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Ecological sustainability in Austrian and British geography textbooks

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Abstract

This paper discusses and compares the thematic representation of ecological sustainability in the frame of education for sustainable development (ESD) in British and Austrian lower secondary geography textbooks. Two textbook series from each of the two countries have been selected and analyzed by using a qualitative content analysis. The findings suggest a topical focus of the Austrian textbook series on the subject of agriculture in connection to resource use, whereas the British sample emphasizes topics related to the Earth's service function (Maude, 2014). The British textbooks offer a problem-based and contextualized approach to topics related to ecological sustainability, which corresponds to ESD claims. The Austrian textbooks, on the other hand, provide neither sufficient reference to geographical content knowledge regarding climate change and global warming, nor enough contextual information to facilitate a comprehensive understanding of ecological sustainability issues. Both textbook series reveal shortcomings with regard to addressing learners' experience realms, and fail to establish a connection between consumer behavior, production processes and associated negative repercussions on climate and the environment. Finally, all textbooks demonstrate a lack of pluralistic, and in particular ecocentric, views.

Keywords: Ecological Sustainability, Geography Textbooks, Education for Sustainability Development (ESD), Ecocentric Education, Planetary Boundaries Framework

1. Introduction

This paper compares the thematic representation of ecological sustainability in Austrian and British lower secondary geography textbooks. Education for Sustainable Development (ESD) has become a guiding principle in education policies, promoted by the United Nations through a variety of different programs. An important aim of ESD is to encourage students to take action in order to facilitate future development that considers environmental quality, social equity, and economic prosperity (Lambert and Morgan, 2010). Robertson (2014) takes up this idea and

speaks of the so-called "triple bottom line" (TBL) or the "three Es", whereby the ecological dimension plays a leading role. The first "E" (environment) refers to the conservation and restoration of habitats and ecosystems. The second "E" (economics) states that resources should be distributed fairly and equitably. The third "E" (equity or social equity) includes free and equal access to food, water, work, education and health care. Equity is also about intergenerational concerns – the awareness that our decisions will have an impact on future generations. The three Es concept is similar to the three Ps (People, Planet, Profit) approach, which has become popular under the contemporary green economy – combining business strategies with sustainable development (Miller, 2020). The three dimensions are not only interdependent, and there are debates whether they should be considered equally important or not (Corsten and Roth, 2012). Öhman and Öhman (2012), who analyzed how the three dimensions were established in upper secondary school practice in Sweden, showed, for example, that students interpret SD from a harmony perspective. Tensions between the different dimensions were not probed.

However, ESD in formal education has encountered major critics. First, Kopnina (2020) has noted that sustainable development and ESD are mostly taken for granted, and remain unquestioned. Second, SDG 8 promotes decent work and economic growth (UNESCO, 2015), but the growth paradigm is highly contested, since it is leading to and being the reason for continuous and unsustainable use of non-renewable resources, biodiversity loss and environmental destruction (e.g. Hickel, 2020; Washington, 2018). Already back in 2015, Huckle and Wals (2015) highlighted that the UN Decade of Education for Sustainable Development failed to challenge neoliberalism as a hegemonic force blocking transitions towards real and genuine sustainability. Third, Indigenous ecological knowledge and practices are generally lacking in school curricula and higher education worldwide (Stastny and Kowasch, 2022). Although they provide a more holistic approach to education, and promote a harmonious and spiritual relation with nature, they are often seen as superstition (Black, 2017). Fourth, Gusmão Caiado et al. (2018) conclude that greater effort is necessary to change consumption standards and more sustainable production. Fifth, critical scholars such as Kahn (2010) or Bonnett (2007) have highlighted that social and economic priorities are being taught at the expense of ecological considerations.

To investigate the role of the ecological dimension of sustainable development, we have conducted a qualitative content analysis of selected Austrian and British geography textbooks. We ask how topics related to ecological sustainability such as agriculture, energy, marine pollution, and biodiversity are addressed. Are the topics sufficiently contextualized and does the thematic representation reflect ESD claims and criticism?

2. Theoretical background: interdependence, ecological sustainability and ecocentric education

2.1. Sustainability and the Concept of Interdependence in School Geography

To foster ESD in school geography, the subject needs to attend to its parent academic discipline to convey content knowledge. In the case of geography, this implies the possibility of drawing from two branches, human and physical geography, which is particularly important in order to enable learners to develop a profound understanding of human-environment interactions. Since "sustainability concerns the global, long-term impact of our practices, relationships, and institutions because we live in a connected world" living sustainably requires "to act with an expansive temporal and geographic awareness" (Thiele, 2013, p. 3). Therefore, the concept of interdependence plays a key role for geography education, since it refers to thinking about the world "as networks of social relations where the things happening can only be understood fully by looking elsewhere-looking outwards as well as inwards" (Lambert and Morgan, 2010, p. 111). Kowasch (2017, p. 52) points out that "questions of sustainability must be fully contextualized and linked to content-knowledge".

