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Keynote

Lessons learned from Covid-19: Why Sustainability Education Needs to Become Political

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Structured Abstract

Background: Research from various disciplines indicates that the human endeavour has shifted the earth into a new geologic epoch: the Anthropocene, in which we are stressing several planetary boundaries. Many political papers see education as key to making the Anthropocene a sustainable epoch. This paper evaluates evidence on the effects of education for sustainability. It asks which role education must play in our endeavour to shape a sustainable future.
Purpose of this study is to evaluate existing approaches within education for sustainable development and position them relative to political and scientific demands.
Setting: The paper sets a three-step approach by (1) evaluating the global challenges of the 2020s based on evidence on the great acceleration of resource use, the approaching of the Anthropocene as a new geological epoch and the planetary boundaries. Central concepts of education to cope with these challenges like sustainability competences are analysed (2) and (3) programs aiming to implement these competences are evaluated.
Results: The paper shows that sustainability competences often are too abstract and that programs on education for sustainability often have a very limited impact on learners' consciousness and behaviour. Based on data on sustainability policies and recent data on the Covid-19-lockdown the paper shows the limited effect of current strategies on education for sustainability.
Conclusions: Based on the empirical findings the paper concludes that when education for sustainability focuses on leaners' competences to participate politically, it has a higher chance of success and a higher chance of having a positive effect on the sustainability challenges of the 21st century than a focus on learners consciousness or environmental behaviour.
Keywords: *education for sustainable development, science education, Anthropocene, political education*

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1 Introduction

There is a consensus in the scientific debate on sustainable development, that sustainability can only be achieved through profound changes in the economy and in our lifestyles – at least in the early industrialised countries. Many political rather than empirical papers argue that education is a key variable to make this epoch a sustainable one (UN 1992). Educational opportunities should create awareness of sustainability-relevant problems, enable the acquisition of knowledge about these problems and develop the necessary competencies to deal with them (Michelsen, Siebert & Lilje 2011). However, studies evaluating the effects of education on sustainable development are rare.
This paper evaluates evidence from various disciplines on the effects of education for sustainable development. It asks which role – especially science – education can play in our endeavour to shape a more sustainable future.

2 Background

2.1 The challenge

Through the steady growth and globalisation of their economic activities, humans have brought many novel materials into circulation in a short time. The Earth has not experienced such a rapid change in the 2.4 billion years since the mass production of oxygen by cyanobacteria (Niebert, 2018).
Especially the second half of the 20th Century is unique in the history of the planet: human activities reached take-off points, sharp accelerations after WWII which are still increasing (Steffen et al, 2015). Food production today is more dependent on fossil fuels for energy to produce synthetic fertilisers than it is on the sun. Through the global exchange of goods, for example, not only T-shirts from the sweatshops of Bangladesh reach Europe, but also various species cross geographical barriers in planes or on ships, thus changing the course of evolution. Geologists now agree that humanity has become the greatest geological force on our planet. Nobel Prize laureate Paul Crutzen has proposed the name Anthropocene, the human era, for the new Earth epoch (Crutzen 2002).
From a science perspective, it is not unusual for an organism to change its environment. The question is rather at what intensity these changes lead to a collapse of the Earth system. For this purpose, Rockström et al. (2015) have developed the model of planetary boundaries. This model attempts to define a measure within which environmental changes can take place without leading to irreversible damage. Nine planetary boundaries are identified in the model. Analyses show that in four of the nine areas red lines have already been crossed. These are climate change, land use change, biodiversity, and nitrogen and phosphorus input into the biosphere. Other areas that have been identified are the ozone layer, water use, ocean acidification, aerosol pollution and chemical pollution. In some areas, thresholds have yet to be defined (e.g. chemical pollution). The centre of the model represents the "safe" area. The farther the individual limits are exceeded, the higher the risk and uncertainty for irreversible damage to the Earth system. In the outer area, sudden, non-linear environmental changes are also conceivable, i.e. there is a high risk of irreversible damage.

