The last component is *action experience* which points to the benefits of taking concrete action during teaching – while keeping in mind the educational value of such actions (Jensen & Schnack, 2006). Thus, the action competence approach goes further than the traditional, science-oriented approach to environmental and climate education, which can be criticized for mainly providing knowledge about the existence, scope, and consequences of environmental problems and the climate crisis, thereby overwhelming students with knowledge about the seriousness of the ecological crises and contributing to the feeling of powerlessness and anxiety many young people feel (Jensen & Schnack, 2006).

In response to this, a key point of the action competence approach is to "handle the anxiety and worry which students already feel" by developing a "form of teaching from which pupils acquire the courage, commitment, and desire to get involved in the social interests concerning these subjects" (Jensen & Schnack, 2006, p.472). It is important to stress that the action competence approach does not have the answer in itself but rather indicates a direction and perspective on these questions by being a formative ideal in a democratic approach to education and an alternative to the tendency to regard the educational task as merely a question of behaviour modification (Jensen & Schnack, 2006; Læssøe, 2016).

One component of the action competence approach is the development of visions about the future, both at the personal and societal level. Similarly, one of UNESCO's eight key competencies for sustainable development is the ability to understand and evaluate multiple futures, both possible, probable, and desirable, as well as the ability to create one's own visions for the future, assess the consequences of actions and dealing with risks and changes (UNESCO, 2017). Riel Miller (2018) describes this as being 'futures literate'; to be conscious of how assumptions about the future play a central role in shaping behaviours in the present and how the ability to imagine different futures can change one's perception of what is possible in the present. Future literacy is in this sense closely connected to the argument that transformation processes require imagination (Moore & Milkoreit, 2020) and to the field of 'futures education' which seeks to enable people to recognise that "the future is not something that passively happens to them and over which they have no control, but that it is actively created" and consequently open up the imagination to "a vista of alternative futures" and encourage young people to "see themselves as actors in imagining and creating their futures" (Smith, 2021, p.2).

In an educational context, these perspectives on future literacy and imagination can be connected to the concepts of dreams and utopia within Freirean pedagogics. Freire denounced fatalism and fatalistic education through concepts of utopia, arguing that without dreams there is no guidance for transformation (Misiaszek, 2022). Utopia in this sense should not be understood as 'miracles' magically occurring, but rather as "dreams of tangible societal transformation" which can help students imagine another possible world, identify the barriers that prevent achieving it, seek the possibilities of overcoming these barriers, and thereby "give rise to what does not yet exist" (Misiaszek, 2022; Gadotti, 2008).

Haste and Chopra (2020, p.2) similarly argue for the "power inherent in narratives, counter-narratives, utopias and dystopias as pedagogic and relational tools in education" specifically in relation to the need for education to help learners manage and influence change in their communities. Their point is that our imagination of the future, and future problems, will inevitably be based on our current theories, knowledge, and experiences as well as "culturally available narratives of possible futures", and that long run social change therefore "depends on a shift in core narratives and beliefs" (Haste & Chopra, 2020, p.4).

The need for such a shift is not least evident because of what can be called the 'imaginative monoculture' or 'colonisation' of our futures produced by neoliberal thought, understood as the widespread understanding that there is no alternative to capitalism and that techno-managerial solutions to the climate crisis are the only viable path forward (Amsler & Facer, 2017; Sonessen, 2022).

This has also been referred to as a 'crisis of imagination' (Ghosh 2016) and can be described as a lack of imagination on three fronts: ecological imagination (to understand the impacts of human actions on earth's biophysical system), social imagination (to see the relationships within society that cause ecological degradation) (Norgaard, 2018) and of utopian imagination (to imagine desirable futures that can mobilise action) (Wright, 2010; Levitas, 2013). It follows that in order to effect and accelerate change, we need to strengthen and broaden our imaginative capacities and challenge this imaginative monoculture.

Underlying these understandings of dreams, imagination, utopia, and narratives as necessary for effecting change and transformations in society is the concept of hope. To envision a desirable future, a possible world, and how to achieve it necessarily involves hope understood as positive expectations about some sort of goal. However, in relation to climate change, there is some debate about whether hope is related to environmental engagement or is rather associated with unrealistic optimism and subsequent passivity or even denial (Ojala, 2015). For instance, some argue that blind reliance on technological solutions to the ecological crises constitutes a "single, false utopic future doomed to fail" as well as a "false hope" which will sustain or even intensify unsustainable lifestyles (Misiaszek, 2022, p.2304). Others argue that hope is an important motivational force because it manages fear and gives strength to act when facing difficulties and uncertainties (Kleres & Wettergren 2017; Ojala 2015) and, since many young people are worried and pessimistic about the future, it should be integrated into environmental and climate education (Ojala, 2015).

Maria Ojala furthermore argues for the importance of considering the different *sources* of hope, thereby being able to distinguish between different *kinds* of hope. In a study of Swedish high school students concerning whether a focus on the future in school is related to hope, she identified two kinds of hope: constructive hope, based on trust in oneself as well as other societal actors, and hope based on denial that climate change is a serious problem (Ojala, 2015). Not surprisingly, constructive hope was found to be positively related to environmental engagement while the opposite was the case for hope based on denial (Ojala, 2015). Thus, constructive hope can be understood as an integral part of the action competence approach. Relatedly, Amsler and Facer argue that different "modes of anticipation in education influence the political construction of hopelessness and hope by shaping what is learned about the nature of social reality, the status of political possibility and the relationship between learning and the future" (Amsler & Facer, 2017, p.7).

So far, the argument is that in order to limit the damaging consequences of the multiple ecological crises the world is facing and secure a sustainable future for all, rapid and far-reaching transformations across all sectors and systems of

society are necessary. This includes our educational system which is implicated in the multiple crises society is facing (Sterling, 2021), but which also holds the potential of an immense transformative force through the shaping of knowledge and values and the formation of present and future citizens. The action competence approach and the concepts of utopia, narratives, imagination, and hope all seek to shed light on what such a transformation of the educational system should entail to prepare students to be active, democratic participants in the sustainable transformation of society, as well as dealing with the inevitable ambiguity and uncertainty concerning the future.

These concepts can be brought together in UNESCO's concept of Education for Sustainable Development (ESD), not as 'answers' in themselves to how education is to be transformed, but rather as ideals that can be used to direct the transformation. In other words, while there are plenty of fine ideals, big questions remain concerning how to develop a pedagogy, a form of teaching, that fosters "the full breadth of competencies necessary to engage students in effective action" (UNESCO, 2021, p.34). Building on the action competence approach and the importance of imagination, utopia, and narratives of the future as well as hope in relation to engagement, my argument is that such a transformative pedagogy or 'pedagogy of sustainability' needs to include a focus on how to strengthen our collective imagination as a way of fostering hope and agency.

Beyond the Fossil Era

One attempt to implement such a transformative pedagogy is the study material *Beyond the Fossil Era* created in collaboration between the Swedish Society for Nature Conservation and a group of researchers from Lund University connected to the research group *Climaginaries*. The study material is the result of a previous project by the research group, *The Museum of Carbon Ruins*, an exhibition set in the year 2053, with the premise that Sweden reached its goal of net-zero emissions in 2045, that we were successful in limiting global warming to 1.5 degrees and the transition to a post-fossil society has been completed (Raven & Stripple, 2021; Stripple et al, 2021). The exhibition looks back at our current time and the time leading up to the transition by displaying different objects such as a frequent flyer card, artificial grass, and one of the last fast-food hamburgers. Each object illustrates something that was given up during the transition years and is presented with explanatory texts about what drove the transition and what came to replace the different objects (Raven & Stripple, 2021).

The Museum of Carbon Ruins has taken many forms since its inauguration in 2019, one being the study material *Beyond the Fossil Era* which is available online in both Swedish and English through the website of the Swedish Society for Nature Conservation (Naturskyddsföreningen, n.d.). The study material consists of three exercises. First, students get transported to the future and

introduced to the fictive museum by watching a short movie of a museum guide touring part of the exhibition and presenting some of its objects. Second, the students explore the museum's objects by clicking on their images and reading stories about them. Lastly, the students get the task of considering other objects that could be included in the exhibition and writing a story that explains the significance of the chosen object, what happened to it, and which events played a key role in its replacement.

Besides these three 'steps' of the material, an important component is a list of eight 'change factors' that played a part in the transitions of society up until 2053. These include activism, innovation, policy, and new markets and are in different ways integrated into the stories about the museum objects (see appendix 5). Students are also encouraged to take inspiration from these in their contributions to the museum and consider if it was a specific person, corporation, politician, or protest that drove the imagined change of their chosen object. Another source of inspiration for the students' own contributions is a timeline of important historical events during the period from 1849 when fossil fuel usage increased dramatically up until 2053 when the museum opens (see appendix 6).

The researchers behind The Museum of Carbon Ruins have characterized it as a "participatory form of world-building that allows for new ways of knowing, and new ways of being, in relation to post-fossil transitions" (Stripple et al, 2021, p.89) and the aim of the study material is to give students an understanding of the transition through "knowledge-based speculation, creativity, imagery and stories" thereby deepening the students' knowledge about the causes and solutions to climate change, putting the transition into more concrete terms and encouraging them to work towards it (Naturskyddsföreningen, n.d).

Aims and research question

While acknowledging the open-ended process of the study material, *Beyond the Fossil Era* will be used as an entry point in the following research to explore how imaginaries of the future can be used as educational tools, and the potential of such creative teaching methods in fostering hope and action competence, thereby contributing to the cultivation of the competencies needed for young people to contribute to the sustainable transformation of society.

Beyond the Fossil Era is a material developed for and used in Swedish schools and has been used in trainings with nearly a thousand Swedish teachers in a range of geographies and subjects (Sonesson, 2022), but has to my knowledge not been used in Denmark. By analysing its use in a Danish high school class, I build on the empirical insights from previous work, notably Ludwig Bengtsson Sonesson's master's thesis in Environmental Studies and Sustainability Science *Beyond the Fossil Era – Transformative Pedagogy for Sustainability* (Sonesson 2022). My

research overlaps with the work of Sonesson in the sense that the central object of study is this specific study material and its use in praxis. I also use some of the same concepts as Sonesson, particularly futures, utopia, and hope. But where Sonesson analyses Beyond the Fossil Era as an example of 'transformative futures education', I place the material within the field of education for sustainable development and use it to explore the concepts of hope and action competence. Thereby I seek to add to the literature on education for sustainable development and especially efforts to develop a 'pedagogy of sustainability'.

By situating my research in Denmark, I furthermore aim to contribute to the work of eight partnerships for education for sustainable development, established by the Danish Ministry of Children and Education in March 2022 (Børne- og Undervisningsministeriet, 2022). I have been involved in the partnerships as a project coordinator since the beginning of the project and therefore draw on my experiences from this work while being aware of my own positionality. The partnerships span the entire education system from kindergarten to adult education and were last year tasked by the Ministry to identify barriers as well as possibilities of integrating education for sustainable development in their respective areas of the Danish education system as well as formulating proposals for the government and other decision-makers on how to strengthen the work on education for sustainable development. The partnerships concluded the first phase of their work in September 2022 by presenting a report with their collective findings to the Minister of Education (Bang, 2022).

One of many insights in the report, shared by all partnerships, is the need for more knowledge about sustainability and how to teach about and for sustainability (Verdens Bedste Nyheder, 2022, p.12). The partnerships all point to the need of strengthening teachers' competencies to integrate sustainability into their teaching, both in terms of teaching content and teaching methods. This statement is supported by a survey conducted by Epinion in 2021 among 1,396 Danish teachers on sustainability education in primary schools. One of the main findings of the survey is that 66 percent of the responding teachers find it important to integrate sustainability in their teaching, but 77 percent find it a challenging and complex concept and therefore point to the need for material and methods that can support and guide their teaching about sustainability across different disciplines (Epinion 2021).

The aim of my research is not to establish a causal relationship between the use of Beyond the Fossil Era and a sustainable transformation of society. Rather, my thesis resembles a pilot study that aims to conduct an initial investigation of the potential of this kind of transformative pedagogic and answer questions such as what we can learn from the study material and how it can be developed. Building on the work and arguments of educational researchers outlined above as well as

the insights from practitioners within the educational sector stating the need of developing new methods of teaching for sustainability, I attempt to answer the following research question:

> *What can we learn from the use of imaginaries of the future in the study material "Beyond the Fossil Era" as a way of fostering hope and action competence in 'climate education'?*

The structure of the thesis is as follows: in section 2, I outline my theoretical framework by further exploring the overarching concept of education for sustainable development and the relationship between the three key concepts of action competence, futures, and hope. In section 3, I describe my methods of gathering empirical data through surveys, observation, stories, and interviews. In section 4, I analyse the gathered data and discuss how Beyond the Fossil Era and my findings can be used in a wider educational context. The last section summarises the thesis and presents conclusions.

2. Theoretical framework

In the following section, I expand on the key concepts outlined in the introduction. I use the concept of Education for Sustainable Development (ESD) as an overarching frame to encompass the broader field of 'environmental education', in which Beyond the Fossil Era can be placed. I then combine the concepts of action competence, futures, utopia, and hope within this overarching frame of ESD to reach an initial understanding of the potential of Beyond the Fossil Era to contribute to a 'pedagogy of sustainability' by fostering hope and action competence.

Education for Sustainable Development

Both 'education' and 'sustainable development' are very broad concepts and consequently, Education for Sustainable Development can be understood and used in many different ways. The term originated at the Earth Summit in Rio de Janeiro in 1992 where it was promoted by UNESCO as part of Agenda 21 which calls for education as a driver for sustainable development in every chapter (McKeown & Hopkins, 2003; Jørgensen & Lysgaard, 2020). Especially chapter 36 'Promoting Education, Public Awareness, and Training' sets out some broad proposals for governments to both ensure universal access to basic education and to "achieve environmental and development awareness in all sectors of society on a world-wide scale as soon as possible", which includes a reorientation of existing education to address sustainable development (United Nations, 1992, p.320).

