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Encouraging a sense of responsibility among German geography students in the context of Education for Sustainable Development

Robin Felix Schönstein and Alexandra Budke

Institute for Geography Didactics, University of Cologne, Köln, Germany

ABSTRACT

Education for Sustainable Development (ESD) is a central part of the German curriculum across all subjects and school types. Geography, in particular, lends itself well to ESD integration. The aim of ESD is to empower students to take action and practise sustainable behaviour in the classroom. In order to achieve this, students should become aware of their own responsibility, as well as that of other actors, on sustainability issues through geography lessons. This article describes four levels of responsibility (space, groups, sustainability dimensions and time) that should be addressed in geography lessons focusing on ESD. An exploratory qualitative intervention study of two school classes tested the extent to which a differentiated sense of responsibility could be promoted among students through lessons that took these dimensions into account. The results show that the students were able to analyse the actors involved and the consequences of their actions. However, they struggled to perceive their own responsibility in a differentiated way, and to describe the responsibility of other groups of actors. In particular, the students were reluctant to hold the government accountable. The intervention helped the students to become more aware of their own responsibility and that of other groups. Nevertheless, it cannot be said that they developed a differentiated sense of responsibility.

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Education for Sustainable Development; action competence; sense of responsibility; sustainable development; responsible action

1. Introduction

In an era of mounting global challenges, including climate change, social inequalities, and unsustainable practices, it is imperative that our society and each individual learn 'to take informed decisions and act responsibly for environmental integrity, economic viability and a just society, for present and future generations' (UNESCO 2017, 63). The 17 Sustainable Development Goals (SDGs) have been defined to help achieve this, and have been integrated into the curricula of German schools through Education for

CONTACT Robin Felix Schönstein rschoens@uni-koeln.de Institute for Geography Didactics, University of Cologne, Köln 50931, Germany.

Sustainable Development (ESD). ESD lessons are intended to promote SDG4, 'Quality Education', in particular (cf. UNESCO 2017, 18–19). In order to achieve this, ESD must be integrated into the curricula of all school subjects (cf. Federal Ministry of Education and Research 2019, 25). The 'National Action Plan on Education for Sustainable Development' of Germany (UNESCO 2017, 24) therefore emphasises: 'ESD is an overall responsibility of the education system'. In addition, Bazilova et al. (2025, 1) also make it clear that 'all educational institutions will be guided by ESD principles in educating the generation capable of addressing sustainable development issues and possessing necessary important competencies needed to contribute to sustainable future'. Nerveless, there is a particular focus on ESD-related subjects, such as geography. Topics like climate change, global disparities and sustainable urban development lend themselves particularly well to ESD integration (cf. Bazilova et al. 2025, 2; Deutsche Gesellschaft für Geographie e (DGfG) 2020). ESD has therefore become a central aspect of education in Germany, particularly in geography lessons. However, ESD is also viewed critically in research, as it is prescribed in a top-down approach at the level of educational policy and, due to its normative approach, it quickly leads to attempts to persuade or pressure students to behave more sustainably (cf. Gryl and Budke 2016, 66). As a result, ESD was created with a theoretical deficit from the outset (cf. Leder 2015, 138). To this day, ESD remains a catch-all term that is anchored in many curricula, but there is no evidence of systematic implementation (cf. Wolff et al. 2025, 20). With its clear action goals, ESD can also become a political educational tool that conveys a utopian ideal of feasibility and only aims to change the behaviour of individuals (cf. Gryl and Budke 2016, 65–66). Furthermore, ESD struggles with the problems that it often focuses too much on the ecological aspect and that western capitalist views of development are conveyed as the ideal (cf. Warienius 2022, 151–152). Didactic research must therefore address how ESD can be properly implemented in the classroom.

Therefore, a central goal of ESD must be to promote students' ability to take action (Sass et al. 2023, 2). Sustainable action is therefore described as an essential component of all key ESD models, including de Haan's 'Gestaltungskompetenz' (2010, 320) and the European Commission's GreenComp conceptual reference model (Bianchi, Pisiotis, and Cabrera Giraldez 2022, 3). The ability to act is closely linked to students' sense of responsibility. On the one hand, they must learn to take responsibility for their own actions in the past and present and, on the other hand, to take responsibility for the future development of our planet (cf. Holzbaur 2020, 5–8). This means that the possible future consequences of current decisions must also be anticipated and assessed. However, the topic of a sense of responsibility and the assumption of responsibility has so far been little investigated in relation to the willingness to act and decision-making in the context of ESD in geography lessons and has so far played a minor role in the German discourse on ESD. Although the normative approach to responsibility in curricula has been criticised and the danger of excessive demands and moralising has been addressed (cf. Diedrichs and Wittau 2023, 91), the sense of responsibility in ESD itself has hardly been studied to date. It is therefore not yet known whether and to what extent students are aware of their own responsibility and the responsibility of other actors. A lack of or undifferentiated sense of responsibility could be a reason for a lack of sustainable action (cf. Portus et al. 2024, 847). In this context, an undifferentiated sense of responsibility means that students are not aware of all the actors

involved and the consequences of their actions, and are therefore unable to decide who bears responsibility and to what extent (cf. Schmiedl-Neuburg 2017, 208; 219). In order to promote students' sense of responsibility in a targeted manner, methodological approaches for ESD lessons are therefore needed, the effectiveness of which has been empirically researched. However, teachers have hardly been supported in teaching students the skills needed to assess their responsibility for sustainability problems, and to decide what responsibility they want to take on and where their responsibility ends, in ESD lessons. The 'Pathway to students' sense of responsibility in ESD' (see Figure 1), presented in this article, was designed to help teachers promote this in a targeted manner. The pathway was also trialled in a qualitative intervention study with two school classes. The study aimed to answer the following research questions:

1. To what extent are students aware of their own responsibility and that of other actors in the context of sustainability issues?
2. To what extent does the intervention with the 'Pathway to students' sense of responsibility in ESD' (see Figure 1) change students' sense of responsibility?

2. Theoretical background

2.1. Acting in ESD

Current global conditions, and the resulting sustainability issues, are not random developments, but rather the consequence of human actions. In human geography, geographical spaces are viewed as man-made constructions. Based on this understanding, action-oriented geography views spaces as changeable. Werlen (2000, 13) describes this approach as 'doing geography'. Therefore, people worldwide must react to current problems such as climate change and positively influence our future. With regard to ESD problems in particular, it is important to understand them as consequences of actions and, at the same time, to look for ways to solve them. This creates a cycle of actions and consequences that require new actions (cf. Werlen 2017, 138). Dewey describes this cycle as 'continuity of experience' (Dewey 1938, 25–26). ESD lessons must convey this complex understanding of actions and consequences in order to effectively promote students' ability to act. The aim should not be the uncritical adoption of simple behavioural changes, such as buying organic products. Instead, students should be encouraged to think critically, develop their own sustainable ideas and take action to promote sustainability at school (cf. Sinakou, Donche, and Van Petegem 2022, 9–11). Vare and Scott (2019, 3) refer to this as 'learning as sustainable development' (ESD2). A similar approach is evident in transformative education. It pursues an 'emancipatory intention' through ESD, aiming to make students 'capable of criticism and action' so they can 'take paths to overcome heteronomy' (Schreiber and Nöthen 2023, 2). This concept of action competence is present in all key ESD models (cf. Bianchi, Pisiotis, and Cabrera Giraldez 2022, 3; De Haan 2010, 320; UNESCO 2017, 10). In addition to didactic science, the importance of action is reflected in German curricula and syllabuses (cf. Ministerium für Schule und Bildung des Landes Nordrhein-Westfalen (MSB NRW) 2019, 14). Furthermore, the German educational standards for geography describe action as one of six core competencies (cf. Deutsche Gesellschaft für Geographie e (DGfG) 2006, 26–29). Therefore, it can be

concluded that there is a consensus among scientists, educators and policymakers that a central goal of ESD is to enable students to critically evaluate actions and consequences, and to take action to solve sustainability problems.

Nevertheless, actions are rarely implemented in ESD lessons (cf. Chaplin and Wyton 2014, 406). Many students recognise the importance of sustainability issues (cf. Mulder et al. 2015). However, action to solve these problems is rarely taken (cf. Mulder et al. 2015; Zulauf and Wagner 2021, 2). The difference between one's values and attitudes, and the implementation of action, is known as the 'value-action gap' (Chaplin and Wyton 2014, 406). There are many possible reasons for this. One reason may be the students' lack of action skills, which are not communicated by teachers (Sass et al. 2020, 299). Another reason is that teachers do not design ESD lessons in such a way that they 'refer to students' conscious participation in action aiming to solve SD related problems' (cf. Sinakou, Donche, and Van Petegem 2022, 2). Additionally, aspects such as motivation, willpower and willingness to act must be intrinsic to the students. Furthermore, structural barriers, social norms, costs and time constraints can prevent students from taking sustainable action. Another important motivator for students to overcome the value-action gap and become sustainably active is their sense of responsibility (Portus et al. 2024, 847).

2.2. Responsibility in ESD

To date, the sense of responsibility of students in the context of ESD and how it can be promoted in the classroom has hardly been investigated. Nevertheless, the term 'responsibility' is used excessively in connection with ESD. For example, in the German 'Framework for Global Development Education' (Ständige Konferenz der Kultusminister der Länder in der Bundesrepublik Deutschland (KMK) 2016), the term is used 91 times in the context of ESD. The great importance of responsibility and students' sense of responsibility is due to the fact that it is a central factor that can potentially strengthen their willingness and desire to act sustainably (cf. DiGiuseppe et al. 2019, 142).