2.2. Anthropogenic environmental damage and climate change

Ecological challenges are omnipresent and pressing matters in the age of the Anthropocene, which refers to a period of time during which human beings have changed natural processes in a dynamic, long-term, and irreversible way (Zimmermann, 2016b). Rockström et al. (2009), Steffen et al. (2015), and Richardson et al. (2023) have tried to identify the world's most problematic and severe environmental challenges in their planetary boundaries framework, which has attracted considerable scientific and societal attention, inspiring governance strategies and policies at all levels. The concept can be seen in the continuity of the Club of Rome's first publication Limits to Growth in 1972, which addressed the interdependence between the Earth's capacity and development. The report predicted that "global ecological constraints (related to resource use and emissions) would have significant influence on global developments in the twenty-first century" (Meadows, 2004). The planetary boundaries framework today defines a "safe operating space" for nine Earth system processes, in which sustainable human development is possible without destabilizing the Earth system, and calls for more deeply integrated modelling of Earth systems (Steffen et al., 2015). If the defined boundaries were to be surpassed, because of continued anthropogenic perturbation, this "could inadvertently drive the Earth system to a much less hospitable state" (Steffen et al., 2015, p. 737). Climate change has been labelled the greatest challenge of the 21st century. For climate change, the authors (ibid, 2023) retained the boundary of 350 parts per million (ppm) CO_2 with the zone of increasing risk ranging from 350 to 450 ppm before reaching high risk. This corresponds "approximately to a range of global mean surface temperature rise of 1° to 2°C (assuming mainstream scenarios on non-CO2 forcing)" (ibid, 2023, p. 2). Currently, the estimated atmospheric CO2 concentration is 417 ppm, which is well beyond the safe operating space.

Although the ramifications related to climate change are expected to be regionally diverse, several globally significant threats have been identified. Amongst these are the melting of Arctic ice and a rise in sea level. This will result in higher risks of flooding, especially in deep-set coastal regions. Extreme weather events, such as hurricanes, mudflows and wildfires, are also expected to occur more frequently (Zimmermann, 2016b, pp. 29-30).

Concerning the planetary genetic diversity, Rockström et al. (2009, p. 3), referring to Ceballos et al. (2015), highlighted that the current rate of species extinctions is estimated to be "at least tens to hundreds of times higher than the average rate over the past 10 million years", and the rate is still accelerating. Around 1 million of an estimated 8 million plant and animal species are threatened with extinction (Brondizio et al., 2019), and over 10% of genetic diversity of flora and fauna may have been lost over the past 150 years (Exposito-Alonso et al., 2022).

In addition to climate change and biosphere integrity, the boundaries for biochemical flows, comprising phosphorus and nitrogen flows mainly originating from fertilizers and industrial sources, have been largely crossed so that the flows represent a very high-risk scenario. The nutrient flows have both effects on ecosystem composition and long-term Earth system effects.

2.3. Ecological sustainability and eco-centric approaches

Many scholars agree that sustainable development rhetoric is largely anthropocentric and economy-centric (Bonnet, 2007; Sutton, 2007; Kopnina, 2020). According to Sutton (2007, p. 133), sustainable development often fails to give an "overt reference to the natural environment" and is "anthropocentric rather than ecocentric". Eckersley (2002) has distinguished the ecocentric approach, described as deep green perspective approach, from environmental pragmatism (defined as shallow ecology), suggesting that both need to be clearly articulated so that they both can communicate to find solutions in the face of global environmental changes.

As established before, the concept of sustainable development comprises three dimensions. There are, however, different views with regard to whether or not a hierarchy

between these three categories should be established (Zimmermann, 2016a). For the purpose of this paper the following model of the dimensions of sustainability will be used (Figure 1).

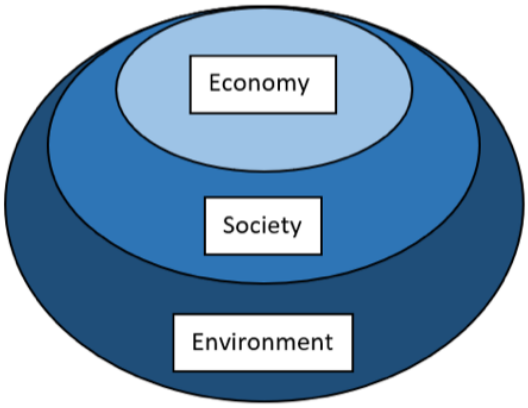

Figure 1. Dimensions of sustainable development
Source: adapted from Zimmermann, 2016a.

The model suggests that the economic dimension of sustainable development is embedded in a social and environmental context, which goes in line with Raworth's (2017) concept of Doughnut Economics. This concept states that human needs can be met in a zone that is confined by a "social foundation" which refers to an "ecological ceiling" which marks the Earth's limited capacity and should not be surpassed, since this would lead to "planetary degradations such as climate change and biodiversity loss" (Raworth, 2017, p. 10-11). Similar to Raworth's concept that views the environment as an "ecological ceiling" (2017, p. 10-11), this paper's model perceives the ecological dimension as an existential foundation. By considering the ecological dimension as an existential foundation, ecological sustainability can be defined as "the maintenance into the future of the environmental functions that support human life and human welfare" (Maude, 2014, p. 48). According to Maude (2014, p. 47-48) the environmental functions can be summarized as follows:

- The extraction of raw materials from the natural resources of soil, water, forests, minerals and marine life (the Earth's 'source' function).
- The safe absorption (through breakdown, recycling or storage) of waste and pollution (the Earth's 'sink' function).
- The provision of the environmental services that support life without requiring human action, such as climatic stability, biodiversity, ecosystem integrity and protection from ultraviolet radiation (the Earth's 'service' function).
- The intrinsic recreational, psychological, aesthetic and spiritual value of environments (the Earth's 'spiritual' function).

Maintaining these functions is the essence of ecological sustainability. The definition of ecological sustainability and the corresponding four environmental functions, as well as environmental damage and climate change caused by human interference in the Earth system, will henceforth serve as the basis for our textbook analysis.