The concept of ESD is as such closely linked to the notion of sustainable development, as introduced in the much-cited Brundtland Report from 1987 as a development that "meets the needs of the present without compromising the

ability of future generations to meet their own needs" (United Nations, 1987, p.24), and which requires a balance between economic, environmental and social dimensions (Mogensen & Schnack, 2010; McKeown & Hopkins, 2003; Jørgensen & Lysgaard, 2020). Ten years after the Earth Summit, the UN introduced a Decade of Education for Sustainable Development, which spanned from 2005-2014 with the overall goal "to integrate the principles, values, and practices of sustainable development into all aspects of education and learning" (UNESCO, 2005, Annex 1, p.1). Since then, ESD has been an integral element of Agenda 2030 as a key enabler of all the Sustainable Development Goals but in particular, Sustainable Development Goal 4 (UNESCO, 2020, p.3) concerning inclusive and equitable quality education and lifelong learning opportunities for all.

Internationally, environmental education is broadly recognized as a forerunner of ESD, although some see it as an integrated part of ESD and some even as a competitor to ESD (Rolls et al, 2014). While there is no doubt about the similarities, ESD has developed and is continuously developing as a field of its own. A noticeable difference between ESD and environmental education is a shift in focus from the emphasis of environmental education on the preservation of the natural environment to a broader focus of ESD on addressing the needs of both environment and society as well as recognizing "the world's perceived need for development" (McKeown & Hopkins, 2003, p.120). In addition, within ESD there is a strong emphasis on student-centred, explorative, action-oriented, and transformative learning as well as on issues of equality and social justice (Jørgensen & Lysgaard, 2020; McKeown & Hopkins, 2007). Lastly, as the overall goal of the UN Decade of ESD emphasises "all aspects of education and learning" (UNESCO, 2005), many within ESD advocate for a 'whole school approach' as a way of recognising the need for more than information, more than education *about* sustainable development, to achieve a more sustainable future. As such, the whole school approach strives to "embed sustainability beyond disciplines by modelling sustainable development practices in all their activities – from purchasing and hiring policies to the everyday running of the schools" (McKeown & Hopkins, 2007, p.22). Sterling similarly argues for the term 'sustainability education' rather than education *for* sustainable development, thereby seeking to move attention towards a transformation of education itself, "its paradigms, policies, purposes and practices […] and its *adequacy* for the age we find ourselves in" (Sterling, 2008, p. 63, emphasis in original).

As the notion of sustainable development is at the very core of ESD, it should be noted that this is a complex and heavily debated term. I will not attempt to summarize the critique of the term but emphasize here one strand of the debate. Mogensen and Schnack (2021, p. 62) make the point that sustainable development "does not solve any questions", but rather leads to dilemmas. This should not be understood in negative terms, as sound dilemmas in an educational setting are a

good thing. Læssøe points to the fundamental contradiction between 'sustaining' and 'developing' and how 'sustainable development' thereby represents a fundamental paradox or dilemma, as we can identify both stabilizing and developing forces in all aspects of life and the challenge then becomes to balance the two (Læssøe, 2016, p.101). In the context of ESD, Læssøe further argues that the ability to identify and manage such contradictions between sustainability and development, and the dilemmas relating to for example current and future generations, the relationship between the local and the global or between rich and poor, are central (Læssøe, 2016).

Such dilemmas involve different forms of knowledge, different ways to understand the relationship between humans and the natural environment, and different values. Consequently, the concept of sustainable development is characterized by complexity and debate, as are the issues which the concept seeks to address. As a result, it can be challenging to grasp ESD as a concept, especially within an educational sector organised along disciplinary lines (Jørgensen & Lysgaard, 2020; Rolls et al, 2014). On the other hand, this complexity and multitude of perspectives on sustainability can be seen as exactly what makes it possible to integrate issues of sustainability in education across disciplines (Jørgesen & Lysgaard, 2020).

I use ESD as an overarching frame or 'umbrella' under which I place both environmental education, climate education, and other related conceptualisations. I will not go into a detailed description of the different conceptualisations of each of these 'branches' of education or their chronology, but simply note that they build on and influence each other and constitute a broad field that continues to evolve.

Any label, such as ESD, will always risk being delimiting, dividing, and confusing, as much as it can be clarifying. And as the case is with the notion of sustainable development more broadly, work and initiatives under the label of ESD are often subject to accommodation by the mainstream it seeks to change (Sterling, 2017). While being aware of this, I still choose ESD as the larger umbrella of my research. This is mainly because of the terms' international recognition, which has provided a kind of "legitimized door into the mainstream" (Sterling, 2017, p.39) for many of the ideas central to environmental education as well as its growing recognition within the Danish educational sector – not least because of the work by the partnerships for ESD mentioned in the introduction. In addition, Beyond the Fossil Era is part of the promotion by the Swedish Society for Nature Conservation of ESD (Naturskyddsföreningen, 2022). As such it makes sense to use ESD as the overarching frame to understand the development and use of Beyond the Fossil Era in both a Swedish and Danish context.

Action competence

Action competence is not a specific competence and not exclusively related to education for sustainable development or any subject or discipline but is rather an 'ideal' or 'approach' closely linked to democratic education and the notion of 'Bildung' (Mogensen & Schnack, 2010; Carlsson, 2020). The concept was developed by a group of researchers at the Research Centre for Environmental and Health Education at the Royal Danish School of Educational Studies in the 1980s and 1990s and has since become central in many countries' national curricula in relation to ESD and in international guidelines in this area (Carlsson, 2020). The development of the concept was based on a critique of what was considered a tendency towards 'behaviour modification', moralistic tendencies, and preconceived ideas within health and environmental education which did not leave room for students to make up their own minds and decide themselves on the intended behaviour change (Jensen & Schnack, 2006; Mogensen & Schnack, 2010; Carlsson, 2020). In this sense, action competence is rooted in critical pedagogy and values concerning democracy and emancipation (Carlsson, 2020). In the words of Karsten Schnack: "Participants in a democracy are actors, not ignorant and passive voters. They are (or make themselves) well-informed about the relevant issues, make up their minds, and choose the relevant actions in accordance with their beliefs and values" (Schnack, 1994, p.185).

Schnack recognizes this as a somewhat 'ideal' understanding of democracy, especially considering the increasing amount and complexity of the problems we have to deal with in society, and in this regard stresses the need for education to build up action competence and makes the important point that "behaviour modification is not a serious aim in a democratic perspective" (Schnack, 1994, p.186). However, this distinction between the goal of behaviour modification on the one hand and action competence on the other should not hide the fact that the action competence approach to a great extent *also* is about changing behaviour, but with a strong focus on competencies such as critical reflection and democratic debate (Schnack, 1994). The difference is that while sole behaviour modification as an educational goal is typically focused on changing the students' individual behaviour, e.g., through recycling activities in school, from an action competence perspective such personal behaviour changes should be seen in relation to social conditions and be an object for critical reflection (Mogensen, 1997; Schnack, 1994).

Emphasizing the close connection between action competence and critical thinking, Finn Mogensen argues that "a healthy, just and sustainable future is created not by unthinkingly and uncritically continuing along the same tracks as hitherto" and that future citizens, therefore, need the competence to "participate actively in the solutions to environmental and health problems – in any direction which they find most reasonable according to their interpretation of the problem"

(Mogensen, 1997, p.435). Action competence is as such very focused on developing students' critical thinking skills, the development of "a critical approach to the structural levels of society, as well as the scientific and personal levels and the connections between them" (Mogensen, 1997, p.429) In this vein, Mogensen further argues that environmental education is less about finding technical solutions, but rather a matter of critically "choosing among accessible solutions and making a qualified choice" (Mogensen, 1997, p.430).

This leads to another central aspect of the action competence approach, and ESD more broadly, which is to not shy away from the conflicts and controversial issues related to issues of the environment, climate, and sustainability, as there is a significant pedagogic potential in working with such conflicts (Mogensen, 1997; Carlsson, 2020). This can be expressed as promoting 'dangerous knowledge', as teaching about environmental issues must necessarily deal with concerns and sources of conflict and as such represents "knowledge which questions the interests and operations of certain groups in society" (Mahler, 1985 as cited in Mogensen, 1997). The point is then to qualify students' understanding of environmental problems as conflicting interests and develop their competencies to act on the problems without leaving them resigned and worried (Mogensen, 1997).

A central part of this is to 'rise above' the individual level and develop the competence to "collaborate with other people on *changing collective conditions for everyday life*" (Schnack, 1994, p.186, my emphasis). Again, this sort of collaboration should be shaped by democratic debate and critical analysis. This points to the transformative perspective of critical thinking and action competence on the structural level and the argument that in the long run, it is not sufficient merely to teach students to recycle or take the bus rather than the car. The changes that really matter must deal with the more fundamental mechanisms and powers connected to the political, economic, and social structures of society – the level of 'living conditions' (Mogensen, 1997). Part of the argument is that not only are individual behaviour changes not sufficient, a one-eyed focus on such individual actions in the face of the magnitude of the ecological crises, risks leading to "resignation, anxiety, powerlessness, and action paralysis" (Mogensen, 1997, p.434) and the action competence approach, therefore, puts great emphasis on building and supporting students' understanding of community and collective action.

A last argument concerning action competence is the point that people already have the competence to act – it is a fundamental and existential condition. Educating for action competence is therefore also to educate for responsibility. And considering the many challenges society is facing in relation to the environment, climate change, inequality, etc., *not all actions are of the same*

value. In this perspective, Schnack argues that "the actions have to be qualified as sustainable" and the competence to "reflect upon and to discuss what this means is an integrated part of being an educated person" (Schnack, 1994, p.188).

Action competence is thus not something to learn "besides the subjects". It is "a capability – based on critical thinking and incomplete knowledge – to involve yourself as a person with other persons in responsible actions and counter-actions for a more humane world" (Schnack, 1994, p.190).

Futures, imaginaries, and utopias

Beyond the Fossil Era is constructed as an imaginary future, a so-called 'post-fossil society' set in 2053 in which Sweden (or in my adaptation, Denmark) has reached its net-zero goal. It is inherently about imaginaries, possible futures, and utopias. Thinking about and anticipating the future is essential for all organizations and societies, yet the future remains a mystery as futures, in the plural, are "unpredictable, uncertain and often unknowable, the outcome of many known and especially unknown unknowns" (Urry, 2016, p.1). Despite this, or maybe because of this, powerful social institutions and thinkers have developed various methods for "envisaging, visualizing and assessing potential futures" (Urry, 2016, p.2). Some of these futures have performative consequences, they are 'built into' present-day society – that is, some of the visualizations of futures end up being realized through often complex rhetorical imaginaries (Urry, 2016), or as expressed by Bauman "our statements about the future become, from the start, active factors in shaping futures" (Bauman, 2009, p.2).

Assumptions about the future thus play a central role in shaping behaviour and 'seeing' possible lines of actions in the present. As such, the future is "too important to be left to states, corporations or technologists" (Urry, 2016, p.7) but needs to be 'democratized'. This requires developing what Miller (2011) calls 'futures literacy': the ability to use imaginary futures to rethink the assumptions we use to understand the present and to question what is doable now.

The dominant form of knowledge about climate futures is that of climate modelling and scenarios such as those developed by the IPCC (Raven & Stripple, 2021; Urry, 2016). I will not go into the details concerning these models and scenarios, but support the claim made by Urry (and many others) that "identifying the 'causes' and 'consequences' of climate change necessarily entails multi-disciplinary research and theory" (Urry, 2016, p.156) and consequently that climate change "concerns *social* and not just physical or technological futures" (Urry, 2016, p.157, my emphasis). This point is also made by Paul Raven and Johannes Stripple, two of the researchers behind the Museum of Carbon Ruins, which Beyond the Fossil Era is based on. They further argue for the need for speculative efforts drawing on quantitative modelling and the extrapolation of

sociotechnical trends *combined* with imaginative and qualitative methods to explore 'climate-changed futures' from the bottom up (Raven & Stripple, 2021). As such, they describe The Museum of Carbon Ruins as a 'speculative initiative', which allows its visitors to "grapple with, evaluate, amend and critique the post-fossil futures that official policy is striving towards" (Raven & Stripple, 2021, p.221).

This is similar to Miller's point about futures literacy and highlights the important role arts and humanities play in "thinking through our *representations of environmental change* and give tangible form to the imagination of different worlds outside the constraints of the given present" (Yusoff & Gabrys, 2011, p.518, emphasis in original). Furthermore, while climate change as a phenomenon at a very fundamental level is characterized by its relationship to futures, and efforts to understand and model the consequences of emissions in order to anticipate and avoid the worst consequences are central to climate science (Yusoff & Gabrys, 2011; Urry, 2016), current 'climate scenarios', with all their assumptions and all that they leave out, often unintentionally become taken as statements of *the future*.

The question of who or what "owns the future" should be central to social science, as 'the future' within neo-liberal discourse increasingly can be seen as being 'corporatized' by thinktanks and corporate futurists, rather than as something public, held in common (Urry, 2016). This corporatization or 'colonisation' of our futures largely takes place without us noticing "the influences we are exposed to, especially the hegemony of political ideas, philosophies and images mediated through the media" (Smith, 2021, p.2). Thus, Urry argues for the 'thinking and democratizing' of futures as a renewed way of 'planning' that strengthens the role of civil society in 'making futures' and which neither sees the future as fully determined, nor completely empty and open (Urry, 2016).

A stronger focus on imagination, understood as "a way of seeing, sensing, thinking, and dreaming", as a condition for intervening and acting in the world can be a way to "open new spaces and practices for dealing with the effects of living with uncertain futures" (Yusoff & Gabrys, 2011, p.518). Norgaard similarly raises the point that climate change poses a challenge to the human imagination, both in terms of what she describes as 'ecological imagination' (to understand the relationship between human actions and ecological degradation) as well as 'sociological imagination', a term borrowed from C.W. Mills (to be aware of the social structures which are environmentally damaging) (Norgaard, 2018). And while climate science has provided crucial evidence of the impacts of humans on 'the natural world', Norgaard argues that we are alienated not only from our ecological conditions but also from our social conditions – failing to truly see not only the relationship between e.g., personal car use and climate change but also

our car-dependence as a function of corporate lobbying and political planning rather than a 'given' or the result of poor choices (Norgaard, 2018). Essentially, she argues "we lack the ability to imagine social structure" and as a result "most people can only imagine their impacts on the planet in the form of individualized consumer actions" (Norgaard, 2018, p.172).