The concept of responsibility is part of a geographical discourse on 'moral geography' (cf. Smith 2000). Responsibility cannot be viewed in isolation from moral contexts. Responsibility is therefore not a fixed characteristic of an individual, a group or a system, but is always dependent on the social environment, institutional structures and cultural discourses. Responsibility must be understood as a social construct and a moral idea. Especially when it comes to complex sustainability issues, responsibility remains a complex construct that cannot be objectively measured or quantified.' Responsibility can be defined as an actor taking responsibility for the consequences of their actions in relation to an applicable norm' (Heidbrink 2017, 5). With regard to sustainable development, responsibility involves making decisions in a way that can be justified to others from an ethical perspective (cf. Holzbaur 2020, 22). UNESCO (2021) describes this as follows: 'ESD enables learners to make informed decisions and act responsibly […] by imparting knowledge, skills, values, and attitudes.' Responsibility can give rise to the motivation to act in a way that has positive consequences (cf. DiGiuseppe et al. 2019, 142). Conversely, in ESD, responsibility can also be understood as taking responsibility for the future consequences of current actions. Nikel (2007, 545) distinguishes between 'having responsibility' and 'taking responsibility'. An actor is directly responsible for the consequences of their actions and therefore obliged to act sustainably. However, they

can also take responsibility for the actions of others to achieve a higher future goal, such as sustainability. Therefore, responsibility refers both to the creation of a sustainability problem and to its solving. Heidbrink (2017, 5) describes this as 'the tension between culpability and responsibility'. When the responsible party fails to take responsibility, as is often the case with companies and governments, society must encourage them to change their behaviour (cf. Samardzic and Marjanovic 2021, 6).

As shown, German definitions of responsibility mostly focus on the individual. The aim is to make the behaviour of individuals, and thus society as a whole, more sustainable. The pervasiveness of moralisation in society means that responsibility is primarily viewed in relation to the individual and the consumer (cf. Ermann and Redepenning 2010, 5). However, this view is problematic because it disregards the responsibility of companies, governments and social groups. A survey of 844 sustainability experts from 72 countries revealed that national governments, institutional investors, and private companies, in particular, are not fulfilling their responsibility for sustainable development (The Globescan/ERM Sustainability Institute Research Program 2025, 4). Students' sense of responsibility must be understood as responsibility as a social construct that does not only refer to their own responsibility.

In ESD lessons, care must be taken to ensure that a sense of responsibility does not become a burden for students. A global study by Hickmann et al. (2021, 863) has shown that 'climate anxiety […] are widespread in children and young people in countries across the world and impact their daily functioning'. Taking on too much responsibility can lead to feelings of hopelessness and pessimism. Thus could paralyse action. At the same time, a certain degree of responsibility can also increase motivation to act and trigger feelings of hope and optimism (cf. Nikulin 2021, 39–40). Ojala (2017, 82) showed in a review of theories and empirical studies that hope is 'a multifaceted concept consisting of existential, emotional, cognitive, and action components'. Teachers must be aware of this complexity and therefore find 'a balance between critical emotional awareness and a trusting atmosphere in the learning setting'. Successful ESD teaching therefore makes students aware of their responsibility without overburdening them with it.

Although children cannot yet be held fully responsible for their actions, the aim of ESD lessons is to develop their sense of responsibility (cf. Sombetzki 2014, 143). This involves encouraging students to decide for themselves to what extent they are responsible for the consequences of their own and others' actions, and where their responsibility ends. Frith (2014, 141) has shown that 'a loss in the belief in free will leads to a weakening of the motivation'. Additionally, the Beutelsbach Consensus, an established principle of political education in Germany, prohibits teachers from imposing their own opinions on students (cf. Pohl and Will 2016, 40). The same applies to the attribution of responsibility. In a nutshell, although students can only be held responsible for sustainability issues to a limited extent, they are certainly capable of developing their own sense of responsibility. Having a sense of responsibility means understanding 'who is responsible to whom, for what […]' and, based on this awareness, 'mentally and willingly […] intending to act' (Schmiedl-Neuburg 2017, 208; 219). In relation to ESD, however, this definition must be expanded to include the dimensions of sustainability, since students' responsibilities can relate to ecological, economic, social, or political processes, as well as the sustainability of their consequences (cf. Wrase 2022, 5–10). Additionally, a spatial and temporal dimension must be

incorporated into geography lessons (cf. Holzbaur 2020, 25). This results in the following definition of students' sense of responsibility in geographical ESD lessons:

> *A sense of responsibility means understanding who is responsible to whom, for what, at what spatial and temporal level and in what dimension of sustainability. An intention to act can be mentally and wilfully derived from this understanding.*
>
> Definition of students' sense of responsibility in geographical ESD lessons. Expanded according to Schmiedl-Neuburg 2017.

This must be learnt and tested in geographical ESD lessons. Students must understand the extent to which they are responsible for their past and current actions, as well as for future developments and what responsibilities they want to take on. At the same time, they should be encouraged to reject partial responsibilities and attribute them to others, such as governments or companies (cf. Fexer and Hippe 2024, 42). Only through teaching this complex perspective can 'sustainable and transformative thinking and action' be promoted in ESD lessons (Brock and Holst 2022, 6).

2.3 Didacticisation of the sense of responsibility

The 'Pathway to Students' Sense of Responsibility in ESD' (see Figure 1) was designed to help teachers organise lessons in ESD so that students can effectively engage with their own responsibility, as well as that of others, for the sustainable development of our planet. The pathway can be used to structure lessons on sustainability topics, or teachers can work directly with it in lessons at higher grade levels. The pathway does not claim to be exhaustive, but is intended to be used to develop a differentiated sense of responsibility in students.