2.4. Education for sustainable development, emotions and ecocentric education

Wals (2011) and other scholars (e.g. Sund and Lysgaard, 2013; Kowasch and Lippe, 2019) highlight the controversy on the strategy of ESD that aims to lead to a behavioral change in students according to prescriptive actions, referred to as the instrumental approach. Referring to the UNESCO (2017, p. 7), ESD is supposed to enable individuals to become "sustainability change makers", by acquiring the necessary knowledge, competences, values and attitudes that will lead them to participate in "moving their societies towards sustainable development". Vare and Scott (2007) described this approach as ESD 1, education "for" sustainable development with obvious ethical objectives. It has been argued that this approach "contradicts the very foundation of education and borders indoctrination", since education should focus on "capacity building and critical thinking" (Wals, 2011, p. 179). While ESD 1 inhibits an instrumental character, ESD 2 can be described as education "as" sustainable development, highlighting an emancipatory approach (Vare and Scott, 2007). According to Wals (2011, p. 179), this emancipatory approach enables students to "critique, construct and act with a high degree of autonomy and self-determination". However, Vare and Scott (2007)

perceive ESD 1 and 2 as complementary, not as contradictory. Both are important to prepare for transition and more sustainable futures.

Since ESD has evolved, in France for example, the paradigm has shifted from ESD towards the Education for the Anthropocene, including concepts such as *Buen Vivir*, transitions, green economy or climate emergency (Barthes, 2022b). This postulate is accompanied by the idea of the uncertainty of a future world in an Earth system whose resources are finite and where human responsibility is more than ever engaged. The education for the Anthropocene movement has the merit of taking planetary boundaries issues out of the realm of the established institutional policies of sustainable development, and moving on to more complex and resolutely political forms of education. Therefore, it has connections and intersections with sustainability sciences (e.g. Leal Filho, 2018), environmental humanities (e.g. Blanc et al., 2017) or political ecology (e.g. Robbins, 2019). Citizen participation in political dialogue and youth climate engagement and activism (Kowasch et al., 2021) becomes important for scientific culture, translated by the foundation of scientists for future, representing an essential element of the education for the Anthropocene movement. Vare et al. (2019) propose an RSP (Rounder Sense of Purpose) framework comprising ESD competences and activities, reflecting a constructivist pedagogy. The framework mainly promotes a holistic approach to ESD and fosters holistic principles to sustainability.

In Austria and many anglophone countries such as Australia, UK or the US, transformative learning has emerged as a new leading concept in sustainability education. Against the background of the transgression of planetary boundaries and the danger of reaching global tipping points (Richardson et al., 2023), sustainable transformations of human societies are of utmost importance (Grund et al., 2024). While Mezirow (2000) is considered to be the founder of transformative learning theory, Nohl (2015) links the theory to discourses on education, and Ball (1999) wrote the first empirical study of transformative learning in the context of sustainability (cited in Grund et al., 2024). Emotions and values are important elements of both civic engagement and school education. Durkheim (1992) noted that children learn more at school than content knowledge provided by school curricula, referring to discipline aims and to a system of moral education that produces a given value system (see also Barthes, 2018). In this context, Kowasch and Lippe (2019, p. 1069) add that prevalent existing moral paradigms revolve in most western countries "around different variants of economic growth" (Kowasch and Lippe, 2019, p. 1069). Although the economic growth paradigm is included in the Sustainable Development Goals (SDGs), several scholars argue that economic growth and sustainability are contradictory and that the growth paradigm is the source for biodiversity loss, climate emergency and global environmental damage resulting from increased consumption of natural resources (e.g. Kallis, 2018; Kopnina, 2020; Washington; 2018). Kopnina (2020, p. 286) therefore criticizes ESD for prioritizing "economic measures concerning poverty alleviation, health improvement but which do nothing to slow growth in population and consumption". She argues that this approach to ESD leads to an "economy-centered and anthropocentric bias of sustainable development" (ibid, p. 287).

An alternative to the dominant forms of ESD "can be summed up under a broad umbrella of ecocentric education" (Kopnina, 2020, p. 284; see also Shrivastava, 1994), which includes for example the concepts of critical pedagogy (Kahn, 2010), ecopedagogy (Toro, 2016), deep ecology (Naess, 1989) and eco-citizenship (Sauvé and van Steenberghe, 2015). The idea of eco-citizenship leads to a more integrative engagement, which goes further than environmental and climate activism. According to Kopnina (2012, p. 242), for ecocentric activists, the rights of non-human species have the "same moral imperative as the earlier social movements to liberate slaves, women, homosexuals and other 'minorities' from dominant hegemonies". Kahn (2010) argues that eco-literacy and critical pedagogy thus have the capacity to challenge mainstream anthropocentric worldviews. They also support problem-based learning approaches and consider pluralistic views on various topics (Hofmann, 2015; Kopnina, 2020). The Chart of Ecopedagogy

(Gadotti, 2000) also highlights a form of Earth citizenry that should lead to harmonious relationships with other living forms on the planet and with nature. The 10 points of the Chart also state that humans are part of the evolving and living planet, and promote a new way of governance, based on decentralization, participation and cultural diversity (see also Toro, 2016).