This leads to what can be described as the lack, and consequently need, of 'utopian imagination' the ability to 'think futures' as alternative solutions to the problems and conditions of the present. An ability described by Bauman as "a necessary condition of historical change" (Bauman, 2009, p.3). Ruth Levitas describes utopia as "the expression of the desire for a better way of being or of living, and as such [it] is braided through human culture" (Levitas, 2013, p.xii) but nevertheless it is "commonly dismissed as an irrelevant fantasy or traduced as a malevolent nightmare leading to totalitarianism" (Levitas, 2013, p.xiii). However, in light of the ongoing ecological crises, change is not only necessary at a societal level: on a more fundamental, planetary level, it is inevitable as the consequences of the ecological crises are already being felt around the world. The question then becomes the nature of the change of our social and economic systems – how to achieve secure and sustainable ways of life for all? In relation to this, Levitas offers another way of thinking about utopia, as not just the attempt to *imagine* but to *make* the world otherwise (Levitas, 2013). Erik Olin Wright similarly promotes the concept of 'real utopias' which embraces the tension between dreams and practice and is based on the belief that "what is pragmatically possible is not fixed independently of our imaginations, but is itself shaped by our visions" (Wright, 2010, p.6).

However, for most people, it is very hard to imagine how to "successfully challenge existing institutions of power and privilege" as we are "born into societies that are already made" (Wright, 2010, p.23) and internalise the rules and structures of society. As Norgaard argues, people generally lack 'social imagination'. Wright further makes the point that even when people accept the critique of current systems and institutions, most people respond with a "fatalistic sense that there is not much that could be done to change things" (Wright, 2010, p.24). Rutger Bregman similarly notes that "radical ideas about a different world have become almost literally unthinkable" and "the expectations of what we as a society can achieve have dramatically eroded, leaving us with the cold, hard truth that without utopia, all that remains is a technocracy" (Bregman, 2018, p.15).

It is almost a paradox that we experience this lack of 'utopian imagination' in this time of the 'Anthropocene' characterized by the unprecedented power of the human species to modify the natural environment – our very living conditions and life as we know it. Some even argue that our access to technology, artificial intelligence, and biotechnology means that human beings have the power to

significantly change the evolutionary trajectory of the human species itself (Murga-Menoya, 2021). This power to affect planetary (and possibly evolutionary) change is obviously a huge responsibility to the Earth, future generations, and other species and further stresses the need to pay attention to who 'owns' the future as well as efforts to strengthen our 'utopian imagination' and democratize the future.

In this regard, Levitas argues for the legitimization of utopian thought "not as a new, but as a repressed, already existing, form of knowledge about possible futures" Levitas, 2013, p.xv). This can be understood as somewhat similar to what Oomen et al describe as the act of *futuring*, defined as "the identification, creation and dissemination of images of the future shaping the possibility space for action, thus enacting relationships between past, present and future" (Oomen et al, 2021, p.253). They argue that by viewing 'the future' in terms of "imaginative work and practices that negotiate meaning and legitimacy", it becomes a site of agency and by extension a site for 'the politics of the future' (Oomen et al, 2021, p.254). They further stress the need to pay attention to the 'material' aspects of futuring, as it is not only our language that "structures what is thought of as possible" (Oomen et al, 2021, p.256), but also material bodies and objects. For instance, the imaginary of the 'American Dream' would not have been possible without the existence of cars, oil, and the material capacity to construct highways and suburban infrastructure. The future is not only a discursively but also a materially enacted part of the present. This is also exemplified by Beyond the Fossil Era's use of 'museum objects' to concretize stories and imaginaries about how the transition to a post-fossil society was realized, thereby seeking to make both the future and the transition less abstract and easier to relate to.

Hope

A concept closely related to utopia is that of hope. The German philosopher Ernst Bloch argues in his comprehensive three-volume work *The Principle of Hope* from 1938-1947 that hope has always "permeated the spirit of the times" and is "continuously rearticulated through utopian ideas, dreams, and expressions" (Hammond, 2017, p.24). When the Berlin Wall was constructed in 1961, Bloch filed for political asylum in West Germany and later the same year delivered the lecture "Can Hope Be Disappointed?" in which he reasserted the value and necessity of "incomplete and radical hope" (Hammond, 2017).

Utopia is another keystone in Bloch's work, as well as the category of the 'Not-Yet' which is similar to the point made in the previous section, as Bloch argues that "the future is Not-Yet made or indeed guaranteed and, as such, alternative 'futures' must inevitably emerge" (Hammond, 2017, p.25). Bloch expands this point about the 'openness' and multitude of possible futures by pointing out that "the fact that the future is not guaranteed means that it can either progress towards

‘perdition or redemption’ and as such, he singles out hope as “the most essential of human principles and experiences” (Hammond, 2017, p.25-26) since “nothing is more human than venturing beyond what is” (Bloch 1998, as cited in Hammond, 2017).

Victoria McGeer similarly argues that hope, or hoping, – despite its connotation to rosy-hued delusion or naivety – is not something we can simply choose or not choose to do, it is a unifying and grounding force of human agency. “To live a life devoid of hope is simply not to live a human life; it is not to function – or tragically, it is to cease to function – as a human being” (McGeer, 2004, p.101). Consequently, McGeer argues that questions of the rationality of hope should rather be about “getting the quality of the hope right” and developing the skill of ‘hoping well’ (McGeer, 2004, p.102).

McGeer sees a close connection between agency and hope, as hope “arises in situations where we understand our own agency to be limited” and hoping then is not only about “recognizing but also actively engaging with our own current limitations in affecting the future we want to inhabit […] rather than crumbling in the face of reality” (McGeer, 2004, p.104). This is an argument similar to Snyder’s hope theory which proposes that hope contains three aspects: 1) a positive future goal, 2) pathway thinking – to find ways to reach the goal and 3) agency thinking – to motivate oneself to use the pathways (Ojala, 2015).

To ‘hope well’ is then to do more than ‘wish’ for something to happen, to be over-reliant on external powers to bring one’s hope about, it is “to take a reflexive and developmental stance toward our own capacities as agents” (McGeer, 2004, p.105). Furthermore, to hope well is to recognize one’s dependency on others and the importance of what McGeer calls ‘peer scaffolding’, a process similar to when parents help infants out of their hopeless state through scaffolding and comfort (McGeer, 2004). For adults, this ‘peer scaffolding’ is about stimulating others’ “confidence in their own hopes and capacity to realize those hopes – to reinforce their sense of self-directive agency (McGeer, 2004, p.118). In this way the concept of community and alterocentric concerns of care are central to the practice of ‘good hope’ as these elements help “fuelling our capacity to realize our hopes and cope with the difficulties when they arise” (McGeer, 2004, p.124).

This last point by McGeer is important, as she acknowledges that while hope is a grounding force of human agency and as such not really an option for us, hope is still, tragically, something we can lose (McGeer, 2004). This point is especially relevant in these times of ecological crises where it is common, especially for young people, to feel powerless and lose hope. According to McGeer, maintaining hope then requires a “responsive social world – a world of others who, in some way or other, support our hopes” (McGeer, 2004, p.109). In the absence of such support and ‘peer scaffolding’, maintaining hope “requires considerable inner

strength and imagination – strength to resist the indifference or disparagements of others and imagination to understand and enliven the transformative value of what we do" (McGeer, 2004, p.109). In this sense, our peers and community significantly affect our power of agency and hopeful efforts.

In relation to this, Maria Ojala has looked specifically at how teachers can "influence their students' emotion regulation concerning climate change, including ways of evoking hope" (Ojala, 2015, p.136). Her work is part of a growing recognition that education about the climate crisis and other global issues should not only be focused on causes and possible solutions but also include emotional aspects, especially since many young people are worried about the future (Ojala, 2015). As mentioned in the introduction, there is some disagreement concerning whether hope is an important motivational force when it comes to environmental engagement, or if it rather leaves people overly optimistic and disengaged. In relation to this, Ojala argues to consider the *sources* on which we base our hope and identifies two hope dimensions: 'constructive hope' and 'hope based on denial of the seriousness of climate change' (Ojala, 2015).

Constructive hope is rather similar to McGeer's concept of 'hoping well'. Ojala also advocates for a perspective on hope as not only an emotional concept, but also as related to agency – a way to cope with difficulties (Ojala, 2015). In relation to the teachers' response to their students' emotions, Ojala finds that 'constructive hope' is especially experienced by students who perceive their teachers as accepting their negative emotions concerning climate change and who have a more positive and solution-oriented teaching style (Ojala, 2015, p.141-142). On the other hand, students who feel hope based on denial generally perceive their teachers as not taking their negative feelings concerning climate change seriously (Ojala, 2015.). Furthermore, the study finds a connection between the feeling of constructive hope and students who responded that sustainable development was discussed frequently in school, thereby supporting the argument that it is important to discuss the future and issues of sustainability in schools in order to foster constructive hope (Ojala, 2015; Mogensen & Schack, 2010). Lastly, and not surprisingly, the study supported the finding from a previous study by Ojala that constructive hope is positively correlated with 'pro-environmental behaviour', while the opposite is the case for hope based on denial (Ojala, 2012; 2015).

As such, the work of Ojala indicates that 'hope' is not 'one thing' and is not necessarily 'delusional' or naïve and in relation to societal issues such as the climate crisis, hope can be both positively and negatively related to engagement, depending on the characteristics of the more specific sources of hope, or pathways to hope (Ojala 2012; 2015).

Building on these findings about the relation between hope and engagement, as well as McGeer's emphasis on hope as a precondition for agency and the fact that feelings of hopelessness are common among young people, it is worth briefly considering the role of hope in climate activism. This was done by Jochen Kleres and Åsa Wettergren in a study of how not only feelings of hope but also fear, anger, and guilt are managed among climate activists in Denmark, Sweden, and at two UNFCCC Conferences of Youth in order to both mobilize and sustain their activism (Kleres & Wettergren, 2017). In short, they found that while fear can motivate action, hope is essential as it "*manages fear* and inspires action which in turn produces more hope" (Kleres & Wettergren, 2017, p.508, emphasis in original). This resonates with McGeer's notion of peer scaffolding. However, they also found a difference between the northern and southern context, as this point about fear and hope as motivating emotions is mostly representative of the activists from 'the Global North', while the interviewed activists from 'the Global South' were generally "more acutely frightened, less hopeful, and more angered, ascribing guilt – responsibility – to northern countries (Kleres & Wettergren, 2017).

Despite these differences, in both the northern and southern narratives, hope in collective action is emphasized, and as such the study supports the observations made by Ojala and McGeer that hope and action can mutually reinforce each other – and that, in some sense, hope is a necessity to sustain any action at all (Kleres & Wettergren, 2017).

3. Methods

My research is rooted in educational action research, understood as transformative social learning with a change agenda, where scientific and practical knowledge is co-created with the people involved directly in the object of study (Mertler, 2019). Furthermore, while a central part of my research has been to gather empirical data related to the use of the study material, I am also inspired by abductive reasoning – understood as a never-ending process of sense-making where there is "no hard line between life, research, theory and methods" (Brinkmann, 2014, p.722). As such, I not only use the data gathered at the school to inform my understanding of the study material, but also my conversations with the researchers behind the material, my own background as part of the Danish partnerships for ESD, as well as my experience with educational policy from my involvement in the student movement, and not least my reading of the theoretical literature outlined above, as "the most important of our instruments … are our *concepts*" (Richards, 1976, as cited in Clark, 1994, p.1035, emphasis in original).

My understanding of 'data' is in other words quite broad and not limited to something that can be 'collected', but rather as something constantly "produced, constructed, mediated by human activity" (Brinkmann, 2014, p.721). An

understanding similar to Niels Bohr's redefinition of 'phenomena' to not just be that which is observed, but to also include the context of observation (Clark, 1994, p.1035).

In the following, I describe how I went about collecting empirical material to inform my analysis.

Preparations

As part of the preliminary stage of my research, I met online with Ruben Ritzén, who is part of the *Climaginaries* research group and works with the educational aspects of the Carbon Ruins project and is evaluating its impact. Through Ritzén I got in contact with Ludwig Bengtsson Sonesson, who was part of the development of both the Museum of Carbon Ruins and Beyond the Fossil Era, which he wrote his master's thesis on last year.

My meetings with both Ruben Ritzén and Ludwig Bengtsson Sonesson were unstructured and explorative. They were not recorded or otherwise treated as 'interviews', as the primary purpose was to get background knowledge on the motivations, thoughts, and intentions behind the Beyond the Fossil Era material, as well as some insight into its use in Swedish schools. There will not appear 'data' from these meetings in the thesis, but I consider both Ritzén and Sonesson as expert sources and the information they shared with me was valuable in guiding my inquiry and contributing to my pre-understanding of the study material. Furthermore, as Sonesson wrote his master's thesis on the use of Beyond the Fossil Era in Swedish schools last year, my meeting with him gave valuable perspectives on the use of the material, his findings, and my own position in relation to his work.

In order to gather my own empirical data and explore the use of the study material 'in practice', I used my network within the Partnerships for ESD and contacted the vice principal of the Danish high school, Herlev Gymnasium, Mads Strarup and asked if he could help me get in touch with one or more teachers who would be willing to 'test' the study material with their students. He referred me to Kristian Anton Stender, a teacher in social studies and physical geography as well as the coordinator of the environmental committee of the school. He was very interested in the material and agreed to try it with his class of senior high school students as part of their social studies class.

I met with Kristian Stender one week before the 'test' of the study material to go through the material together, answer any questions he might have, and agree on how to conduct the following teaching session and my observation of it. We agreed to adapt the material by slightly changing the timeline of the material to a Danish context, as a few of the events in the original referred specifically to Sweden (see appendix 7). Furthermore, he made the point that the original

timeline lacked some sort of events where the turning point stemmed more explicitly from social movements or protests. I therefore added the events to the timeline: in 2027 public pressure resulting in the ban of all fossil fuel advertising in Denmark and international climate strikes resulting in the passing of a UN resolution in 2036 to bring the issue of climate justice to the International Court of Justice (see appendix 7).