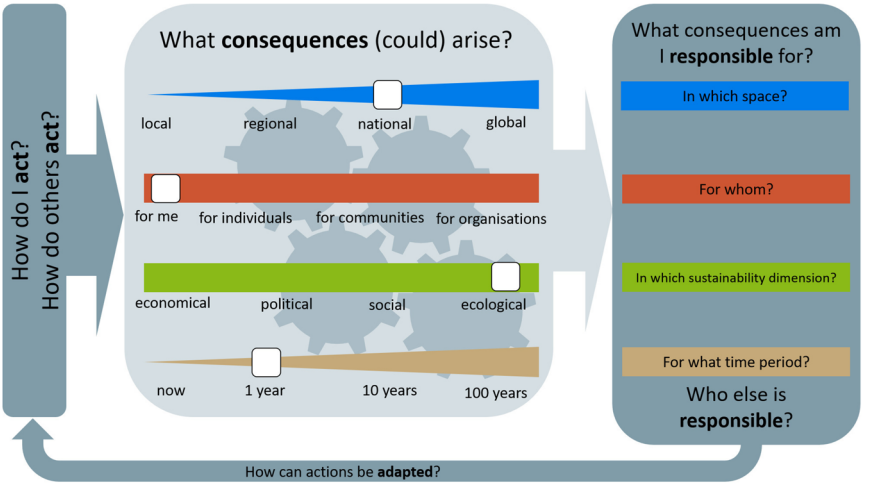

Figure 1. 'Pathway to students' sense of responsibility in ESD'. own illustration.

Problems of sustainability are primarily the consequence of unsustainable human actions by different groups and individuals at various temporal and spatial levels, which influence and sometimes reinforce each other. Students must analyse and understand these actions and their consequences so that they can recognise their responsibilities and limitations. The pathway is therefore structured as a three-step process consisting of actions, consequences, and responsibility (see Figure 1 from left to right). Discussions about responsibility can then inform adaptations to one's own actions or attempts to influence the actions of others. These adapted actions result in different consequences, creating a cycle (cf. Werlen 2017, 138).

The first step is to consider one's own actions, as well as those of others, in the context of sustainability (see Figure 1, left). With typical ESD topics, such as plastic waste or clothing consumption, one's actions are usually related to consumer behaviour (cf. Bastos de Sousa 2023, 2069–2100). Students must first recognise their own actions in order to take responsibility for them later on. However, it is also important for students to analyse the actions of others, particularly companies and governments (cf. Fexer and Hippe 2024, 42). The aim of this step is to gain a holistic view of the actions of different actors on a sustainability topic.

The consequences of different actions can be very complex and varied. Therefore, this pathway attempts to capture these consequences through four levels, shown here as four controllers (see Figure 1, centre). Firstly, consequences can be considered at different spatial scales (see Figure 1, first controller) (cf. Holzbaur 2020, 25). Analysing these levels is a fundamental approach, especially in ESD, and is important for students' deep understanding of sustainability (cf. Skarstein and Wolff 2020, 3). Consequences that occur locally can differ greatly from regional, national, or global consequences. Thinking spatially in this way is an important perspective in geography and geography lessons (cf. de Miguel 2024, 72–74). The consequences can also be differentiated according to the groups affected (see Figure 1, second controller) (cf. Bräutigam 2014, 80–82). Depending on the sustainability topic and teaching unit, different groups and individuals are always affected. Thirdly, the consequences can be considered in terms of the sustainability dimensions at political, social, ecological and economic levels (see Figure 1, third controller) (cf. Wrase 2022, 5–10). Finally, the consequences can be considered at different timescales (see Figure 1, fourth controller) (cf. Holzbaur 2020, 25). Both sustainable and non-sustainable actions can have consequences, some of which occur immediately and some of which may not materialise for years, decades or even centuries. Considering different time levels is common in geography education (cf. Fögele 2016, 74). Depending on the teaching topic, different time scales must be considered. For each ESD topic, the consequences can be analysed with regard to these four levels (spatial, group, sustainable dimensions and time) to encourage a more nuanced approach. The pathway (see Figure 1) helps ensure that the most relevant consequences of unsustainable actions are considered and analysed in class. This enables a holistic view of the consequences of actions to be taken, which is necessary in order to talk about responsibility.

When talking about responsibility in ESD lessons, it is not a matter of finding simple answers and attributing responsibility entirely to students or other actors. ESD lessons must therefore convey a more nuanced view of responsibility. Students should

be encouraged to decide for themselves to what extent they are responsible, how much responsibility they wish to take on, and where their responsibility ends (cf. Ohl 2018, 141). This approach considers one's own responsibility and the responsibility of others on the same four levels as the consequences (see Figure 1, right). Students should ask themselves: Who is responsible for which space, which group, which sustainability dimension and which time period? In this way, students should consciously differentiate responsibility rather than viewing it as a whole. They will learn about the possibilities for the differentiated assessment of responsibility, which they can then negotiate and test in class. For instance, students could decide to take responsibility for the local consequences of an unsustainable action, since they can effect change in this area. However, they can leave global responsibility to governments and try to influence them through elections or demonstrations. By doing so, they can reduce their area of responsibility to a size where their actions can really achieve something. It is crucial that students learn to assess their own area of responsibility. This sense of responsibility can then be used to implement sustainable actions.