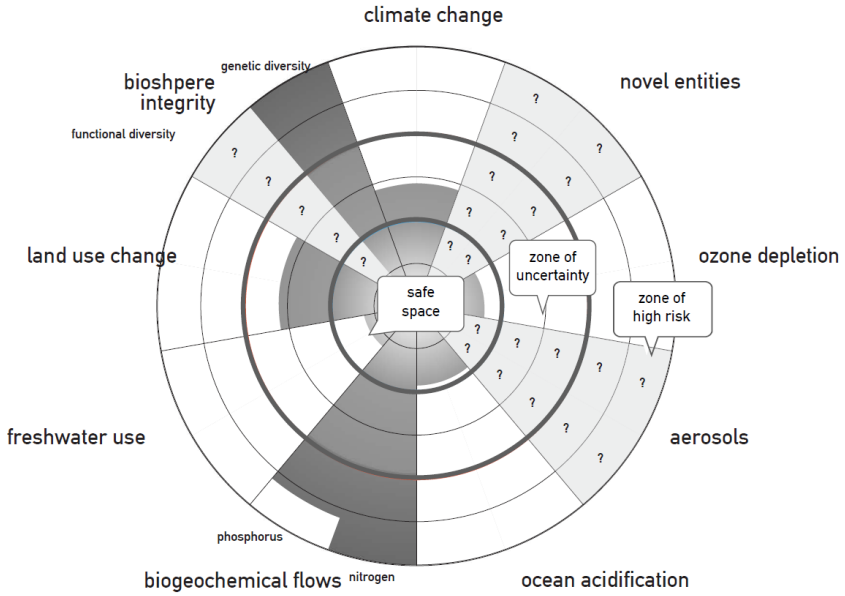
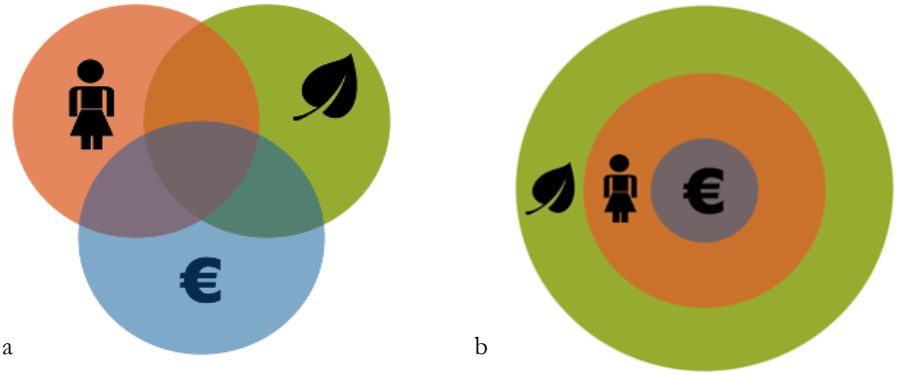


Fig. 1. The planetary boundaries concept

2.2 The solution

To deal with these developments, sustainable development is described as a core idea of achieving environmental sustainability and at the same time develop societies socially and economically. Historically the concept of sustainability was developed based on the idea that resources should be used in such a way that they can regenerate in the same amount of time (Grober 2013). Today, sustainability is understood more broadly and has grown into a global guiding principle that has found its way into politics, the economy and even into schools and lessons. Today, the best-known definition of sustainable development comes from the Brundtland Report of 1987, which calls for *development that meets the needs of the present without restricting the ability of future generations to meet their needs* (WCEF, 1987).
Since the 1990s, the discussion on sustainability has generally been characterised by three equally important pillars: ecology, economy and social issues. In the course of time, there have been repeated proposals to integrate further sustainability dimensions, such as culture or politics. However, this has not been widely accepted. The three dimensions of sustainable development are often presented as a pillar or an intersection model. The intersections show the clear connection and interdependence of the dimensions. The aim is to achieve a balance between the dimensions (Fig. 2a). However, the concept of balancing is considered a failure by various authors (Griggs et al. 2013; Müller & Niebert 2017; Steffen et al. 2015), as it always led to imbalances. In case of doubt, social as well as ecological needs are pushed back in favour of economic interests. Alternatively, it is proposed to understand sustainable development as an economic activity that serves the fulfilment of social needs and remains within planetary pressure limits (Müller & Niebert 2017; Niebert 2018; Ott 2009) (Fig. 2b).



a b

Fig. 2. Two principles of sustainability: From balancing (a) to keeping within limits (b)

The goals of sustainability policy have changed, as the "Agenda 2030: Transforming Our World" as the most prominent paper documents: 193 countries agreed on a process of change towards sustainability and on the realisation that global challenges can only be solved jointly (UN, 2016). The demands of the United Nations are set out in 17 Sustainable Development Goals, one of which is explicitly high-quality education (Goal 4). In many other goals science issues play a central role. These include in particular the goals on nutrition (2) and health (3), water supply (6), clean energy (7), climate protection (13) life under water (15) and life on land (15).