As I do not have any professional teaching experience, we agreed that I would only briefly introduce myself and explain the purpose of my research to the students and Kristian Stender would then do the actual teaching based on the online guide to the material, while I would observe, but not engage with the students. The purpose of this, besides drawing on Kristian Stender's professional expertise, was to make the teaching run as 'normally' as possible. Relatedly, it was important to me to leave room for Kristian Stender to adapt the material to fit 'the context of the class', e.g., expanding some elements or downplaying others, based on his knowledge of the students as well as which themes or subjects they had previously covered in his classes and in that way seeking to 'integrate' the session into their wider social science education and making it more relevant for them.

Student survey

Before the actual teaching session began, I asked the students to answer a short survey concerning what they imagined the future to be like, how they imagined a sustainable transformation of society would take place, and what they generally thought and felt about climate change (see appendix 1). After the class, I asked the students to fill out a second part of the survey with questions concerning whether their imaginaries about the future had changed, if their view on their own role in the transition of society had changed, what they felt during class and how the teaching method was different from how they 'normally' were taught about climate change and climate politics.

The purpose of this was to get a sense of the 'character' of the students' imaginaries about the future before they 'tried' the material and to some extent be able to compare their imaginaries before and after the teaching, and thereby evaluate its impact.

It should be mentioned that many of the students in the class were active in the environmental committee of the school and that they had already covered quite a lot of 'climate topics' in their social studies classes, most recently the EU's 'Fit for 55' package. I therefore knew they had some pre-knowledge about the causes and consequences of climate change as well as some of the wider social and political questions relating to climate change. Informed by especially Ojala's emphasis on the importance of also considering students' emotions in relation to

climate change (Ojala 2015), I included questions concerning both the students' thoughts and feelings about the climate crisis.

Students' stories and museum objects

The teaching followed the overall structure and steps of the online material as described in the introduction, but with an additional task for the students to write a short story about their lives in 2053. Some of the students presented these stories in class and some of them also agreed to share their written stories with me afterwards. Two weeks after the teaching session, I participated in the students' exhibition of their 'objects' for the museum. The students had formed groups and chosen objects or phenomena which they imagined to be abolished or replaced by something more sustainable in the future. At the exhibition, the students presented their chosen objects on posters and presented a short story about why the object was unsustainable and how it had been transformed. These stories (appendix 2), along with the students' stories of their future selves (appendix 3), are also part of my empirical data and give valuable insights as 'proxies' of the students' imagination.

Interview with teacher

After the class, I conducted a semi-structured interview with Kristian Stender about his use of the study material, his interpretation of the students' reaction to it, and his reflections about what worked well and how the material could be improved (see appendix 4).

The purpose of this was to get his insights about the material as a professional teacher, thereby adding nuance and context from praxis to my theoretical understanding of how the material ideally should work – acknowledging the value of practitioners' knowledge about their professional field. A related point was to get his perspectives on how some of the methods and 'components' of the material might be used in other educational contexts, thereby adding to my understanding of the wider potential of the material and what can be learned from it as a 'creative' teaching method more broadly.

Limitations and positionality

The main limitation concerning my research had to do with time constraints due to the rather inflexible schedule typical of a high school. This meant that Kristian Stender, who did not know the material beforehand, only had a week to prepare the teaching. My initial meetings with some of the researchers behind the material and my background knowledge of ESD to some extent made up for this, as I could introduce him to some of the background of the material rather than having to rely entirely on the online guide.

At the beginning of the teaching session the students were quite unruly; talking, laughing, and interrupting each other – according to Kristian Stender more so than normally. He reflected that this probably had to do with the imaginative aspects of the material, as this was an unusual 'exercise' for the students and probably made some of them feel unsure about what was expected of them – what the 'right answer' was. In addition, this aspect also made them touch upon somewhat personal or emotional themes, as they were asked to describe their lives in the future – at the 'risk' of sounding 'silly'. An aspect that stands in clear contrast to normal 'science-based' climate education. Their behaviour could also have to do with my presence in the classroom and the quite unusual situation to have 'a researcher' be part of their teaching. While I encouraged them to ignore my presence and sat in the back of the class, it is impossible to do any kind of 'field work' without affecting the field and its participants as, again drawing on Bohr's redefinition of phenomenon, "we cannot draw an unambiguous distinction between what is being observed on the one hand and the conditions of and instruments for observation on the other" (Clark, 1994, p.1035).

Lastly, the teaching took place during three hours in the afternoon and some of the students stated in the survey afterward that they thought this was very long and that they felt tired, hungry, and confused during the class. A consequence of this was also that slightly fewer students answered the survey questions after class, maybe because they thought they only had to answer the survey once and left as soon as the bell rang. Something like this is hard to completely avoid in an educational setting, but it would probably have helped if it had been possible either to spend an entire day or more on the material.

Still, despite these limitations, the students eventually calmed down and engaged critically and creatively with the material. No doubt this had to do with their teacher telling them to focus, but probably also that they got a bit more comfortable with the unusual setting and my presence.

Ethical considerations

Before asking the students to answer the survey, I made it clear that their answers would be completely anonymous and not used for anything else than my thesis. I also emphasized that there were no 'right' or 'wrong' answers.

Similarly, I asked the students for consent to use their stories about how they imagined themselves in the future as well as their stories about 'objects' for the museum.

I have not anonymized the teacher, Kristian Stender, or the name of the high school. This is primarily because I find it important to acknowledge this individual teacher's crucial contribution to my research.

4. Analysis

Drawing on the concepts from the theoretical framework and informed by my observation of the teaching and empirical data, I seek to gain an understanding of the potential of Beyond the Fossil Era's use of imaginaries of the future in terms of fostering hope and, relatedly, action competence among students.

I am interested in what we can learn from the material as a teaching method and in exploring the action competence approach and the concepts of futures, imaginaries, utopia, and hope in relation to the material, thereby getting closer to an understanding of how a 'pedagogy of sustainability' that leads to hope and engagement rather than worry and paralysis can take form. I do not see Beyond the Fossil Era as 'the end goal' of such a pedagogy, but rather as an example and part of an open-ended process in which the material gets developed by its users. Part of my analysis is therefore also to critically reflect on the content of the material, the ideas behind it, and how it might be developed and applied in a wider educational context.

The starting point

The core premise of Beyond the Fossil Era is its placement in 'the future' and its aim to strengthen the future literacy and agency of its participants. This imaginative aspect, as an educational method, is what makes the material stand out from most traditional 'climate' or 'sustainability education'.

However, the whole premise of Sweden having reached its carbon-neutrality goal in 2045 and 'completed' the transition to a post-fossil society is an obvious object for critique. There is a risk that such a narrative in which 'everything will be alright' will result in what McGeer (2004) describes as 'wishful hope'; an overreliance on external forces to bring about change. Rather than, in line with the action competence approach, instil agency and 'constructive hope' in students. This critique is somewhat similar to the debate concerning whether hope in relation to climate change is necessary and motivating or rather associated with unrealistic optimism and denial. In relation to this, it is therefore important to consider the sources we base our hope on (Ojala, 2015) and the need to "not only envision real utopias, but contribute to making utopias real" (Wright, 2010, p.373) – to understand hope as connected to agency and futures as something actively created.

In this perspective, Beyond the Fossil Era's focus on multiple change-bringing forces is central, as these illustrate how it is not only technological innovation or political decision-making that can spark a transformation, but also forces such as activism and organizing. This aspect of the material should ideally expand the students' perspectives on possible lines of action and encourage them to see themselves as actors in creating a more sustainable future. A few students responded in the survey after class, that they now saw not only a wider range of

“stuff which needs to be dealt with” (many for instance seemed surprised by the negative impacts of artificial grass on the environment) but also more possibilities to “improve our way of life without harming the climate” (appendix 1).

A related line of critique of the core content of Beyond the Fossil Era concerns whether the depiction of ‘the transition’ through the museum objects and the timeline is too ‘optimistic’ and makes the whole imaginary of the ‘post-fossil future’ seem unrealistic and therefore difficult to relate to. This concern has been considered by the researchers behind the material and it should be noted that a key aspect of the Museum of Carbon Ruins was for visitors to engage with the exhibition, not only reacting to but expanding on the objects and stories. Some visitors added stories of their own to the exhibition and many of these were reactions to the perceived optimistic narrative of the transition years (Stripple et al, 2021). One example was a suggestion to add barbed wire to the exhibition as a “symbol of borders, and the horrible migration policies of the EU during the transition years” (Stripple et al, 2021, p.95). The story accompanying the barbed wire was of a massive heat wave across the Iberian Peninsula in 2035, resulting in the collapse of the agricultural system in Europe, a large number of refugees travelling north, and the following mobilisation of a movement for a more humane migration politics (Stripple et al, 2021).

However, this specific story is not included in Beyond the Fossil Era as it was considered by the researchers to be too harsh for a material aimed at children and young adults. Still, in the development of the material, the researchers made a point of not representing the transition as a problem-free journey toward some kind of rosy-hued utopia. They therefore still included museum objects telling stories about loss, grief, and conflicts. This is most directly exemplified by ‘The Weave of Sorrow’ a sculpture imagined to be built outside the museum to commemorate the loss, suffering, and damage caused by climate change – the idea being that people would leave a piece of cloth representing something they lost because of climate change. An example is Sami organisations adding a reindeer hide symbolising how climate change made it more difficult for them to continue their traditional way of life (appendix 8). Another example from the study material is ‘The Flag of the Maldives’, telling a story of how the flag became a symbol of climate justice during the 2020s, the refusal of the Maldives to repay its debts to international lenders, and the adding of a clause to the Paris Agreement granting islanders, who were forced to abandon their homes, the right to asylum in the countries which historically had contributed the most to global CO2 emissions (appendix 8).

These examples illustrate an important point about the role of the imagined museum. Which is “not to paint history in a positive light, but to talk about it and learn from it”, to acknowledge that the net-zero target of 2045 was not ambitious

enough and that many people suffered because of inaction, but also ‘to remind’ people that “the world did not come to an end, as many people believed at the beginning of the climate transition” (Naturskyddsföreningen, 2023).

By including these kinds of objects and stories, illustrating the global inequalities and the loss and damage relating to the climate crisis and the transition, the material not only becomes more ‘realistic’, but can also be seen as building on the action competence approach by not disregarding, but rather using, conflicts relating to the environment, and dilemmas concerning sustainability, pedagogically (Mogensen 1997; Carlsson, 2020). There is a potential for developing this aspect of the material by bringing more attention to these stories and using them to initiate debates with students about possible sources of conflicts and the political, economic, and social structures of society that affect the transition, thereby strengthening critical thinking skills and action competence. It should also be noted that anyone who uses the material has the opportunity to add events to the timeline, as I did, or objects to the museum that to a greater extent illustrate struggles and conflicts if this is deemed suitable for the students in question.

Lastly, this duality of the future narrative within the material, the depiction of not only the serious reality and harmful consequences of climate change but also an emphasis on the fact that life will go on ‘on the other side’ of the transition, is a good example of a way of integrating the dilemmas concerning sustainable development into teaching. Not succumbing to a fatalistic understanding that there is no hope, but also, by including objects of conflict and grief, not going too far in the other direction, downplaying the seriousness of the crisis, or ignoring the worry many young people feel, thereby contributing to a hope based on denial.

The imaginaries of the students

Before going into more detail with the concepts of hope and action competence, I will briefly make some observations about the students’ imaginaries as expressed through the survey and the students’ stories about the future. These form the basis, or starting point, for the students’ engagement with the material.

About half the class had negative thoughts about the future, imagining climate change getting worse, that we will not reach our reduction targets, that many animals will go extinct, and that there will be more natural disasters and ‘climate refugees’ in the future (appendix 1). However, the other half of the class imagined a positive future. A few of these did not relate to the climate crisis per se but simply imagined a ‘good life’ with a family, children, and a good job. But most of the students who had positive thoughts about the future specifically related these to climate change, imagining the future to be “more sustainable and green” and that we will become “smarter about maintaining a planet where both humans and

other creatures can live, without us humans getting in the way" or simply imagining that because of the reduction targets of today, climate change will not be as big of a challenge in the future. One student somewhat ambiguously answered that "the future will be more sustainable, but climate change will be worse" (appendix 1).

It is clear that the climate crisis is central in almost all the students' imaginaries concerning the future. Most of the students in the class also participate in the school's environmental committee, and the vast majority of them stated in the survey that they thought climate change poses a significant and urgent challenge that needs to be dealt with.

In general, the most reoccurring theme in the students' stories about the future is electric transportation and only very few mention wider socio-political structures of society. This is somewhat illustrative of the techno-managerial focus of the dominant, eco-modernist 'green politics'; the idea that we by and large can continue our current lifestyle, but with green energy and electric cars. The students' focus on electrification, technology, and plant-based food can as such be seen both as examples of what is typically mentioned in public discussions about the green transition as well as topics typically touched upon in 'climate education'.

The lack of attention to socio-political structures supports the argument by Norgaard (2018) that people in general lack sociological imagination and the consequent need of integrating such perspectives into climate education to strengthen and diversify the 'monoculture' of imagination. The students' stories are also illustrative of the view that we fundamentally only have our knowledge, experiences, and theories of the present to base our imaginaries about the future on (Haste & Chopra, 2020), and that our "often unexamined notions of the future are constructed in our unconscious by the influences we are exposed to, especially the hegemony of political ideas" (Smith, 2021, p.2). While it is not a ground-breaking finding that high school students are influenced by the internationally hegemonic neoliberal ideology that permeates virtually all aspects of society, including the educational system, a point also made by Sterling (2017), it is nevertheless an important point to keep in mind when contemplating how to develop an alternative 'pedagogic of sustainability'.