3. Case study and methods

3.1. Selection of textbook series

Textbooks play an important role in determining the lesson content and information conveyed to students. As suggested by Bagoly-Simó (2013, p. 60) textbooks "mirror curricular requirements very precisely" and can therefore be viewed "as key indicators of top-down implementation". Referring to Meadows (2020, p. 88) geography is the "science for sustainability" since it "has a distinct advantage in developing a more holistic understanding of global environmental challenges". Therefore, geography education can help learners to understand complex issues of sustainability and promote critical thinking (Freire, 1985; Barthes, 2022a). Thus, geography textbooks are our starting point for examining the thematic representation of ecological sustainability in formal education The sample for the qualitative content analysis comprises three lower secondary geography textbooks from Austria and the UK. In England, the geography national curriculum was launched in 2014, the discipline is a statutory subject throughout key stages 1-3 (ages 5-14). Scotland, Wales and Northern Ireland have devolved education systems. They have their own curricula and processes of review. Therefore, this study focuses on England (The Geographical Association, 2025). Austria has a unique approach of combining the discipline of geography with economics. Both countries, England and Austria, have national curriculums, students thus follow the same curriculum. Both also have in common that they place sustainability at the nexus of geography education. The Geographical Association of the UK noted that five organizing concepts for geography have been recognized in its framework (time, scale, diversity, interconnection and interpretation), and were linked to four geographical key concepts summarizing aspects of geographical knowledge and understanding (place, space, earth systems and environment). Although sustainability was not mentioned, the concept appears in the connection of interpretation and environment, arguing that approaches to environmental issues and differing interpretations of sustainable development should be made by students (Department for Education, 2014). In Austria, service provision and sustainability is one of eight key concepts in geography at lower secondary school level, introduced with the new curriculum in 2024. The key concept underlines that the perspective of sustainability is important for productivity, and that no more resources should be consumed than can be regenerated in order to preserve them for future generations. Sustainability measures should include ecological considerations, economic, individual and social aspects (BMBWF 2024a, BMBWF, 2024b).

The aim of this study is to compare textbooks from two European countries with national curricula, with sometimes similar but also different approaches to geography education. The selection of Austria and England was also guided by the authors' common language skills. The two textbook series (Fridrich et al., 2014a, Fridrich et al., 2014b and Fridrich 2016 for Austria, and Weatherly et al., 2014, Weatherly et al., 2015a and Weatherly et al., 2015b) were selected because all volumes were published in the short period between 2014-2016, they consist of roughly the same number of pages, and they target secondary school students between 11-14 years. Although the textbooks were published some years ago, they are still in use, with updated issues. While a new curriculum for lower secondary schools was introduced in Austria in 2023/24, the old curriculum will still be in use for grade 4 next year. We have selected the two textbook series that are based on the old curriculum, because they account for a high degree of comparability. Nevertheless, since the analysis only involves one textbook series from each country, the study is not representative. With the new curriculum in Austria, new textbooks are being published and will replace the old series. Thus, the present study should be updated in the future.

Main Category and Definition	Example	Subcategory
A: Natural (Re)Sources = "The extraction of raw materials from the natural resources of soil, water, forests, minerals and marine life" (Maude, 2014, p. 47).	"A country that is heavily reliant on the import of energy sources, or one that is reliant on non-renewable sources, could be described as energy insecure because they do not control access to these resources and are vulnerable to sudden interruptions in supply or price increases" (Weatherly et al., 2014, p.49).	1. Agriculture 2. Non-renewable resources 3. Renewable resources 4. Energy
B: Waste and Pollution = "The safe absorption (through breakdown, recycling or storage) of the wastes and pollution produced by production and human life" (Maude, 2014, p. 47).	"Waste products, which can be reused, are purchased by recycling companies" (Fridrich et al., 2014b, p. 54).	1. Transport 2. Production 3. Mass- consumption 4. Maritime pollution 5. Recycling
C: Environmental Services = "The provision of the environmental services that support life without requiring human action, such as climatic stability, biodiversity, ecosystem integrity and protection from ultraviolet radiation" (Maude, 2014, p. 47).	"In addition, as ski runs and pistes are developed and added to a resort, so the species diversity and richness of trees, flowers and birds decreases" (Weatherly et al., 2014, p.119).	1. Biodiversity 2. Ecosystems 3. Land-system change 4. Climate change 5. Global warming

Table 1. Textbook sample. Source: authors' elaboration.

3.2. Categories for content analysis

Mayring's (2015) technique of structuration, a deductive method to establish categories, has been employed to conduct a qualitative content analysis of the respective geography textbooks. The following main categories have been adapted from the environmental functions concept (Maude, 2014). The subcategories are deductively derived from the theoretical chapters on anthropogenic environmental damages and climate change. In addition, to account for a more comprehensive depiction of which aspects the individual categories include, examples from the textbook series, which correspond to each main category, have been selected and are presented in Table 1.

3.3. Methods of Analysis

We conducted a keyword-based analysis of the textbook spreads, each double page thereby making up one unit of analysis (Kowasch, 2017). In addition to this quantitative approach, which investigates how many spreads deal with the aforementioned main categories and subcategories, we conducted a qualitative analysis. The categories subcategories can either be "mentioned" or "discussed". For a category to be "mentioned," keywords related to it need to be named in a text. The term "discussed" requires for a category to be described, explained or addressed in greater detail for instance in terms of several sentences or a figure. Therefore, the number of categories can surpass the total amount of textbook spreads, which is 165 for the British textbook and 128 for the Austrian textbook series.

4. Findings: different approaches in Austrian and British geography textbooks

The extent and manner by which the individual categories established are addressed, differs considerably in the two textbook series.

The Figures 2-4 demonstrate the representation of the main categories and subcategories in the textbooks. Since the total amount of spreads, i.e. units of analysis, in the British textbook series surpasses the Austrian by 37 units, the results are expressed in relative numbers, to account for a valid comparability.