2.3 The promis

At international level, policies have highlighted the central role education plays in sustainabilty (UNESCO, 2017). Various educational policy concepts emerged, such as environmental education, global learning and finally education for sustainability (Michelsen & Fischer 2015). Education for sustainability is often framed as a concept that aims for the acquisition of future-oriented competences. With regard to this challenge, the concept of *Gestaltungskompetenz* developed by de Haan and Harenberg (1999) is often cited. This refers to the ability to apply knowledge about sustainability and to be able to recognise problems of non-sustainable development. Summarising the international debate, Rieckmann (2018) provides an overview for UNESCO, elaborating on the following key competences:

- Systemic competence
- Normative competence
- Strategic competence
- Collaborative competence
- Foresight competence
- Critical thinking
- Self-reflection competence
- Integrated problem-solving competence

Even though these competences describe skills to recognise unsustainable developments and to gain knowledge for sustainability, without a thematic anchoring they are a collection of sustainability-unspecific skills. The competences could be the job-profile for the chair of a sustainability council as well as for the head of an international leading oil-drilling-company.
Kruse (2013) notes in an analysis that many contributions to sustainability education do not contain a single reference to typically biological terms such as environment, nature or livelihoods and often also refer only abstractly to the outdated three-pillar metaphor of sustainability.
The German Advisory Council on Global Change (WBGU, 2011) proposes a concept based less on competencies and more on content areas. The following is to be achieved:

- an understanding of the Earth systems and the interactions of its components (climate, water cycle, soil, biodiversity, etc.)
- knowledge at the interfaces between engineering, earth systems and social sciences
- a basic understanding of complex systems, such as global environmental problems and transformation processes
- an understanding of how science acquires knowledge.

The findings on planetary boundaries, the identification of global environmental change and also the requirements formulated by the WBGU for knowledge in a participatory knowledge society illustrate the need for a basic understanding of the natural sciences.

3 Fulfilling the promise

3.1 The role of educational programs

In 2002, the UN declared the years 2005–2014 as the UN Decade of Education for Sustainable Development (UN-DESD), which was followed by thousands of educational projects to strengthen education for sustainability. In 2014 the UN launched the Global Action Program (UNESCO, 2014) *"to reorient education and learning so that everyone has the opportunity to acquire the knowledge, skills, values and attitudes that empower them to contribute to sustainable development"* (p. 14). Apart from case studies, there are only a limited number of large-scale, mostly international studies that examine the effects of award and certification programs on a larger scale:

- Hallfredsdottir (2011) was able to show in Icelandic schools participating in an eco-programme that knowledge about environmental issues increased. However, there was no positive effect on the development of sustainability attitudes. Krnel and Naglic (2009) found the same in Slovenian environmental schools.
- Ozsoy (2012) confirms the cognitive effects of participation in the Eco-Schools program in Turkey and was also able to find positive action intentions there.
- Boeve-de Pauw and Van Petegem (2011) studied 50 schools in Flanders, half of them certified as Eco-Schools for many years. These studies confirmed acognitive effect, but could not find positive effects on attitude and behaviour.
- A large-scale study on the impact of a sustainable schools certification programme in Canada showed no effects on learners' environmental behaviour (Legault & Pelletier, 2000).
- Large-scale studies in Sweden (Berglund, Gericke & Chang Rundgren, 2014) observed small positive effects on sustainability awareness in grades 6 and 12 in certified schools, but negative effects for learners in grade 9.
- Bögeholz (1999) found that the influence of school-based environmental education on environmental action is low. Studies on out-of-school environmental education in national parks show partly positive effects on attitudes, knowledge and behaviour among learners (cf. Bogner & Wiseman 2004; Lude 2005).
- Garrecht, Bruckermann & Harms (2018) were able to demonstrate positive effects on decision making competences by students participating in environmental projects.
- Cincera and Krajhanzl (2013) showed that it is not the participation of schools in a certification program that has an impact, but the participation of learners in the respective decision-making processes.

In a nutshell: while some of the studies had positive findings with regard to knowledge about sustainability, the results on changes in attitude and action are less promising–or at least very heterogeneous.