Hope

Concerning hope, it is very interesting that while about half of the students expressed quite pessimistic outlooks towards the future in the survey before class, none of them describe anything resembling a dystopic future when asked to imagine themselves in 2053. None of their stories include elements of conflict, grief, natural disasters, resource scarcity, or even warmer weather, despite the

students clearly being aware of the climate crisis. There seems to be a pronounced hope in technological solutions such as electric cars and to some extent political regulations, as some students mention demands being placed on shops to be more 'climate friendly' and 'climate-damaging companies' finding it hard to make money in 2053 (appendix 3).

This pronounced, but somewhat inconsistent, expression of hope can also be seen as an example of McGeer's central point that hope is a very fundamental human capacity and as such not something we can choose to enact or not. It can also be seen as a clear example of "the conflict and paradoxes between the generally positive personal futures drawn against the backdrop of a global dystopian future" (Smith, 2021, p.3). Even when we are aware of and worried about the climate crisis and the rapidly changing world, we tend to imagine our own personal futures as rather positive and 'conventional' in terms of having a family and a good job. This speaks to Norgaard's point about us being alienated from both our ecological and social conditions (Norgaard, 2018). Many of us 'live in denial' or in a 'double reality' in which we, on the one hand, know about the climate crisis and how it most likely will radically alter life as we know it within the next decades, but on the other hand, generally continue our normal everyday life (Norgaard, 2011). This is expressed by some of Norgaard's students as having to do with the magnitude of the climate crisis; that "solving global warming seems like such a daunting task" and "despite my knowledge of the wider climate issues, I am still living the same life" (Norgaard, 2011, p.4).

While it can be seen as a good thing that most of the students have hope for at least their personal future, there can also be observed a need of strengthening the students' skills of 'hoping well' and actively engaging in affecting their desired future and 'rising above' the individual level.

Action competence

Some students display an understanding of some of the socio-political structures of society which prevent or slow down the 'green transition'. The survey answers include comments on rich people continuing their lifestyles, businesses not changing their way of operating because it costs them money, and connections between those who have money and those who have influence.

Some students also touch upon, in their stories about the future, changes in the structure of society. But they do not elaborate on societal change, beyond change in consumer behaviour, specifically relating to food and clothes. Phenomena such as fast-food restaurants and advertisements still exist in their imaginaries; the only difference is that the fast-food will be plant-based, and the advertisements for electric cars. Again, this is quite illustrative of the dominant narratives of the green transition in the media, in politics, and, possibly, in school.

Similarly, when asked about the impact of the study material on their view of their own role in the transition, most of the students who responded that the material *did* change their view, elaborated that they would change some of their personal behaviour, such as eating less meat or biking more. These are textbook examples of the behaviour modification tendencies of earlier environmental education, which the action competence approach stands in opposition to. In addition, out of the students who said that the material did *not* change their perspective on their own role in the transition, some elaborated that this was because there is not much to do as an individual since "those who have money also have influence in society and it is primarily the companies that pollute that make the money". While this statement is not necessarily wrong, it expresses a rather fatalistic sense that there is not a lot of possibility to change current systems and institutions of society. These examples of, on the one hand, a strong focus on individual behaviour modifications and on the other, a sense that 'nothing matters' since we are up against very powerful mechanisms in society, clearly illustrate the need to actively engage with and discuss the material's examples of change-bringing forces and emphasise the focus of the action competence approach on community and collective action as a way of changing the "collective conditions for everyday life" (Schnack, 1994, p.186).

A central part of Beyond the Fossil Era is for students to make their own contributions to the museum, thereby engaging in the 'participatory world building' also central to the Museum of Carbon Ruins (Stripple et al, 2021). The students were asked to form groups, imagine to be in 2053, think of something that was unsustainable in our present time, and write a short presentation about the chosen object as well as its 'transition' – drawing inspiration from the different change-bringing forces. The chosen objects and their stories not only tell about the students' imaginaries of the future but also their understanding of 'action' – how change happens.

The chosen objects were hemp clothing, electric cars, fast fashion, phones, and single-use plastic (appendix 2). It should be noted that hemp clothing and electric cars were not imagined to be unsustainable and therefore belong in the museum, but on the contrary the result of a 'green transition'. These students misunderstood the task, focussing on the 'solution' or 'endpoint' rather than the unsustainable object and the change-bringing forces that led to its transformation. The hemp group indirectly touched upon the unsustainability of textiles such as cotton and polyester by emphasising the advantages of hemp in terms of minimal water requirements, durability, and antibacterial properties. And the electric car group included a rather comprehensive description of the negative effects of the use of fossil fuel in internal combustion engines in their presentation and then highlighted the advantages of electric cars both in terms of air and noise pollution,

reduced extraction of fossil fuels, and a subsequent reduction in CO2 emissions. However, neither of these groups focused on the drivers of the transformation.

The group with the most developed description of the forces and events that led to a transition was the group choosing phones. This story includes a growing awareness of "how harmful phones are for the environment" which led to young people demonstrating in front of the Danish parliament and attention spreading on social media. Demonstrations followed in the US, France, and Germany and eventually, the EU implemented a ban on companies that produced "climate damaging phones". The story emphasises the role of activism and mobilisation as a tool that can put pressure on politicians and result in regulations and policy changes (appendix 2). The structure of this story is very similar to many of the stories by the Swedish students who were part of Sonesson's research. That is "awareness of a problem rises, groups mobilise to advocate for change, legislators or companies are forced to change, behaviour or technology change ensues" (Sonesson, 2022, p.26). The two last groups, focussing on fast fashion and single-use plastic did not develop detailed stories of a transition, but their presentations also emphasized awareness raising and political regulations, such as a ban on single-use plastic similar to the one already implemented on a range of products by the EU.

The complexity of the stories varies greatly, which probably has to do with how much time the students spent on them, but also on the 'level' of the students' sociological imagination and how much attention they paid to the change-bringing forces. These were presented by Kristian Stender at the beginning of the class, but because of time constraints, he did not go into a more in-depth discussion of them with the class. He later reflected that this would have improved the 'effect' of the teaching and if he were to use the material again, he would develop this component by letting the students work more concretely with the change-bringing forces and reflect on their usefulness and how they relate to each other. The 'potential' of the material is thus contingent upon how the exercises are used and depends on both teacher and students.

The lack of details in the stories of museum objects points to the necessity of more attention to social change and the practice of sociological imagination within education. But there seems to be potential in this kind of storytelling as a creative teaching method, as it encourages students to consider in rather concrete terms which events, people, and 'change-bringing forces' might be involved in a specific aspect of a wider sustainable transition.

Assessment of potential

While it did not affect a whole lot of hope and action competence after a single teaching session, Beyond the Fossil Era still might have some potential if its

methods were implemented more broadly. The imaginative aspect is central and while some of the students were quite sceptical about this, commenting that they did not get anything out of the teaching since they "just worked with a dream world and not reality" or that "it would be much more relevant to learn about events that have actually happened, rather than events that are made up to make a story", their teacher on the other hand found quite a lot of potential in this aspect. He emphasised how it brought attention to wider 'horizons of action' and made the students look beyond the current barriers and problems which is the usual starting point of most 'climate education' and instead think of their idea of the good life or a utopia.

In addition, one of the teachers Sonesson interviewed mentioned that by "moving away from polarised debates over contemporary policy, their role as arbitrator of right and wrong was lessened" and instead, the "focus was on pupils' imagined transformations which improved classroom discussion and "release[d] the[ir] creative floodgates" (Sonesson, 2022, p.19). The future aspect and use of imaginaries as educational tools can thus be a way to accommodate the concern of many teachers to turn education about climate, environment, and sustainability into a promotion of certain policies and behavioural changes, as 'the future' to some degree is a 'neutral space' open to interpretation.

It should also be noted that some of the students remarked that the material gave new, interesting perspectives, knowledge, and ways of working and that they liked the variation and creativity. Building on some of the insights from Sonesson's research, this creative aspect of the material could be developed even further by paying more attention to the importance of 'staging' understood as the 'medium' of the performance of the future and how people are brought together both physically and imaginatively (Oomen et al, 2021). I had made a point of making the teaching session resemble 'normal' teaching as much as possible, having their usual teacher run the session and being in their normal classroom with their classmates, and this might have made it more difficult for the students to immerse themselves in the 'future world'. Kristian Stender attempted to 'stage' the time travel to the future by playing ambient music and asking the students to close their eyes. But for the material to reach its 'full potential', it might be necessary to rethink where the teaching happens and put more effort into creating a 'perceptual bridge' between the present and the future (Sonesson, 2022). However, this is also a pragmatic question as teachers are increasingly pressed for time and other resources, and for the material to be used at all in a hectic teaching reality, the barrier of entry needs to be low.

Current educational paradigm as barrier

Lastly, an important point concerning the use of the material is the inadequacy of merely implementing ESD as a theme day. Such an approach resembles what

Sterling describes as mere ‘accommodation’ - when the response of educational institutions to the sustainability agenda centre on “campus greening and curriculum accommodation in “obvious” disciplines only” (Sterling, 2021, p.3). What is needed is a fundamental rethinking of education, the integration of a “sustainability ethos as the driver of purpose, policy and practice” (Sterling, 2021, p.3), a shift of educational culture and practice as a whole.

A similar point was made by the Danish partnerships for ESD. One of the reoccurring points in their final report is that ESD shall not be an ‘add on’ or theme day but needs to be integrated into all teaching and learning as well as the management of the educational institutions, in line with the whole school approach (Verdens Bedste Nyheder, 2022, p.13).

Such a fundamental change of the existing educational system shaped by a “technocratic, managerialist, economistic, and vocationalist” view on education, underpinned and energized by neo-liberal ideology (Sterling, 2017, p.33) is obviously not achieved just by using a study material like Beyond the Fossil Era. But this does not mean that the material cannot be useful as a way of inspiring new ways of knowing and new ways of learning.

5. Conclusion

While it is difficult to draw any extensive conclusion from a one-time use of Beyond the Fossil Era, my research, as an experimental pilot study, still offers some insights into what can be learned from the material as a way of fostering hope and action competence.

The use of imaginaries and the ‘future setting’ of the material is what makes it remarkedly different from most ‘climate education’. This aspect of the material offers quite a lot of potential, as it opens new avenues of action, encourages students to imagine both the future and themselves otherwise, to practice their ecological, sociological, and utopian imagination, their ‘future literacy’ or ‘anticipatory competency’. This has been identified as one of the key competencies for sustainability, but the students’ demonstrated quite limited practice hereof – illustrating the need to further develop this type of educational material.

This aspect of the material, as well as its focus on different change-bringing forces, makes it especially relevant within subjects like social studies, but also history, language, and art. The methods and concepts of the material can thus be a method of integrating issues of sustainability into subjects and disciplines which conventionally do not relate to such issues. In addition, these aspects can be a way of widening more traditional natural-science-based ‘climate education’ to include a more holistic perspective on not only the causes and consequences of climate change and environmental issues, but also on how these issues relate to and are

rooted in social, political, and economic structures of society. Thereby, the material offers a lot of potential for interdisciplinary cooperation.

The findings concerning the concept of hope are not very clear. The students were divided in half on the question of whether their imaginaries of the future were positive or negative. But all their stories of their own lives in 2053 were remarkedly positive and without any traces of the negative consequences of the climate crisis. This paradox is worth more attention and consideration of how to develop teaching that addresses the concerns that the students clearly feel in relation to climate change but also helps them develop the skill of 'hoping well' and see themselves as agents of change.

Concerning action competence, while many of the students focused mostly on individual behaviour changes, there is potential in developing and emphasising the material's component of change-bringing forces. The teacher reflected how he, in social studies, usually focuses on the policy level when discussing possibilities to affect change and how, compared to this, the material is more action-oriented and offers a more nuanced view of democratic influence. He also remarked that he would develop and spend more time on this component if he were to use the material in the future.

Despite these potentials, a learning point is that there are some important institutional barriers, especially relating to a lack of resources and time, which need to be considered. High schools in Denmark are subject to a lot of demands, and overcrowded curricula with very specific learning goals hinder the development of subjects with greater emphasis on sustainability and make it difficult for the individual teacher to find room for experiments and develop new ways of teaching (Verdens Bedste Nyheder, 2022, p.79). Considering this, I was very lucky to find a teacher who was willing to rearrange his schedule at very short notice and, without knowing very much about it, try the material with his students. The time constraints of the actual teaching session also made it difficult to realise the full potential of the material, as this made it difficult for both teacher and students to go in-depth with the exercises.

It is interesting to notice how hard it generally was for the students to imagine alternative futures outside of the dominant, techno-managerialist narrative of the green transition which they are exposed to through media and politics. Furthermore, some of the students clearly found the whole imaginative aspect of the material rather silly and did not see the relevance of imagining a 'made-up future' instead of learning about "theories or more specific problems and solutions". A learning point that can be drawn from this could be to consider opening discussions with the students about some of the concepts behind the material, to make them more explicitly consider the concepts of futures, imagination, and utopia in relation to climate change and climate politics.

In relation to this, a last concluding remark is the need to consider the character of the educational system into which Beyond the Fossil Era is ‘inserted’. As Sterling (2017) emphasises, neoliberal ideology has greatly influenced the dominant conception of education to be an instrument of economic growth and there is not much room for emotions, intuition, and non-conformist practices within this paradigm. Challenging this paradigm requires more than implementing Beyond the Fossil Era as a theme day. But pragmatically, there is also a point in trying to affect change within existing systems, and as such the methods of Beyond the Fossil Era have the potential to inspire and guide teachers who are eager to integrate issues of sustainability into their teaching in a way that is hopeful and action-oriented.

Epilogue

During the time of my research, the Danish government presented a bill that proposes to change the Act on high schools to include 'environment' and 'climate' in the purpose of high school education in addition to the current perspectives on democracy and equality (Folketinget, 2023). The bill is proposed to enter into force in August this year, so from the next school year, all high schools are required to offer teaching that makes students "relate reflectively and responsibly to their surroundings, including fellow human beings, nature, environment, climate, and society" (Folketinget, 2023, my translation).