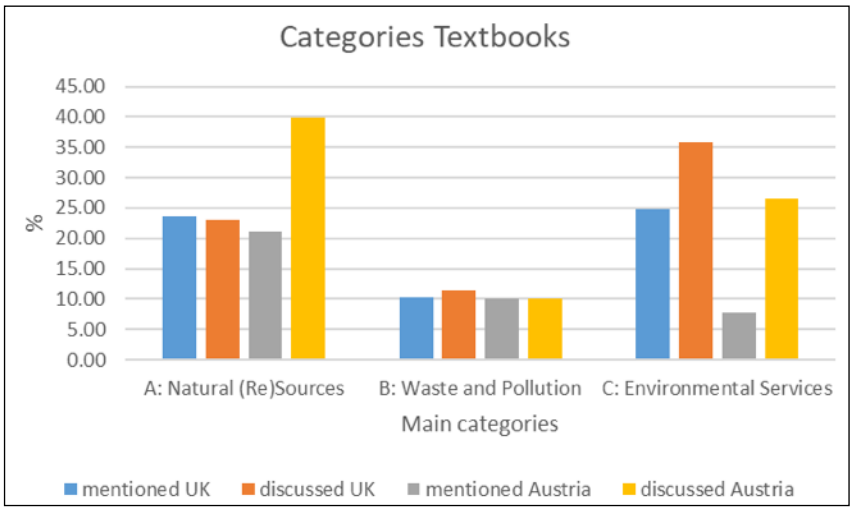

Figure 2. Thematic representation of ecological sustainability in British and Austrian lower secondary geography textbooks. Source: authors' elaboration.

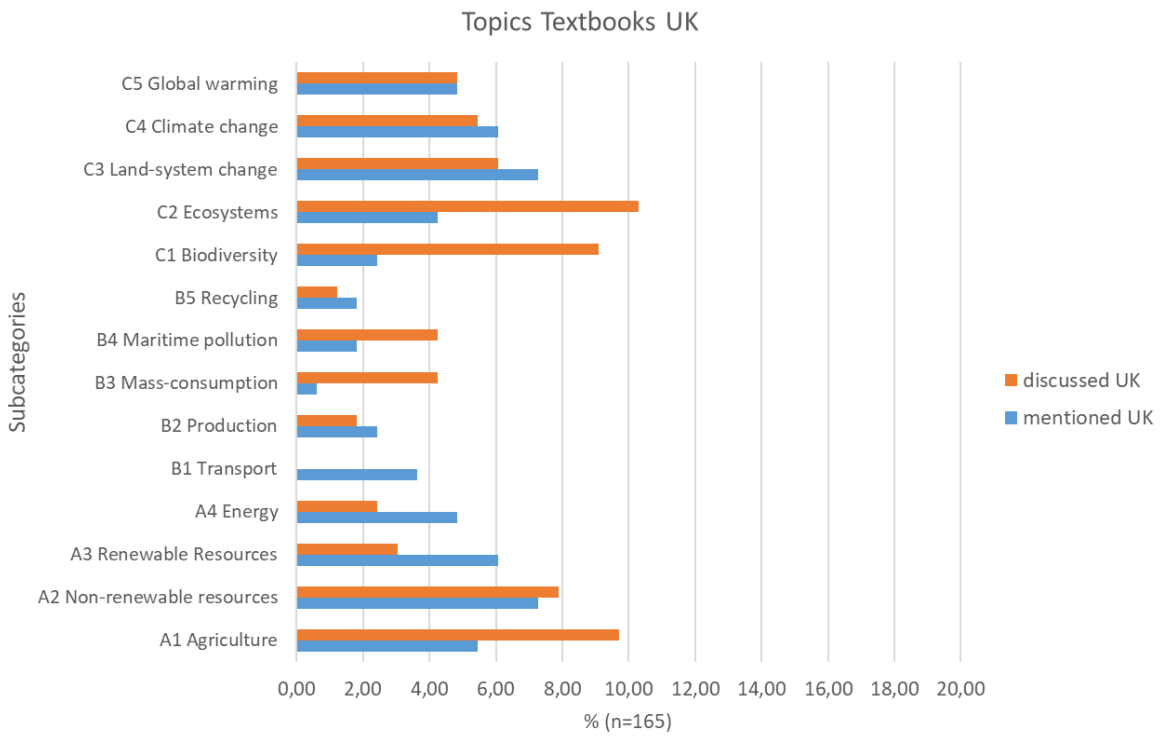

Figure 3. Topics related to ecological sustainability in British lower secondary geography textbooks. Source: authors' elaboration.