3.2 The role of attitudes to become sustainable

Studies on peoples' environmental attitudes show that awareness of sustainability is now widespread among young people. Young people place environmental and climate protection in the context of other political challenges. Their environmental awareness is very clearly characterised by a global and long-term perspective (UBA, 2019). As a result, many young people consider a fundamental change in the economy and society to be necessary and place the onus here on the state. They expect targeted legal measures from the state to protect the environment. With regard to their own behaviour, they are contradictory: on one hand, they want to act ecologically and be socially responsible. On the other hand, they often do not want to cut back on consumption of for example electrical and entertainment technology (UBA, 2016).
Behavioural changes towards a more sustainable lifestyle are processes that have been extensively studied in the social sciences and also in biology education research (Ajzen & Madden, 1986; Diekmann & Preisendörfer, 1992; Hines, Hungerford & Tomera, 1986; Martens & Rost,, 1998, Schlüter, 2007). Attitudes and knowledge on the respective topics are elaborated as essential characteristics. With regard to sustainability issues, however, a complex picture emerges:

- More than 9 out of 10 Europeans (94%) consider protecting the environment important to them personally, and more than half (56%) of respondents consider it very important (EU, 2017).
- There is also high public support for sustainable action: 93 % of German citizens agree that nature should only be used in a way that safeguards biodiversity and preserves nature for future generations (BfN, 2016).

These results indicate that, at least in Europe, there is already a high level of environmental awareness. People are aware of environmental challenges, they have pro-environment and pro-sustainability attitudes, and they support political action for a sustainable future. The challenge, however, is different: does environmental action follow environmental awareness?
In a representative study, the Germany's Federal Environment Agency (UBA, 2016b) examined people's resource consumption and environmental awareness. The respondents were grouped into different milieus based on their income, lifestyle and values.

Tab. 1. Resource consumption and environmental awareness. Values >1: above average; <1: below average environmental attitudes or resource use.

	Mainstreeam milieu	**Critical creative milieu**	**Low income milieu**
Environmental awareness	0,92	1,20	0,87
Resource consumption	1,01	1,11	0,82

One would expect that a high level of environmental awareness would be followed by a lower consumption of resources. However, the data show a rather negative correlation between environmentally consciousness and environmentally conscious behaviour. From the results it can be deduced that strategies to reduce resource consumption should start in the social milieus of the well-educated middle and upper classes, as the reduction potentials are particularly high there.
However the data show that to reduce resource consumption and greenhouse gas emissions, it is not enough to appeal to responsibility towards the environment (Moser & Kleinhückelkotten, 2018). Obviously, it does not seem to be primarily attitudes, awareness or perceptions that influence our environmental behaviour. The question thus arises: what then should be the goal of education for sustainability?

3.3 The role of knowledge

Environmental topics such as climate change or energy are often entry points for sustainability into classrooms. Surveys show that topics such as climate change and environmental protection have a high priority among the population (see above). At the same time, it is evident that central scientific aspects of non-sustainable developments are hardly understood:

- Lay people have difficulty distinguishing ozone depletion from climate change (Niebert & Gropengiesser, 2014).
- Even science students often consider pollution and acid rain rather than CO2 as the cause of ocean acidification (Danielson & Tanner, 2015).
- Learners usually have naïve ideas about agriculture, they hardly think of industrial, intensive farming (Fröhlich et al., 2013).
- Brämer, Koll and Schild (2010) describe how nature is trivialised by young people as good and the beautiful («Bambi syndrome»). The use of nature is suppressed and denounced.
- Learners struggle to develop effective strategies to reduce human impacts on environmental changes such as climate change (Niebert, 2015).

To make sustainability fruitful and sustainable lifestyles attractive, it certainly takes more than focusing on «simple» knowledge transfer. Kaiser, Roczen and Bogner (2008) were able to show empirically that environmental knowledge has only a small share in environmentally friendly behaviour. However, knowledge for sustainable action becomes effective when the different knowledge areas of system knowledge, action-oriented knowledge and effect-specific knowledge are not addressed individually, but together (e.g. Gresch, Hasselborn & Bögeholz, 2013).

4 Getting ESD out of its dead end

In the last decades educational policies have been striving to make the world a more sustainable place. The evidence presented on this paper shows that creating effective educational programs that enhance peoples' environmental attitudes, awareness, knowledge or behaviour seems to be a complex, yet often unfulfilled promise. But even if we dream the dream to equip people with sustainability competences, fill them with knowledge about earth's radiation budget and increase the ratio of people with pro-environmental attitudes from 93% to 99%, will this save the planet, stop the great acceleration of resource use, keep us within the planetary boundaries and make the Anthropocene become a sustainable epoch?

Studies showing that the richest 10% of the world (us!) consume 20 times more energy than the poorest 10% could be good news for sustainability education: If it is our lifestyle that is ostentatious and wasteful, we have the power to change this. So at least theoretically more environmental conscientiousness could decrease our overconsumption: fewer oversized cars, less meat and less frequent traveller miles for the next holiday trip.