This is something many within the high school sector have pushed for years, but there is also some concern among teachers who do not feel prepared for such a change and are unsure how to integrate issues relating to climate, environment, and sustainability into their teaching (Verdens Bedste Nyheder, 2022, p.78-79). To address this concern, the vice principal of the high school I visited has initiated the production of a book about 'sustainability education' aimed at high school teachers. And I have been asked by Kristian Stender to contribute perspectives from my research to a chapter of this book. In this way, the ideas and concepts behind Beyond the Fossil Era might be spread to a larger number of high school teachers and students. While it is hard to change the educational sector, which indeed can be described as a 'sleeping giant' in relation to the complex issues of the climate crisis and 'green transition', sometimes change needs to start on a small scale through the sharing of ideas – and dreams.

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Appendices

Appendix 1: Survey

Before class (22 students)

What do you imagine the future to be like?

I think of a future with a wife and children. I'm self-employed.

I don't imagine anything. There is no future.

That the climate has gotten worse.

I don't know.

The future in terms of climate change is 100 % going to be worse and we can already see it.

That we are more sustainable and green.

That I don't have any (future)

I imagine a good life with my family and friends and that I have a good job.

I don't know.

We don't reach our targets and have to make more strict targets.

I imagine that we have become kings of the climate.

I think that in the future we will have become much smarter about maintaining a planet where both humans and other creatures can live, without us humans getting in the way.

I think we get a better climate since a lot of targets have been made in different countries.

I don't have very many thoughts on the future. The environment is probably not doing great, and I could imagine quite a few animals are extinct. We probably had to change our diet, because in the long run we won't be able to eat nearly as much meat as we do now. More natural disasters than we already have now.

I think that if we continue being this indifferent to the climate, it will have consequences for the future and in the worst case there may be some natural disasters.

I imagine the future a place where global warming is not as big of a challenge.

Climate change is reduced. There is more talk about the issue.

I think the future will be more sustainable, but climate change will be worse.

I imagine that there will be more focus on climate change since the consequences will start to show. There will be more climate refugees etc.

To reduce the consequences of climate change, society needs to be transformed. How do you imagine this transformation will take place?

I don't know.

Reluctantly.

Reluctantly and the government will have to make more restrictions.

Focus on renewable energy: the transition to renewable energy such as solar, wind, geothermal energy and biomass can reduce the dependency on fossil fuels and reduce the emissions of greenhouse gasses.

Green energy, be more sustainable.

I imagine that we will proceed slowly.

Yes. We should strive for a green future. This means that we have to change a lot of the structures of society and economy. E.g., with a doughnut economy.

Chaos.

I think we will use renewable energy sources to a much greater extend and that fossil fuels will disappear.

Less CO2 emissions.

I think it will be a transition that is going to be really challenging to the lifestyle we are used to in many parts of the world, as it will mean that you have to give up many of your privileges.

More green energy, electric cars, less CO2 emissions from the industry.

I think the rich will be living in fancy houses where they can still eat what they want and mostly live unaffected by the consequences of climate change. The houses will probably be more robust, so they don't break. I think people who already don't have a lot of money will be hit the hardest by the consequences, but also have the least means to limit the consequences. Right now I don't see a realistic transition where, in one way or another, it is not going to affect the most disadvantaged.

We recycle different things and think about the amount of CO2 we emit and take better care of ourselves and each other.

I imagine that our energy sources will be more climate friendly and that the future maybe is a bit more electric (regarding cars).

Change of the law about cars. More focus on public transport. Plane tickets will be more expensive.

The change will happen as a green transition in terms of what we buy, e.g., meat and better options to buy organic products. Cheaper electric cars etc.

More electric cars, recycle more and more sustainable “plastic”

What do you think about climate change?

I don’t know.

They are gradually getting worse and there is not the greatest commitment to improve them, as it requires the big companies to actually take responsibility and change something, but it costs them money, so they don’t bother.

It is bad and dangerous that the climate can change so much.

Climate change is a significant challenge for the planet and its inhabitants.

It is something that needs to be taken seriously. It is a problem that does not just disappear by itself and which has big consequences for us humans.

I think that it is good that we do something for the world.

I don’t like it. It kills a lot of people.

It is fucked up.

It is not that great, but I don’t complain that it’s getting warmer #longersummer

Well, we caused it ourselves, right?

I think it is a big problem which we need to solve together so future generations can live good lives like us.

It is bad.

It is sad.

There are some necessary actions we need to take to limit climate change. Actions which will change our way of life but help the future. I think climate change will continue to get worse, but hopefully it will get better in the long run.

It is obviously bad.

I’m not a fan.

I think it is reasonable, because it will improve our future.

It is not the best, but I believe it is something we can manage.

It is shit which ruins the world for future generations and something we need to take actions against.

It is not good, and it affects our planet.

It is serious and needs to be dealt with.

It is something that needs to be treated now, otherwise it will become much worse.

What do you feel when you think about climate change?

Sadness: 13,6 % (3 persons)

Anger: 4,5 % (1 person)

Happiness: 4,5 % (1 person)

Anxiety: 22,7 % (5 persons)

Hope: 9,1 % (2 persons)

Powerlessness: 22,7 % (5 persons)

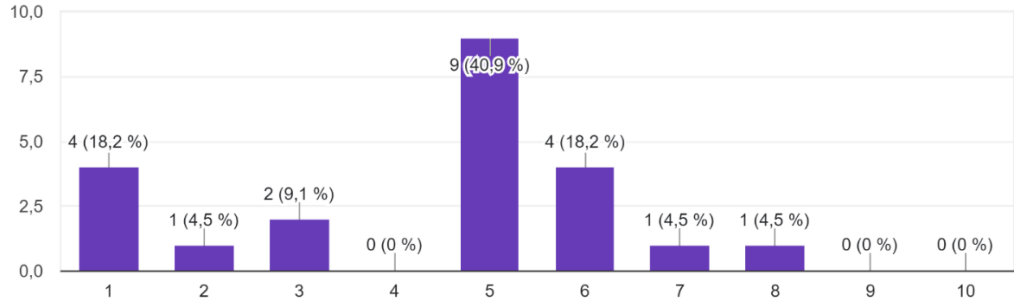
Don’t know: 4,5 % (1 person)

It is what it is (1 person)

I feel both sad, angry, anxiety and powerlessness (1 person)

I feel a mix of hope, anger, anxiety etc. (1 person)

Has your education prepared you for the future? (1 not at all, 10 very much)



After class (16 students)

What do you think about the future now? Have your imaginaries about the future changed?

I think everyone will find something good in something that you probably can’t save. It won’t be the happy party you hope for, but instead it will be survival of the fittest with a lot of losses and compromises.

No, I still think something needs to be done in terms of the future, otherwise big problems will await us.

There is a very long way to go before we will be carbon neutral.

Yes, I think the future will be very different, since we have to change stuff, we live with every day.

Not really, no.

I largely think the same about the future, although I can see that there are a lot of possibilities to improve our way of life without harming the climate.

I don't know.

I hope the future will be better.

I don't know.

Approximately the same.

Yes, there might be a bit of hope.

Yes, to a large extend. My future is much more sustainable now.

Yeah, there are a lot of stuff which need to be dealt with. Stuff like football fields was something I hadn't thought would be a problem. The future will put more focus on the individual stuff that is harmful and, in the future, we will find other alternatives.

It will be more sustainable.

I hope the future will be more sustainable and there will we more green and nature.

Did the class make you change your view on your own role in the transition of society?

Yes

Yes

There is not a lot I can do as an individual.

No, I know that I'm part of the generation who need to save the world.

No, I still believe that the individual person will have a much smaller role in the transformation of society than a company with an income of several million a year. Not because the individual does not want change but because those who have money also have influence in society, and it is primarily the companies that pollute that make the money.

Yes, a lot.

Yes.

Yes, got a new perspective on society.

The football field.

No.

If yes, how?

In terms of the public transport, I use. Maybe I could ride my bike instead.

You need to bike more, eat less meat.

As young students we play a big role in developing the country and improving our way of life in the future.

There is a lot that can happen.

How I am as a person.

Because I eat a lot of meat, maybe I will cut down on it.

I have gotten a better understanding of how the future should look like (less meat, more sustainable energy and more sustainable clothes)

Did not think it was a problem.

In terms of transport, food waste and materials you use in your everyday life.

What did you feel during the class?

I was tired and hungry and confused and did not think I got anything out of it at all, since we just worked with a dream world and not reality.

It was interesting that we had to imagine that we were in 2053.

It was very long.

It was a bit heavy, but alright.

Tired. I don't see the point in this study material. I feel it would be much more relevant to learn about events that have actually happened, rather than events which are made up to make a story.

It was an interesting concept and very different than normal classes.

I don't know.

Good.

It was interesting, I liked it.

A feeling of anxiety, because the future is uncertain/unsafe.

That if we don't do something now, we will be fucked.

I felt hope in my body for a more positive future.

Not anything special, I just learned a lot.

New knowledge.

It was a very different and interesting way to talk about the future, which made it more exciting, since it was about our opinions and imaginaries.

How is this study material different from how you "normally" learn about climate change and climate politics?

This is fictive.

This kind of teaching make us put ourselves in those roles.

Normally it is more concrete stuff and more relevant and current stuff than a fictive world.

I have never made an exhibition and have not meditated in class.

Normally we are taught about events which have actually happened.

Normally you focus on theories or more specific problems and solutions.

A new interesting perspective.

More productive.

I didn't get any homework.

More knowledge.

It was better and funnier.

What was better/worse?

It was fictive.

It was heavy in terms of content, it quickly became hard to follow, although we got to experiment a bit.

Worse.

Less taking time to the teacher and smaller modules.

I don't think it was very relevant to learn about events that have not occurred. You can examine different products as pollutants, but I think it's strange to do it from a fictional future.

I liked the variation and new creativity.

I don't know.

A bit dry, but also interesting.

It was fun to make my own product.

Better.

New ways of working.

It was a much better way to learn.

Appendix 2: Students' objects for the museum

Hemp clothing

A group of four young students from Herlev Gymnasium had decided to create a clothing brand where the textiles are made from hemp, as hemp has multiple advantages compared to other textiles such as cotton and polyester.

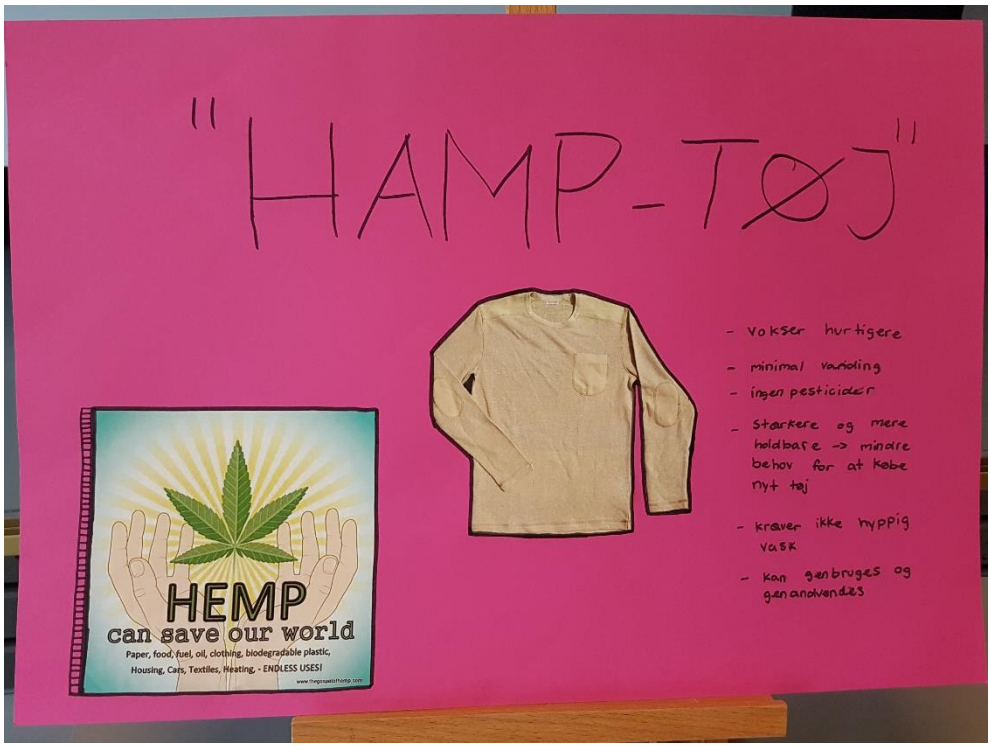
Hemp fibre is a sustainable material that can be used to produce clothes, bags, shoes and a number of other products. Hemp plants grow quickly and require minimal watering and no pesticides or herbicides, making them a more environmentally friendly alternative to other fibre materials.

Hemp fibres are also strong and durable, and clothing can last longer than clothing made from other materials. This means that there is less need to buy new clothes, and it can help to reduce waste and consumption of resources.

Hemp is also breathable and naturally antibacterial, meaning the garment feels comfortable to wear and does not require frequent washing. This can help to reduce water consumption and energy consumption in washing machines.

Finally, hemp fibres can also be reused and recycled, which means they can give life to new products instead of ending up as waste.

Because of all these factors, hemp clothing is a good alternative for those who want to reduce their environmental impact and live more sustainably.