3. Methodology

To answer the research questions (see introduction), an intervention study with a pre- and post-test was conducted at an 8th and a 10th grade of a German school. A total of 42 participants took part in the intervention (8th grade: 25 participants; 10th grade: 17 participants). For anonymisation purposes, participants in the 8th grade were labelled S8.1 to S8.25, and those in the 10th grade were labelled S10.1 to S10.17. Six respondents did not complete the pre- and post-tests and were therefore excluded from the analysis. This left 20 respondents from grade 8 and 16 from grade 10, whose pre- and post-test results were analysed. All quotes from these participants were translated from German. Written consent was obtained in advance from the legal guardians of the study participants for the collection, evaluation and publication of written and audio data. All data was treated anonymously throughout the study by means of coding carried out by the participants. No personal data was collected. The study design, tasks, working materials and evaluation methodology are described below.

3.1. Study design

The study was conducted as a 90-minute teaching unit in each class. A teaching unit on a typical ESD topic was designed based on the pathway (see Figure 1). The chosen topic was soya cultivation in Brazil and its role in cheap meat production (cf. Kuepper 2020). This topic addresses many issues related to unsustainable development, and students can be encouraged to consider their own responsibility in this regard. It can also easily be linked to the curricula of both grades (cf. MSB NRW 2019, 23–32). At the beginning and end of the intervention, 5-min pre- and post-tests were carried out. The pre- and post-tests contained questions on responsibility in relation to a typical ESD topic. These topics were different from the intervention in order to investigate understanding of responsibility rather than learning gain on the content topic. Additionally, these topics should address sustainability issues with which the

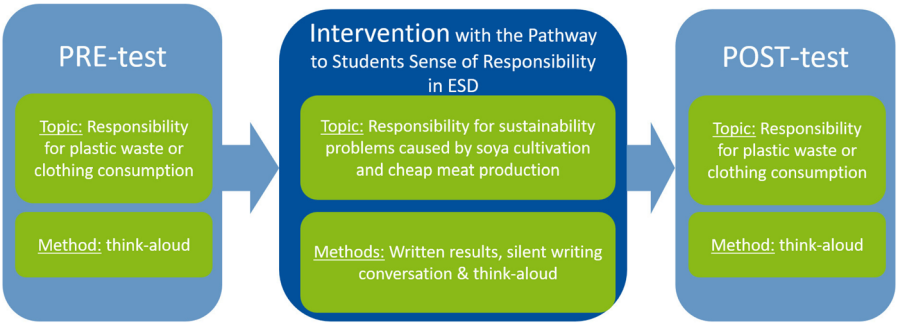

Figure 2. Study design. Own illustration.

respondents are already familiar. Therefore, the topics 'Problems caused by plastic waste' (cf. Dammayr 2022) and 'Overconsumption of clothing' (cf. Amați and Abrudan 2022) were chosen. Half of the participants were randomly assigned the topic of plastic waste for the pre-test and the topic of clothing consumption for the post-test, while the other half were assigned the opposite. This approach was intended to minimise the influence of the topic on the results (see Figure 2).

The 'think-aloud' method aims to provide insight into respondents' thought processes and how they approach answering questions and was therefore used in the pre- and post-test (cf. Sandmann 2014, 181–182). The pre- and post-tests were completed individually by the participants. They have accomplished the following two tasks orally. The participants were first asked to describe what they knew about the topic in general. The initial aim was to assess participants' understanding of the issue and their level of basic knowledge about it. One participant who knew too little about the topics to be able to talk meaningfully about responsibility were excluded from the analysis. After that they were asked to describe their understanding of their own responsibility and that of others in relation to the topic. The analysis examines whether the participants differentiate between their own responsibility and that of others using the dimensions of the pathway, and whether they have learnt anything in the process.

3.2. Working material and tasks in the intervention

To prepare teaching material on the topic of soy cultivation in Brazil and cheap meat production, a 1.5-page document containing text, illustrations and maps was created. The material was intended to provide an overview of the system, the associated problems, the actions of the relevant parties, and the consequences of these actions for the participants. Based on this material, five tasks were set, derived from the pathway (see Figure 1).

The first two tasks related to the first aspect of the pathway: the actions (see Figure 1, left). Participants were asked to identify all the actors in the material and attribute their actions to them. The third task related to the second aspect: the consequences of unsustainable actions (see Figure 1, centre). Participants were asked to enter the consequences described in the material into a table organised by the four levels (space, groups, sustainability dimensions, and time).