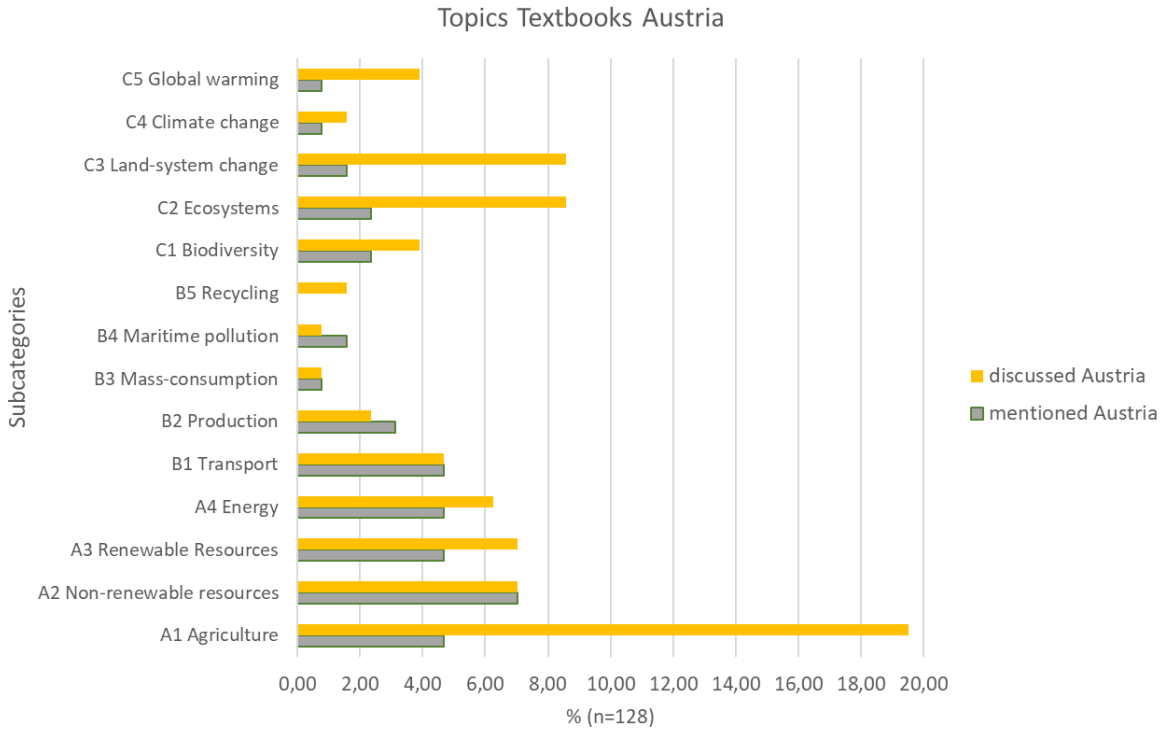

Figure 4. Topics related to ecological sustainability in Austrian lower secondary geography textbooks. Source: authors' elaboration.

The results from the analysis of the main categories reveal that the category of Natural (Re)Sources (A) is most often discussed in the Austrian textbook sample, being discussed in almost 40% of the respective textbooks (Figure 2). This category is almost twice as often discussed in the Austrian textbooks compared to the British ones. In the case of the British textbook series, Environmental Services (C) were the most discussed category. The discussion of environmental services is carried in the course of more than one third of the whole British textbook sample and discussions of this category occur almost 10% less frequent in the Austrian textbook corpus. The figures regarding the second category Waste and Pollution (B) are similar in both countries, being the least addressed main category in both textbook series (Figure 2).

The results of the analysis of the subcategories covered in the two textbook series can account for a more detailed depiction of the topics covered in the British and Austrian geography textbooks. In addition, they help identifying which topics constitute the most to the aforementioned differences in the countries' thematic representation.

Topics related to ecosystems and biodiversity are most often discussed, both in roughly 10% of the British textbook sample. Another category that is addressed in the same degree was agriculture, being also discussed in almost 10% of the corpus. A further aspect to be highlighted is the fact that several subcategories, such as renewable resources, energy and in particular transport are significantly more often mentioned than discussed (Figures 3 and 4).

As previously mentioned, the main category of Natural (Re)Sources (A) is most frequently addressed in the Austrian textbook series. By considering the subcategories which are covered in the respective corpus, topics related to agriculture are by far most often discussed in the context of this main category, as well as the whole corpus. Discussions regarding this subcategory are conducted in

almost 20% of the spreads. Two different subcategories which are also broadly addressed, are land-system change and ecosystems, both being discussed in roughly 8% of the textbooks' units of analysis. As indicated by the results of the main categories, the subcategories of recycling, maritime pollution, and mass-consumption related to waste and pollution are less often addressed, in roughly 2% of the whole corpus.

Relating back to the differences of the two countries' textbook series regarding the main categories it becomes evident that the topic of agriculture is roughly twice as often discussed in the Austrian textbook series compared to the British sample. The difference concerning the main category of Environmental Services (C) stems from the fact that the British textbooks discuss topics related to climate change and biodiversity significantly more extensively than their Austrian counterparts.

5. Discussion: ecological sustainability, contextualization and ESD claims

5.1 Thematic representation of ecological sustainability

The content analysis identified the extent by which the ecological dimension of sustainability is covered in the Austrian and British lower secondary textbooks. Topics concerning the ecological dimension of sustainable development are discussed in roughly 70% and mentioned in nearly 60% (Figure 2) of spreads of British geography textbook series. The selected Austrian textbooks cover topics related to this dimension of sustainable development by means of discussions in over 75% of the spreads and name related terms in nearly 40% (Figure 2). Thus, the thematic representation of both the British and Austrian lower secondary geography textbooks extensively comprises aspects of ecological sustainability. These numbers, however, do neither reflect how the topics related to ecological sustainability are addressed, nor which perspectives and details that are included. They should therefore only be seen as proof that school geography is concerned with the (natural) environment and questions of sustainability, but not in which ways.

5.2 Differences in representation of ecological sustainability

Two major differences between the two textbook series were identified. Firstly, the main category of Natural (Re)Sources is significantly more often discussed in the Austrian sample, exceeding the number of discussions in British textbook spreads by more than 15% (Figure 2). The results from the analysis of the respective subcategories reveal that this difference mainly originates from the high number of discussions regarding agriculture in the Austrian textbooks. In addition, the topic of renewable resources is also more extensively covered in the Austrian textbooks.

In the Austrian textbook series, the topic of agriculture is frequently touched upon and discussed as a central subject, in a global, but predominantly local context. The first volume of the Austrian geography textbook series includes a whole chapter of more than 14 pages which addresses various types of agriculture, such as rice cultivation and livestock farming in an international context (Fridrich et al., 2014a). Moreover, the third volume contains an elaborate and extensive discussion of the primary sector in the context of the Austrian "Großlandschaften" (bioregions) and federal districts.

In contrast, the British textbook series takes a more exemplary approach and mainly focuses on agriculture in the context of land grabbing in Africa (Weatherly et al., 2014). Only occasional references to agriculture are made. Overall, however, the primary sector is not discussed in a local context, which is a clear shortcoming compared to the Austrian textbooks, since students are not equipped with sufficient information about food production systems in their own country.