Electric cars

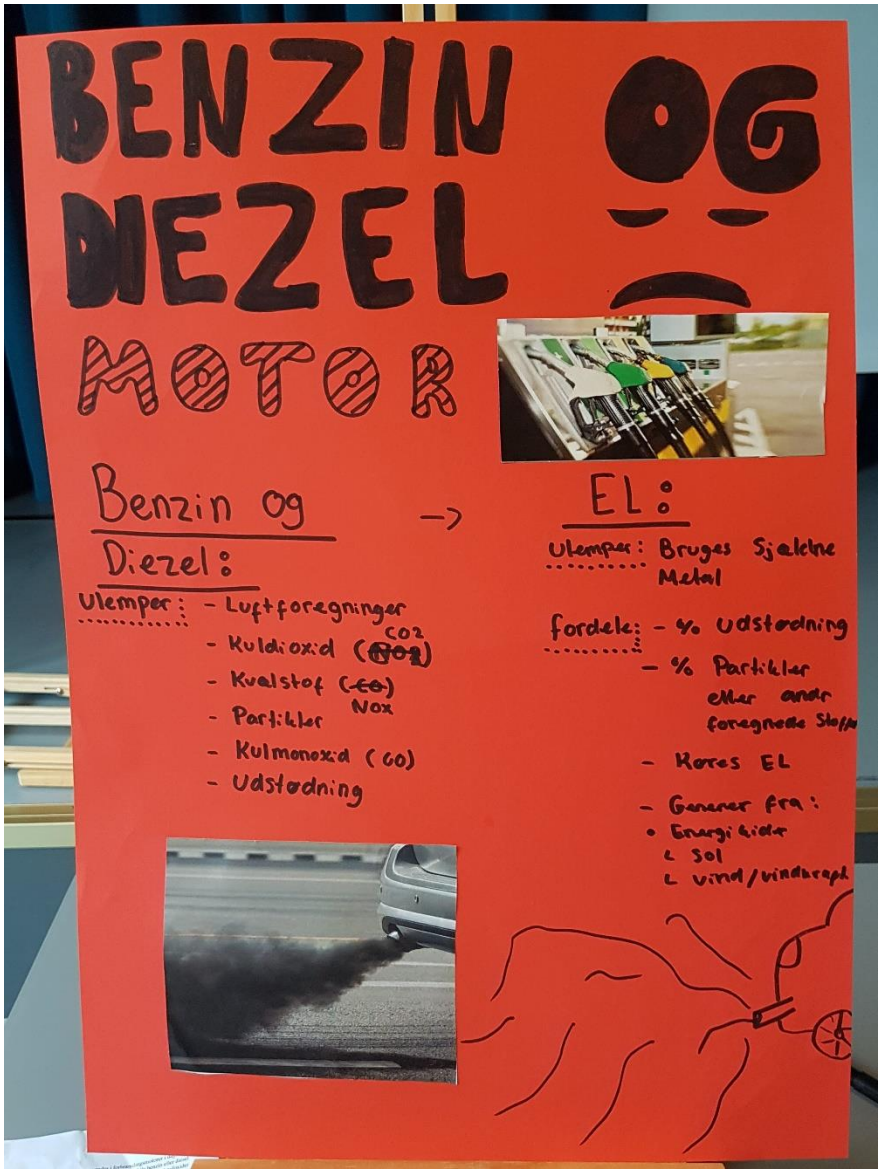
Gasoline and diesel are two of the most common types of fuel used in internal combustion engines today. Unfortunately, both petrol and diesel have a strong impact on the environment and climate. When gasoline or diesel is burned in an engine harmful air pollutants are released, including carbon dioxide (CO2), nitrogen oxides (NOx), carbon monoxide (CO) and particles. These pollutants have a negative effect on the environment and our health.

CO2 is a greenhouse gas that contributes to climate change by trapping heat in the atmosphere and increasing the temperature on Earth. The more CO2 that is released, the greater the climate change. NOx is also a harmful gas that can cause smog and acid rain. Carbon monoxide is toxic and can cause headaches, dizziness and even death in high concentrations. Particles can enter our lungs and cause health problems such as asthma and pneumonia. Because of these dangers related to the use of gasoline and diesel, there is a growing trend to consider alternative fuel types that are more environmentally friendly and sustainable, such as electricity and hydrogen. There is also a focus on improving the fuel efficiency of petrol and diesel engines to reduce their environmental impact and CO2 emissions.

Electric cars help reduce air pollution and CO2 emissions, which is important for the environment in several ways:

1. Air pollution: Electric cars have no exhaustion, which means they do not produce particles and other pollutants that are harmful to human health and the environment in general.
2. CO2 emissions: Electric cars run on electricity that can be generated from renewable energy sources such as solar, wind and hydropower, which means that the car itself do not produce CO2 emissions. Even when the electricity is generated from fossil fuels, an electric car can still be more efficient than a petrol or diesel car, as electricity is a more efficient energy source than internal combustion engines.
3. Reduction in extraction of fossil fuels: Electric cars do not require fossil fuels like gasoline or diesel, reducing the need to extract and refine these resources. This helps to reduce the environmental impact of these industries.
4. Noise pollution: Electric cars are also known to be quieter than petrol or diesel cars, which can help reduce noise pollution in urban areas.

However, it is important to note that electric cars are not completely environmentally friendly. The production of batteries and the energy required to produce and charge them can still have an environmental impact. In addition, electricity can still be generated from fossil fuels in many parts of the world, which can affect the overall environmental impact of EVs.



Fast fashion

This group did not write a story about their ‘object’, but instead made a short film with videos from TikTok about ‘Shein hauls’, people showing the clothes they have bought from the ultra-fast fashion platform Shein. The students then mixed these video clips with pictures of sweatshops and people walking around in huge piles of discarded clothes in ‘the global south’, adding texts such as “It this really worth it?” and “Don’t you regret it?”. At the exhibition the students explained that the video was supposed to be part of a campaign raising awareness about the negative impacts of fast fashion.

https://youtu.be/qx7QQjplzWw

Phones

We have chosen climate-damaging phones.

Why was it unsustainable?

It pollutes when it is produced.

What needed to be changed?

Its pollution

Why did it exist?

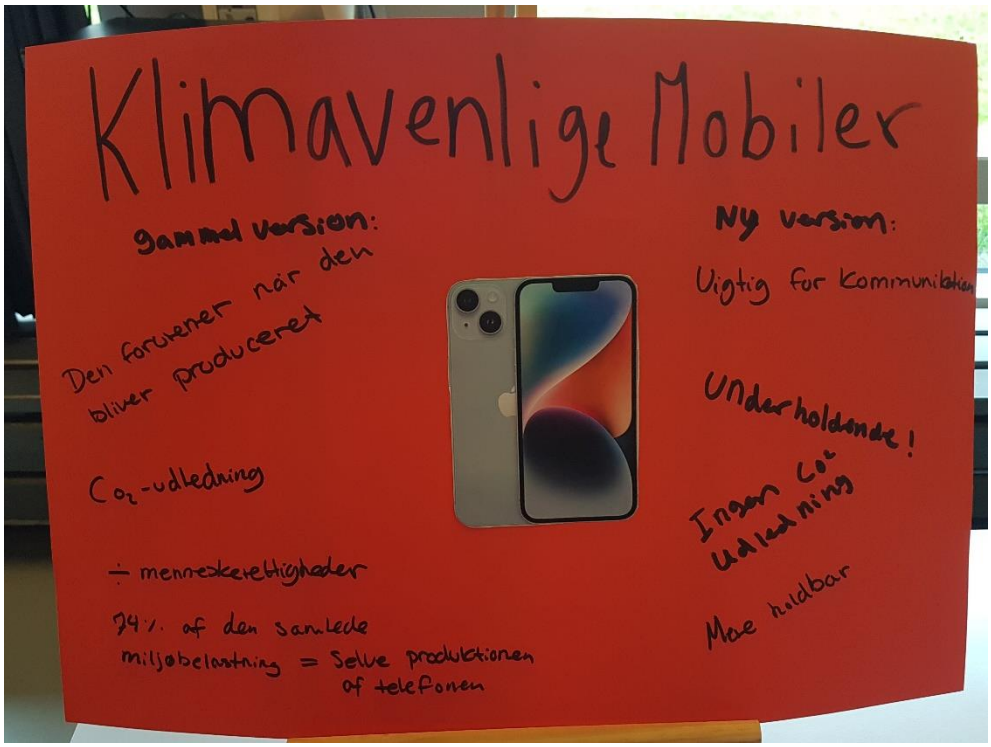
The usefulness: communication, entertainment and stimulation of the brain.

Why did humans need it?

It is vital, all forms of communication with others work through it.

Why does it belong in the museum that celebrates the fossil-free society?

Because it emits CO2 and that is bad for the climate. The production of telephones is also bad for humans.



Based on what you have learned about how changes are created, you must describe how the product was phased out:

The change happened when people discovered how harmful phones are for the climate and therefore, they chose to boycott them, in the hope of creating a better climate.

The decisive incident happened when a group of young people in Denmark gathered in front of Christiansborg (the parliament) and demonstrated to get the politicians' attention. The demonstration got a lot of attention and spread on social media and other countries started to support the idea of removing climate-damaging phones. Demonstrations therefore began in countries such as the USA, France and Germany. This put a lot of pressure on politicians around the world and in Denmark. This resulted in the EU boycotting companies that manufactured climate-damaging phones, as they are responsible for a large amount of CO2 emissions through their production.

It was therefore an organized protest by the young population around the European countries as well as the USA.

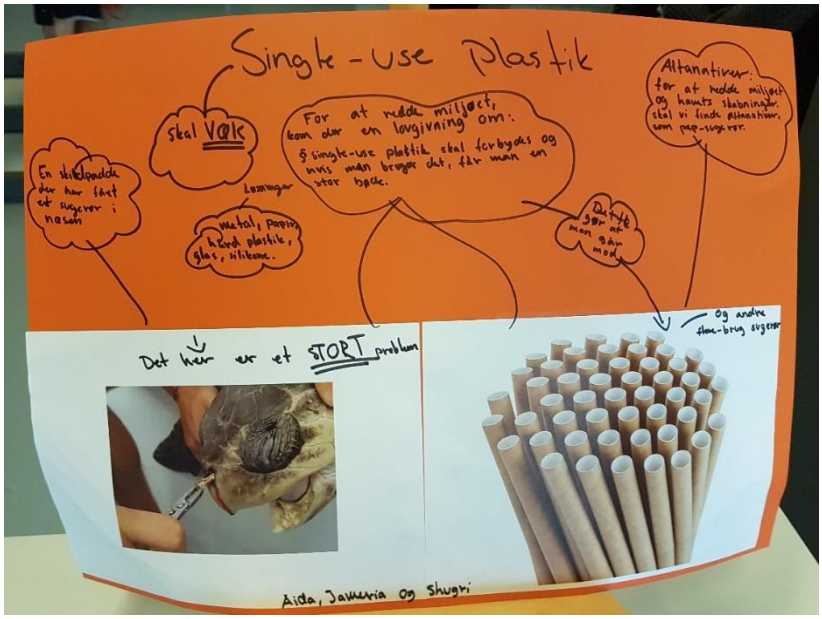
Factors such as demonstrations (activism) and political cooperation, internationally worked together.

At first there was resistance from the people, when they did not want to get rid of their phones. But then it dawned on them that they didn't have to lose their phone, but just had to exchange it for one that was better for the climate.

The demonstration in front of Christiansborg started the thought process in other countries. Then there was an even bigger demonstration in the USA, which helped to start the international conversation about the impact of telephones on the climate.

Single use plastic

This group did not write a story about their object, but chose to focus on single use plastic, illustrating its negative impact on the environment, especially life at sea. The ‘transition’ came from a ban on single use plastic and alternative materials such as metal, glass, silicone, paper and ‘hard’ plastic.



Appendix 3: Students' stories about their lives in 2053

Imagine you are in 2053. How old are you? What do you look like? How do you dress? Where are you and how does it look like around you?

Student 1

49 years old, looks relatively young compared to 49-year-olds today. Futuristic clothes. Am in central Copenhagen. Tall buildings everywhere, different shapes (triangle buildings). It looks greener in the city. There are flying cars and trains.

Student 2

49 years old. Fancy clothes. Grey hair. Technological world. Floating cars.

Student 3

49 years old. I look hot. Sustainable clothing. Central Copenhagen. Technological, sunny, and green.

Student 4

I'm 50 years old. I'm bald, have wrinkles and a large beard. I'm dressed in hemp clothes (or velour). I'm in a world that isn't exactly a utopia, but steps have been made in the right direction.

Student 5

I'm 51 years old. I'm stylish and wears a suit made from a sustainable material. I'm in Istanbul, close to the water. There are tall buildings around me. I own my own villa and live a quiet life. Petrol cars does not exist anymore, neither does hybrid cars. There are also only sailboats without motors. Almost no planes. People very rarely fly, since you need a very good reason to do so. The food is plant based.

Student 6

I'm 49 years old and starting to get old. I have my own family. I'm dressed in climate neutral clothes and am in Copenhagen. The structure of society has changed enormously.

Student 7

48 years old. Gotten older, probably got wrinkles and grey hair. Sustainable and recycled clothes. Find myself around buildings that have been renovated into more sustainable materials. There is more nature and greenery around. The traffic around me is electric, no petrol or diesel. There is less food waste and people eat less, but better, meat and there are more alternatives to meat.

Student 8

All cars are electric. I'm 49 years old. There are ads for new kinds of electric cars. The buildings are high-tech. There are fewer street signs, navigation systems are built into the cars. There is less traffic. The busses also run on electricity. There are more plants.

Student 9

In 2053 I'm 48 years old. I don't look much different, except that I'm older. My clothes, like most other peoples', are sustainable. I find myself on the edge of a big park where nature has been allowed to be wild. Out on the street there are almost no cars and those that are, are electric and can be charged via charging stations. In addition, there are many bikes. Many demands are placed on shops, cafes and restaurants to ensure climate, almost all places are vegan.

Student 10

I was in the Kings Garden, but it was different. There were no old buildings. It was all new buildings with lots of plants growing on them. There were only electric cars on the street. The buildings were in bright colors with lots of details in glass. I looked like myself, just older. I was still hot and had hair.

Student 11

I'm 49 years old. I wear climate friendly clothes and shoes. I'm in a very busy, big city with lots of traffic. There are more electric cars than today. And even more cyclists. There are fewer fast food places and those left are healthier and more climate friendly than the ones we had in 2023. Clothes are more expensive, and we buy them less often.

Electric cars, electric planes. Meat and clothes are extremely expensive. Healthy and climate friendly cafes and restaurants. Climate-damaging companies find it hard to make money.

Student 12

I'm 50 years old. I wear a suit (because I'm fancy). It is beige/pink. I'm in a city with high-rise buildings with lots of windows. There are cars on the street, but they are smaller and all of them are grey. The sky is also grey. But that's because it's raining – typical. My hair isn't grey because I still have blond hair.

Appendix 4: Interview guide

How did you use the teaching material? Did you change anything?

How did the students react to the teaching?

- Elaboration: The future scenario, the timeline, the individual exercises?
- Was there anything about the teaching material that seemed particularly good or bad?