The fourth and fifth tasks focused on the aspect of responsibility (see Figure 1, right). Responsibility was first discussed in writing in groups of four using the 'silent writing conversation' method. In this method, each person in a group answers one of four questions in one minute. They then answer the question of their neighbour on the left and react to their previous answer. This process is repeated until each person has answered all the questions, resulting in a written conversation about each one. This method enables participants to reflect on and express their own views while engaging with those of the other group members. Four questions were asked:

1. To what extent are you responsible for the consequences in the Carrado, in Brazil or around the world if you buy cheap meat? Who else could be responsible? (Spatial level)
2. To what extent are you responsible for the consequences for yourself, the people in Brazil or for all people around the world if you buy cheap meat? Who else could be responsible? (Group level)
3. To what extent are you responsible for the environmental, social, political and economic consequences when you buy cheap meat? Who else could be responsible? (Sustainability dimension level)
4. To what extent are you responsible for the consequences that will happen now, in a few years, in a few decades or in 100 years if you buy cheap meat? Who else could be responsible? (Time level)

These four questions are based on the four levels (space, groups, sustainability dimensions and time) described in Figure 1 for a differentiated discussion of responsibility. As the fifth and final task, participants discussed their own and others' responsibility for the consequences of soya cultivation and cheap meat production in groups of four, as well as what action adjustments would be necessary. Group discussions encourage interactive participation, prompting the participants to position themselves in relation to the statements of others (Prinzen 2020, 306–308). This discussion was audio-recorded.

3.3. Evaluation

The study design produced audio data from the pre- and post-tests, and from the fifth task of the intervention, as well as written data from the first four tasks. A model solution was created for the first three tasks, as the actors, actions, and consequences could be taken directly from the material. Each participant's data was compared with the model solution and evaluated. The results of tasks four and five, as well as the pre- and post-test results, were transcribed using MaxQDA and analysed *via* qualitative content analysis according to Mayring and Fenzl (2019). The four levels of the pathway (space, groups, sustainability dimensions and time) (see Figure 1) were used as the categories for the deductive analysis. In addition, the actors discussed as responsible were analysed and divided into five actor groups. These groups were then used as inductive evaluation categories. The perception of personal responsibility was analysed

Table 1. Deductive and inductive categories for evaluating the pre-test and post-test as well as tasks four and five.

Top category	Sub category	Example
Levels of responsibility (see Figure 1) (deductive)	Space	'Nevertheless, I will be partly responsible if the savannah in the Cerrado is completely gone at some point.' (S10.4)
	Groups	'Besides, I don't know what I have to do directly with the people in Brazil when I buy cheap meat.' (S10.1)
	Sustainability dimensions	'If you mainly consume cheap meat, you are partly to blame if the forests and savannahs in the Cerrado disappear and for climate change in general.' (S10.4)
	Time	'By buying cheap meat, you are supporting the meat industry and ensuring that it continues to exist for longer. Every individual bears responsibility'. (S10.14)
Actor groups whose responsibilities were discussed (inductive)	I (own responsibility) (more precisely differentiated into responsible, partially responsible and not responsible)	'I am responsible for it because I throw it away and I don't know where it goes.' (S8.8)
		'That's exactly why I'm partly responsible for it being produced, but the companies that produce it are definitely also partly responsible.' (S8.14)
		'I would say that I'm not responsible because I can't influence what happens in Asia or Africa.' (S10.11)
	Society	'And I think that as a community again, the whole world has to act against it.' (S10.11)
	Consumer	'So you should buy far fewer things in plastic packaging. For example, don't always buy plastic bags in the supermarket, but take your own bags with you.' (S8.23)
	Producer	'But in any case, the companies that produce it and produce under these poor conditions are also partly responsible.' (S8.14)
	Government	'That's why Germany must actually see to it that the government really says: We must now pass laws that try to stop this somehow.' (S10.10)

in more detail by differentiating between participants who described themselves as fully, partially or not responsible (see Table 1). Both the categories created and the evaluation were reviewed and improved by a team of 15 geography researchers. Moreover, the length of the transcripts was compared before and after the test. The choice of topics relating to plastic waste and clothing consumption was also examined as an influencing factor.

4. Results

The results are presented in the order of the research questions. First, the results of the pre- and post-tests are shown to answer the first research question. Then, the results of the data from the intervention are presented to answer the second research question.

Regarding the first research question, which is about the extent to which students are aware of their own responsibility and that of others, the first thing that can be demonstrated is how often different groups of actors were considered responsible. In the pre-test, participants considered an average of 1.5 actors responsible. This means that, when asked to name those responsible for a sustainability problem, participants usually only named one or two actors. Very few participants demonstrated an understanding of the responsibility of several actors. An example of this can be seen in the statement by participant S8.7:

'The clothing manufacturers could be responsible because they produce cheap products and that's bad because it's child labour.'

Although this participant justifiably holds the producers responsible for child labour in clothing production, they do not discuss their own responsibility as a consumer, nor that of other actors. There is no indication of a pronounced sense of responsibility. In particular, it is clear that more than half of grade 8 participants do not discuss the responsibility of various actor groups. Society and producers are still most frequently seen as responsible. In the 10th grade, the five actor groups, except for producers, are discussed more frequently. The difference is particularly evident in the mention of personal responsibility. Conversely, society is also mentioned most frequently in the 10th grade (see Figure 3). Among all participants, it is noticeable that generalised actors such as 'the producers', 'the consumers', 'the governments' or 'all of us' are mentioned almost exclusively. Specific attributions of responsibility to individual actors are almost never found. Participants frequently used the group of society as a whole to assign responsibility. However, as 'society' is very general, an undifferentiated sense of responsibility is evident. This is exemplified by participant S10.4's discussion of responsibility for plastic waste:

'The whole of humanity is responsible because everyone consumes plastic and throws it away.'