Secondly, the British textbooks address the third category of Environmental Services more often, surpassing the number of discussions in the Austrian textbook spreads by almost 10% (Figure 2). The British geography textbooks hence discuss topics such as biodiversity, climate change and global warming significantly more elaborately (Figure 3). They make frequent references to negative impacts and causes of the climate crisis on a global scale. The second volume of the British textbook series outlines how climate change might alter the Arctic by including an explanation of the albedo effect and the function of the Gulf Stream (Weatherly et al., 2015a). These elaborate explanations and connections to geographical content knowledge can help to foster students' understanding of the intricate and complex climate systems and climate change processes.

The Austrian textbook series, on the other hand, does not include geographical content when discussing the climate crisis. The topic is only rarely and superficially addressed, as can be seen in the following example from the first volume: "Because of climate change the Arctic ice is melting faster" (Fridrich et al., 2014a, p. 47). In sum, there were clear shortcomings regarding sufficient information about climate change and global warming in the Austrian geography textbook series.

5.3 Contextualization of ecological sustainability topics

The first aspect to be considered with regards to the contextualization of topics related to ecological sustainability, is the structure of the geography textbooks examined. Each volume of the British textbook series consists of 6-7 so-called geographical enquiries, rather than conventional chapters. Each enquiry starts alike, by posing a pointed question, such as: "Is fracking a sustainable solution to the UK's energy security challenge?" (Weatherly et al., 2014, p. 42). After providing students with the required knowledge of the questions' topic, they should make judgements and arrive at an informed answer. In the case of the aforementioned enquiry into the UK's energy supply, the textbook first provides information on the oil boom and cohering population growth in North Dakota, continues by presenting the UK's energy mix and moves on by explaining the process of fracking as well as presents alternative renewable energy sources (Weatherly et al., 2014). This step-by-step approach facilitates learners' understanding of sustainability issues related to non-renewable sources of energy and the method of fracking by establishing a connection to illustrative real-life examples and relevant contexts. Another example that encourages learners to evaluate a project by means of sustainability standards revolves around an eco-airport in Osaka. In this case, the textbook provides information on the environmental particularities of the airport's surroundings (Weatherly et al., 2014). Learning about and evaluating this highly contextualized example in the frame of ecological sustainability fosters learners' higher-order thinking skills of analysis and evaluation. In addition, the concept of sustainable development becomes more tangible because it can be applied to a specific example.

The Austrian textbooks that we examined are structured differently, with chapters which are reflective of the thematic objectives expressed in the respective subject curriculum. Each chapter consists of several subchapters that present different aspects of a larger. In terms of contextualization, frequent references are made to real-life instances, however, in a rather brief and superficial manner. Additionally, statements of involved agents, for example, of Indigenous people who describe their viewpoint on the issue of deforestation, are abundantly quoted throughout the volumes. In one case, the headman of an Indigenous community describes the severe problems they are facing because of being robbed of their habitat by investors who claim to have purchased their land from the government (Fridrich et al., 2014a). Statements like these can help students to gain fresh perspectives, in this case on the issue of rainforest degradation, land policies and economic perspectives of environmental management. However, to help students

understand the negative impacts that co-occur with deforestation and to be able to completely grasp the meaning of the issues Indigenous communities are facing, additional contextual information is obviously required. Furthermore, a discussion of the significance of rainforests' ability to absorb greenhouse gases could have added additional significance to the matter, especially in the light of ecological sustainability education. Although the causes of rainforest deforestation, for example the establishment of soy and cocoa plantations are outlined (Fridrich et al., 2014a), they are not connected to consumer behavior nor economic perspectives.

In sum, both textbook series present topics related to ecological sustainability in specific contexts, by including information about individual spatial characteristics. The British textbooks, however, manage to do so in a more elaborate and detailed way, as a consequence of the textbooks' structure which allows for an in-depth investigation of specific real-life instances. The Austrian textbook series, on the other hand, often does not provide enough contextual information to foster students' in-depth understanding of the different perspectives, the interdependence and aspects of certain issues.

5.4 ESD claims and criticism

The content analysis revealed that the effect and to a certain extent also the causes of the climate crisis were discussed in both textbook series (Figures 3 and 4). A connection between climate change and human activities, however, is only rarely, and if so very briefly, established. The British textbook series, for instance, do neither discuss greenhouse gas emissions and pollution in the frame of transport, nor are the merits and drawbacks of different means of transport (e.g. car, plane, train, bus) discussed (Figure 3). The Austrian textbooks include discussions of various issues related to transport (Figure 4), but explicit connections to climate change and global warming are lacking.

Referring to Hofmann (2015) and Kopnina (2020), ESD is supposed to be problem-based, learner-centered, and should consider pluralistic approaches. The British textbook series does not only contextualize various topics, but is also, importantly, an example of problem-based learning. By asking students to answer a concrete question and evaluate a specific issue by weighing its merits and drawbacks, they can acquire problem-solving and critical thinking skills. In addition, this approach puts learners in the shoes of investigators who examine a geographical case and is thus learner-centered and activating. On the other hand, connections between human activities and global environmental changes could be better problematized.

ESD should enable learners to become "sustainability change makers" (UNESCO, 2017, p. 7), or "triggers of change" (Kowasch et al., 2021, p. 11581), and to acquire knowledge about options for action and their respective effects, for instance with regards to consumer behavior (Hofmann, 2015). Both textbook series discuss causes and effects of issues such as climate change, global warming as well as environmental pollution and damage, but make little to no reference to the role of mass-consumption and consumerism in this (Figures 3 and 4). However, in order to achieve the goal of sustainability, a rejection and reduction of mass-consumption as well as an overall economic degrowth are required (Kallis, 2018; Sutton, 2007). Despite that, both textbook series establish no to little interconnection between consumer behavior, production processes and anthropogenic environmental damage.