How does this teaching material differ from how you (and possibly your colleagues) "normally" teach climate change and policy?

Did the exercises in the teaching material give new perspectives on today's society?

What do you associate with the term "action competence"?

Do you think that this teaching material has the potential to strengthen students' action competence?

- Why/why not?

Is there anything about the teaching material that you would change if you were to use it in your teaching again?

Do you have any other comments on the teaching material as a whole, the individual exercises or anything else to add?

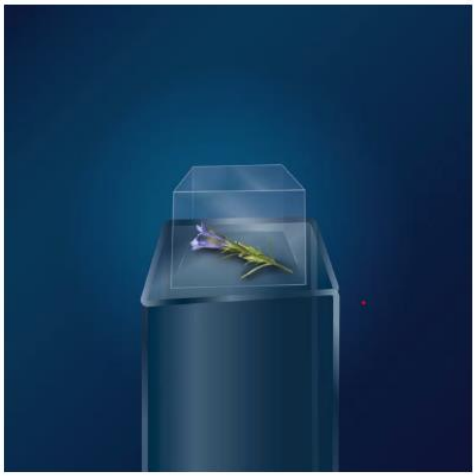
Appendix 5: Change-bringing forces

Activism

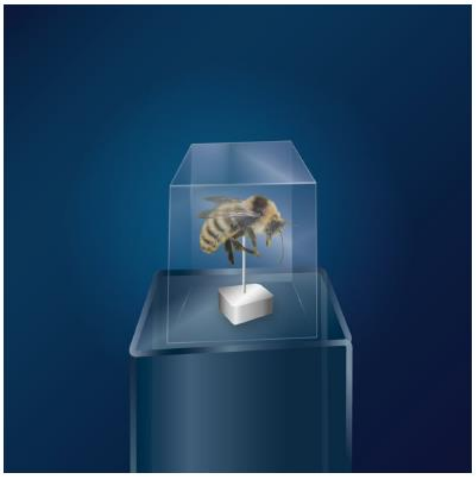
Protests against the emissions from Sweden's last coal power plant, Värtaverket, led to it closing in the year 2020.

Demonstrations against the environmental impacts of vehicular traffic led to a ban against all SUVs in 2036.

Knowledge



Increased insight into the conditions that plants and animals need to thrive made it possible to save several species from extinction, among them the marsh gentian, a flower which thrives in wetlands.



Knowledge about how dangerous "rational" agriculture is for many insects led to new ways of farming. This helped save the great yellow bumblebee.

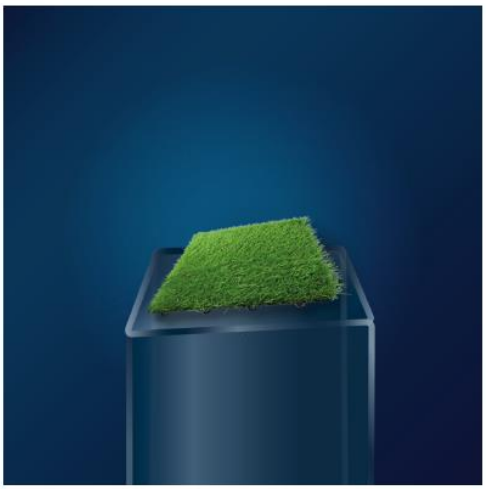
New markets

Harmful emissions from concrete manufacturing led to a construction boom for wooden materials.

Re-usage of old houses created new markets for "transition construction", where old office buildings or luxury villas were converted into cooperative housing.

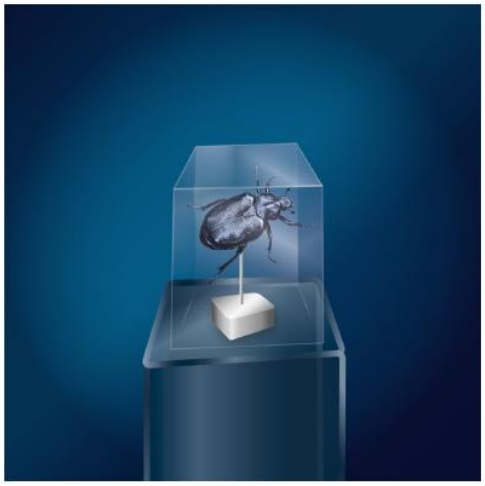
Organizing

Unions developed the #TooHotToHammer campaign to draw attention to the vulnerability of construction workers in increasingly hot temperatures.



Companies, football clubs and activists came together to get the Swedish Football Association to ban artifical grass. And, they succeeded!

Stories

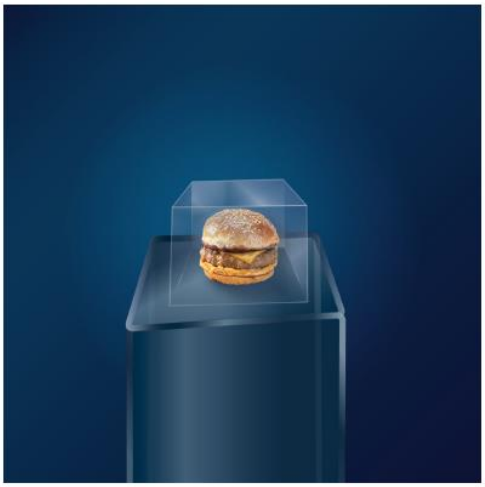


The hermit beetle is still struggling as a result of fossil era forestry. The story of its vulnerability has turned it into a symbol for the fight for survival of all forest-dwelling species.

The story of the Maldives' vulnerability to climate change led to rich countries granting asylum to refugees from there.

Norms and behaviours

The campaing "Rather naked than covered in oil" made it difficult to wear nylon stockings in public.



A less stressed society led to a reduced demand (and eventual sales stop) for fast food hamburgers.

Innovation

More effective charging stations led to gas stations becoming superfluous. They were instead transformed into museums, grocery stores or nursery gardens.

New batteries and more effective recycling programmes are being developed to reduce both dependence on rare earth minerals and the negative effect on nature.

Policy

The Danish state's investments in bio-based plastic made it possible for LEGO to adjust its production and stave off bankruptcy.

Financial policies from the Swedish government made it easier to repair than to buy new things, which reduced both mass consumption and shopping hysteria.

Appendix 6: Timeline of the transition (original)

1849 – 2053
Historical overview

Crucial historical events

1849 Fossil fuel usage increases dramatically as coal becomes the staple energy source in manufacturing.

1882 The world's first coal-fired power plant is built in London.

1896 Swedish scientist Svante Arrhenious shows that humanity can cause climate change.

1908 The first T-Ford is manufactured. Its low cost enables more people to buy a car, paving the way for extensive private car use.

1910 A new discovery (the Haber-Bosch process) enables nitrogen fixation at a low price, which leads to the large-scale manufacturing of chemical fertilisers.

1973 The oil crisis. Oil is no longer viewed as an infinite and cheap energy source.

1991 The Swedish carbon tax is introduced.

2015 The Paris Agreement is signed. This is a global agreement that commits nations to decrease emissions sufficiently quickly to limit warming to 2 degrees Celsius.

2018 Over 100 million cars are produced in a given year.

2020 Stockholm Exergi closes Värtaverket, Sweden's last coal-fuelled power and heating plant.

2024 The carbon bubble burst. It is clear that the future is fossil free, and machines and infrastructure related to fossil fuels become worth less and less. Stockbrokers rush to sell off their assets, plummeting the value and barring these companies from most lenders. Fossil fuel companies are forced to rethink or disappear.

2028 Plastics production peaks at 450 million tonnes per year.

2036 The Belchatow power plant in Poland is closed, at the time the biggest single emitter of CO_2 in the EU.

2037 Bio-based plastic production exceeds fossil plastic. Half of all plastic is made from recycled materials, and there is a drop in the demand for plastic.

2042 The last blast furnace in Sweden is closed. Swedish steel is now completely fossil free.

2045 Sweden reaches the goal of *net-zero emissions* and completes the goals set out in the Climate Act from 2018.

2053 The museum FOSSIL is inaugurated with its first exhibition: *Beyond the Fossil Era*.

Appendix 7: Timeline of the transition (adapted)

1849 Fossil fuel usage increases dramatically as coal becomes the staple energy source in manufacturing.

1882 The world's first coal-fired power plant is built in London.

1896 Swedish scientist Svante Arrhenius shows that humanity can cause climate change.

(He was the first to use basic principles of physical chemistry to calculate estimates of the extent to which increases in atmospheric carbon dioxide (CO_2) will increase Earth's surface temperature)

1908 The first T-Ford is manufactured. Its low cost enables more people to buy a car, paving the way for extensive private car use.

1910 A new discovery (the Haber-Bosch process) enables nitrogen fixation at a low price, which leads to the large-scale manufacturing of chemical fertilizers.

1973 The oil crisis. Oil is no longer viewed as an infinite and cheap energy source.

1992 **The Danish carbon tax is introduced.**

2015 The Paris Agreement is signed. This is a global agreement that commits nations to decrease emissions sufficiently quickly to limit global warming to 2 degrees Celsius.

2018 Over 100 million cars are produced each year.

2020 **The Danish Climate Act is signed.**

2023 **Ørsted closes Esbjergværket, the last coal-fired power plant in Denmark.**

2024 The carbon bubble burst. It is clear that the future is fossil free, and machines and infrastructure related to fossil fuels become worth less and less. Stockbrokers rush to sell off their assets, plummeting the value and barring these companies from most lenders. Fossil fuel companies are forced to rethink or disappear.

2026 **Agricultural reform in Denmark introduces a "farming emissions tax" as well as the protection of 33 % of Denmark's land area by 2030.**

2027 **Public pressure result in a ban on all fossil fuel advertising in Denmark.**

2028 Plastic products peaks at 450 million tonnes per year.

2036 **The international climate movement mobilises more than 10 million people in massive climate strikes. Their demands result in the passing of a UN resolution to bring the issue of climate**

justice to the International Court of Justice, making clear that countries have a duty under international law to cease or alter their harmful activities as well as requiring countries to live up to their financial responsibility for climate-related harms.

2037 Bio-based plastic production exceeds fossil plastic. Half of all plastic is made from recycled materials, and there is a drop in the demand for plastic.

2042 **Aalborg Portland, the single largest emitter of CO_2 in Denmark, is closed.**

2045 **Denmark reaches the goal of net-zero emissions and completes the goals as set out in the Climate Act of 2020.**

2053 The museum FOSSIL is inaugurated with its first exhibition: *Beyond the Fossil Era.*

Appendix 8: Examples of objects from the study material

The weave of sorrow (2045)

This museum is not only intended to celebrate the achievement of net zero emissions. It was also established to remember the more painful parts of the fossil era so that we don't repeat our mistakes.

Choosing not to do something is also a choice. Politicians, business leaders and citizens knew already in the 20th century that the fossil era had to come to an end – and that every year lost would create suffering in the future.

The monument "The weave of sorrow" was built outside the museum in 2045, the same year that Sweden reached its climate targets. The weave of sorrow was the starting point for the collections of this museum.

We don't yet know the exact amount of damage caused by climate change as we're still experiencing its effects. But we do know that many people died and that even more people suffered. We know that the ones the least responsible for climate change were hit the earliest and the hardest. The weave of sorrow was created for all of them. Over the years, many groups have brought a piece of cloth symbolising something they have lost and added it to the sculpture.

The exiled inhabitants of the Solomon Islands added a canoe against a light blue background, which symbolises their lost connection to the sea and their culture.

The Norwegian association of oil veterans added a piece of cloth from their former work uniforms to symbolise the loss of part of their identity when the oil industry collapsed. When doing so, they also apologised for their role in the fossil era.

Sami organisations added a reindeer hide to symbolise the many reindeer and reindeer owners who suffered as climate change and industries made it more difficult for the reindeer to find food.

Many more pieces of cloth will be added over time, and each ceremony is an important opportunity for the participants to remember, grieve and move on.

The role of a museum is not to paint history in a positive light, but to talk about it and learn from it. We now know that Sweden's climate target, net zero emissions by 2045, was not sufficiently ambitious. We know that many people suffered

unnecessarily. But we also know that the world did not come to an end, as many people believed at the beginning of the climate transition.

Retrieved from: https://www.naturskyddsforeningen.se/skola/the-weave-of-sorrow/

The flag of the Maldives (2024)

One of the effects of climate change that we have not been able to entirely avoid, despite the fact that we have now reached net zero emissions, is sea level rise. Island nations such as the Maldives and Tuvalu were only a few metres above sea level in the early 2000s, and these countries, as well as coastal cities, have suffered the most from the rising sea levels.

If you were young in the 2020s, surely you remember the flag of the Maldives. It was placed in windows, painted on walls and projected on large buildings all across the world. By using the flag, people wanted to show their support for the Maldives and their demand that the countries historically having emitted and contributed the most to climate change take greater financial responsibility for the climate transition.

Perhaps you remember the autumn of 2024. That was when the president of the Maldives at the time gave her famous speech “Enough is enough” from a podium halfway immersed in the Indian Ocean. She announced that the Maldives would refuse to repay its debts to international lenders until the promise of $100 billion a year in climate financing was realised. Instead, the Maldives would spend every penny on adapting to a changing climate. “Enough is enough” spread like a wildfire and more and more island nations refused to pay. A year later, rich nations coughed up the billions they had promised – twenty years earlier!

The transition years were difficult for the island nations. Large land areas were lost to the ocean, and crops were destroyed as saltwater flooded the fields. Saltwater getting into freshwater reserves made several islands almost uninhabitable.

This led the island nations to demand that islanders forced to abandon their homes should receive asylum in those countries having emitted the most over time. Eventually, such a clause was added to the Paris Agreement. Following this, many islanders moved to the United States and China, and some were received by Sweden. That is why there is an island on the Swedish west coast largely populated by inhabitants from the island nation of Tuvalu. Many tourists flock there to partake in the cool food culture known locally as island cuisine.

However, some people didn’t want to move and now remain on the islands with flood barriers, desalination facilities and planted mangrove forests.

Retrieved from: https://www.naturskyddsforeningen.se/skola/flag-of-the-maldives/