It is striking that governments were mentioned the least frequently as a responsible actor in both classes. In Class 8, not a single participant mentioned them in the pre-test (see Figure 3).

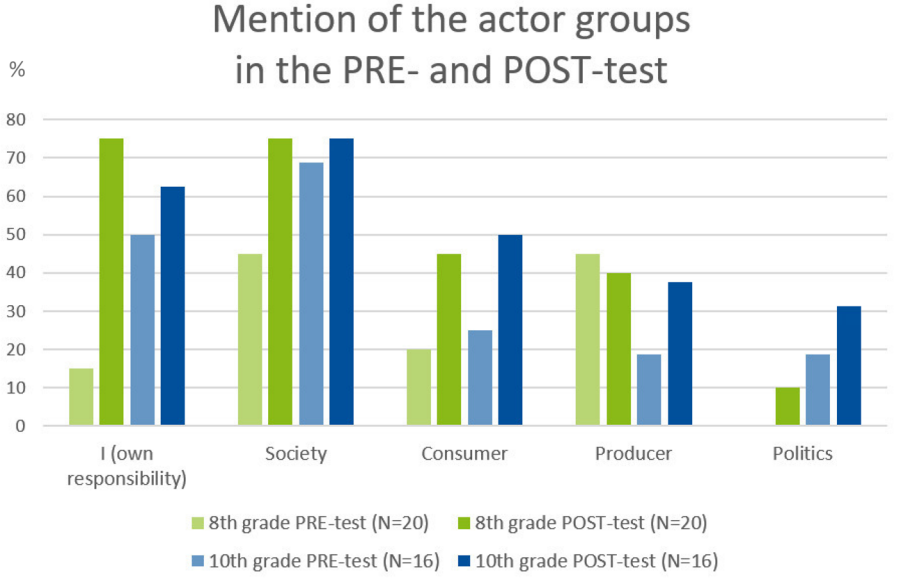

Figure 3. Mention of actor groups in the discussion of responsibility for sustainable action in the pre- and post-test in %. own illustration.

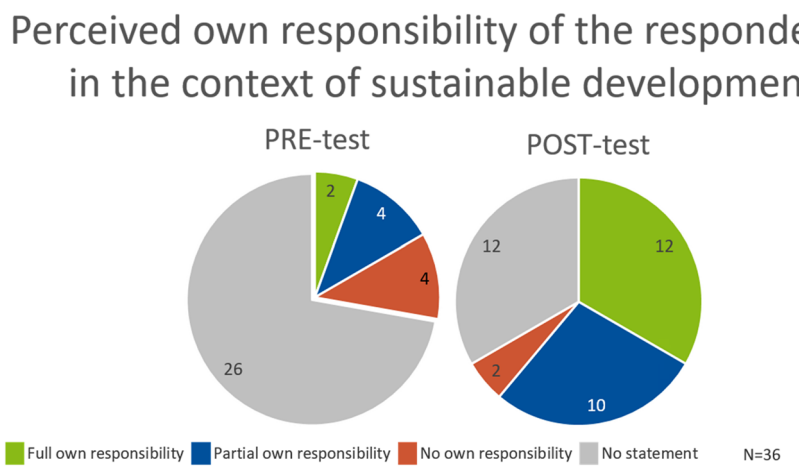

Figure 4. Number of participants discussing their personal responsibility in the context of sustainable development in the pre-test and post-test. Own illustration.

Regarding their own responsibility, 26 out of 36 participants did not discuss this at all in the pre-test. Only two participants saw themselves as fully responsible, while the rest described themselves as partially or not at all responsible (see Figure 4).

Regarding the second research question—to what extent the students' sense of responsibility changed as a result of the intervention—there was a clear difference in their awareness of personal responsibility. This was discussed significantly more often in the post-test than in the pre-test. Two thirds of the participants now discuss their own responsibility (see Figure 4). This increase is particularly evident in the 8th grade, with a rise from 15% in the pre-test to 75% in the post-test (see Figure 3). One third of all participants see themselves as being clearly responsible for sustainability issues. A further third, on the other hand, do not see themselves as responsible, or only partially so. They judge for themselves whether or not they are responsible. For example, participant S10.11 clearly states that they feel responsible:

> *'Also, when it comes to responsibility, I would say that I am definitely responsible if I buy cheap clothes or clothes that I know are made by child labour.'*

Participant S10.6, on the other hand, sees themself as partially responsible:

> *'Among others, I am responsible for the problems caused by the production of plastic waste, because I also use and buy it and therefore support the industry, but of course the industry is also mainly responsible and the government could also do something about it.'*

And participant S10.9 rejects their responsibility for a reason:

> *Because I just throw the rubbish away in the bin and then I no longer have any control over it. That's why I don't really think I'm responsible when I buy products in plastic packaging and then dispose of them.*

On average, participants discussed 1.5 actor groups in the pre-test and 2.5 in the post-test. While participants discussed the responsibility of one or two actor groups

on average in the pre-test, this has increased to between two and three. This allows participants to compare the responsibilities of several actors and take a more nuanced view. Consequently, discussions in the post-test are significantly more extensive and detailed. While the pre-tests average at 138 words, the post-tests average at 222 words. Nevertheless, the identification of the actors remains very general. Almost all participants only mention imprecise groups of actors rather than emphasising individual responsible parties.