But will this be enough? There is room for doubt, even if we only look at climate change as one of the many sustainability challenges. Have you ever wondered why plane tickets often are cheaper than train tickets – which is regularly the case for example between Zurich and lets say Berlin? While the railway companies need to pay energy taxes, VAT and charges for using the rails, there is no VAT on international plane tickets, no taxation on kerosine etc. Even countries with advanced sustainability policies like Germany spend 57 billion euros annually on environmentally harmful subsidies each year to keep diesel, air traffic and energy consumption cheap. Consider this in light of the fact that the German Federal Ministry of Environment has an annual budget of 2.3 billion euros. Subsidies for fossil fuels cover 548 billion USD and thus are higher than the global expenditures for healthcare (Niebert, 2020). As long as unsustainable technology, lifestyles and behaviour are subsidized by the governments, all pro-environmental behaviour will never become a popular sport but will always be like running against the current.

However the main argument as to why the focus on the individual lifestyle, attitude or consciousness fall short of achieving sustainability goals comes from the recent COVID-19 pandemic. At the height of the pandemic in 2020, with many countries in lockdown forcing people to undergo dramatic changes in their lifestyles, the global CO2 emissions fell by 17% compared to 2019 (Le Quere et al., 2020). This drop seems tremendous; the emissions were temporarily comparable to 2006 levels. But given that by 2050 we must have reduced our CO2 emissions by 95% to stop the climate crisis, these reductions give an idea how much deeper emissions cuts need to go than the lifestyle changes possible by individual people. If dramatic personal restrictions, like no more holiday flights, much less business travel, people working in homeoffice, pop-up bike lanes etc. in all major cities lead to just 17% emission cuts, it becomes obvious that the big steps to achieve a more sustainable world are not personal but systemic and thus political ones. 70% of the world's greenhouse gas emissions do not lie in the hands of individuals, but in the hands of 100 fossil fuel producers like ExxonMobil, Shell, BHP Billiton and Gazprom (CDP, 2017). The transformation into a sustainable epoch is a political task.

A look into the history of sustainable development underlines this argument. Stopping the depletion of stratospheric ozone, abandonment of nuclear power in more and more countries, and improvement of air quality in Europe – all

major ecological challenges have not been solved by individual behavioural changes or by "ecologically responsible" consumption, but by political decisions (Niebert, 2019). After all, it is not individual renunciation of CFC-containing deodorants, not individual switching of the electricity provider from nuclear to green electricity and not our individual decision to buy an electric car instead of a fossil-fuelled car that solve global environmental problems.

Here education for sustainability could have an important contribution, as political decisions for sustainability needs citizens' support in democratic societies. But at which grain size is knowledge needed? Do we need to understand the radiation budget, the electron transport chain in photosynthesis, transpiration coefficients or even the absorption spectrum of CO_2 in order to meet the planetary load limits? Not necessarily. What is important, however, is at least a basic understanding of the fundamental concepts of global environmental change. Bord, O'Connor and Fischer (2000) have shown that misunderstanding environmental changes and their causes leads to a decline in public support for a committed environmental policy. If, for example, climate change is attributed to the *ozone hole*, and this hole is closing, why should climate protection still be pursued? The same applies to agriculture. As long as naïve notions of agriculture dominate public consciousness, nitrogen and phosphate pollution resulting from industrial agriculture and factory farming will retain political legitimacy. Thus, at least a basic understanding of sustainability-related issues is probably less important in terms of personal choices and more important in terms of enabling political participation (O'Connor et al., 1999).

Empirical findings from both educational research and ecology show that a sustainable lifestyle can be the goal of education for sustainability. However, as the empirical findings shows that people already have a high sustainability consciousness and that the possibility *and* influence of personal behaviour changes are limited. An education aiming in these directions seem to be stuck in a dead end. More important for the improvement of environmental quality, then, are politically set guard rails, such as climate targets or upper limits for the use of fertilisers. Here education can contribute by strengthening the political participation of learners and enabling them to question the mechanisms that have led to an overload of the planetary boundaries and to point out alternative courses of action. As such, education should not be missunderstood as an instrumentalisation, but rather as a means to open the mind and empower learners to reflect on the mindsets, frameworks and concepts underlying an unsustainable economy and society. Education for sustainability should enable and encourage students to question these mechanisms in order to make a sustainable Anthropocene conceivable. With this interpretation, it stands in the tradition of enlightenment and emancipation in its best sense.

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