The dichotomy between production and consumption should be dissolved to help students gain an understanding that their consumption choices can influence production processes. This is an essential part of achieving the goal of sustainability and facilitating students' development in becoming aware of interconnections and (uneven) power relations. It can also enable students to acquire action competence, which is an essential aspect of ESD (Hofmann, 2015).

Lastly, we will discuss how the textbooks deal with ESD criticism and ecocentric education. Kopnina (2020) points out in this regard that ESD is usually economy-centered and uncritical of economic growth (see also

Bonnet, 2007; Sutton, 2007; Hickel, 2020). She suggests that sustainability education should take an ecocentric approach by focusing on the intrinsic value of the environment, drawing on Indigenous knowledge about the human-nature relationship and promoting economic degrowth.

Our study firstly shows that economic perspectives are more frequently employed in both textbook series than ecocentric approaches. In the British textbooks, when discussing energy sources, the focus lies on economic maxims, such as trading relationships, costs and energy security. Non-renewable resources are twice as often discussed as renewable alternatives in the British sample (Figure 3).

Secondly, both textbook series include Indigenous perspectives on nature. In the case of the Austrian textbook series, when discussing the issue of rainforest degradation (Fridrich et al., 2014a), and in the case of the British textbooks, when discussing the topic of adapting to desertification and degraded land (Weatherly et al., 2015b). This ecocentric approach that focuses on ways of adapting to, rather than altering the natural environment, is only taken in the course of these instances, i.e. problematic issues. Indigenous philosophies and ways of thinking about human-nature relationships are not discussed.

Another instance in the British textbook series which takes an ecocentric approach, focuses on an example of successful flood protection measures by means of re-naturalization processes (Weatherly et al., 2015a). Such examples are, however, very scarcely represented in both textbook series, because questions related to ecological sustainability are in most cases considered from an anthropocentric view. Thinking outside of existing economic and societal paradigms goes in line with the nature of holistic principles of sustainability and ESD (Vare et al., 2019) and encourages learners to develop innovative solutions for pressing issues such as the climate crisis and global environmental changes.

Table 2 summarizes the main results of our textbook analysis and its discussion.

Austrian textbooks	**British textbooks**
Natural resources often discussed	Natural resources not as often discussed
Agriculture often discussed, in a global, but predominantly local context	Agriculture less often discussed, and with a more exemplary approach, also referring to landgrabbing
Environmental Services, and Waste and Pollution topics less discussed	Areas such as biodiversity, climate change and global warming more elaborately discussed, but not Waste and Pollution topics
Ecological sustainability in specific contexts, e.g. related to rainforest deforestation	Ecological sustainability in specific contexts, e.g. UK's energy supply
Climate crisis rarely and superficially addressed	More complex and contextualized information related the climate crisis, including negative impacts
Indigenous perspectives on nature are used, but lack of Indigenous philosophies and ways of thinking about human-nature relationships	Indigenous perspectives on nature are used, but lack of Indigenous philosophies and ways of thinking about human-nature relationships
Little interconnection between consumer behavior, production processes and anthropogenic environmental damages; concept of interdependence should be developed	Little interconnection between consumer behavior, production processes and anthropogenic environmental damages; concept of interdependence should be developed, but problem-based learning addressed
More ecocentric and holistic approaches to ecological sustainability are needed (currently main focus on economic perspectives, sticking to economic growth paradigm)	More ecocentric and holistic approaches to ecological sustainability are needed (currently main focus on economic perspectives)

Table 2. Summary of findings. Source: authors' elaboration.

6. Conclusion

Both countries' geography textbooks cover topics related to ecological sustainability extensively, but the thematic foci, however, differ considerably. The main emphasis in the Austrian textbooks is put on local agriculture, whereas the British series emphasizes discussions of topics related to biodiversity, climate change and global warming.

The Austrian textbooks adopt a conventional chapter structure, which is content-wise informed by the former national curriculum. While the British volumes consist of several, so-called geographical enquiries which each investigate one specific subject matter. The structure of the British geography textbooks fosters problem-based learning and learner-centeredness that correspond to ESD claims, and provide more contextual information and geographical content-knowledge for each inquiry. None of the textbook series take ESD criticism into account. Most of the discussions of questions concerning ecological sustainability adopt an anthropocentric and economy-centred perspective and are uncritical of mass-consumption, consumerism, and economic growth.

Therefore, we would like to make five suggestions for improvement. Firstly, the British textbooks need to extend the discussion of agriculture, especially with regard to the local food production. Secondly, the Austrian textbooks could enable more complex discussions on pressing global issues such as the anthropogenic climate crisis by drawing on geographical content-knowledge. Thirdly, the Austrian textbooks could provide more contextual information about local particularities when discussing topics in an exemplary way. Fourthly, both textbook series ought to establish connections between consumer behavior, production processes and their effects on the (natural) environment and climate to help learners develop the concept of interdependence and become aware of their role and impact as self-sufficient consumers. Lastly, all textbooks should introduce diverse and multi-perspective approaches to ecological sustainability, for example perspectives of various agents and parties (politicians, NGOs, enterprises, etc.) involved, as well as consider questions of sustainability by means of the four environmental functions (Maude, 2014) and ecocentric perspectives.

In sum, holistic, controversial and innovative approaches to questions related to ecological sustainability that are relevant for the learners' lives are required. This will aid students in rethinking current societal and economic paradigms in an effort to contribute to more sustainable futures that are cautious of the Earth system's limited capacity.

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