As with all other actor groups, governments are discussed more frequently in the post-test than in the pre-test. Nevertheless, they are still mentioned by the fewest participants (10% the 8th grade and 31.25% in the 10th grade) (see Figure 3). This pattern is evident not only in the pre- and post-tests, but also during the development of the responsibility dimensions in relation to cheap meat during the intervention. In the first three tasks of the intervention, almost all participants correctly explained the actions of non-political actors, such as consumers and producers, and the resulting consequences. However, the two political actors mentioned in the teaching material (the Brazilian and German governments) were correctly described by only 62% of 10th grade students and 34% of 8th grade students. It is also noticeable in the group work of the 4th and 5th tasks that the governments were discussed less frequently in the 10th grade and not at all in the 8th grade (see Figure 5). Clearly, governments played a subordinate role in the students' sense of responsibility. In addition, the term 'governments' is used indiscriminately by the students. They do not specify whether they attribute responsibility to governments, politics, policy, or individual politicians. The students perceive politics as a whole.

The study also investigated whether the discussions in the writing dialogue related to the respective question about the levels of responsibility (space, groups, sustainability dimension and time), or whether the participants moved on to a general discussion about responsibility. The results show that, in the 10th grade, only around

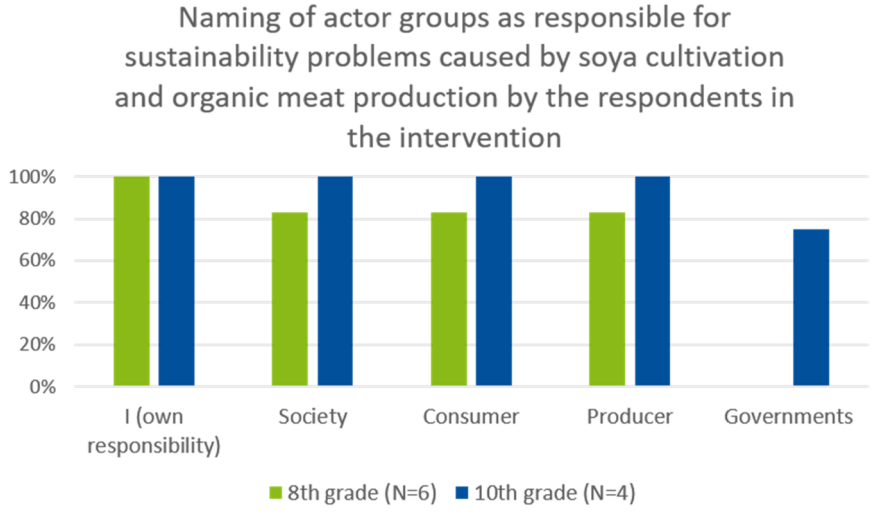

Figure 5. Mention of the responsibility of the actor groups in the writing dialogue (task 4) and group discussion (task 5) in %. own illustration.

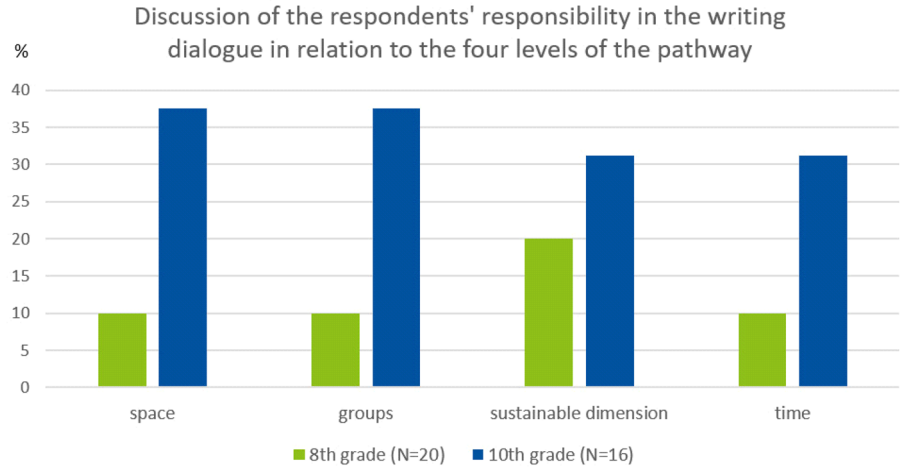

Figure 6. Discussions of the participants in the writing dialogue (task 4) based on the levels of the pathway in %. own illustration.

one in three students discuss responsibility based on these levels. No major differences were observed between the levels. In the 8th grade, however, only around one in five students discuss responsibility based on the sustainability dimensions, and only around one in ten based on the other three levels (see Figure 6).

Notably, groups of participants who were able to relate their discussions about responsibility to the levels of the pathway (see Figure 1) also discussed the responsibility of actors much more concretely and substantiated their arguments. This can be seen in the written dialogue of participants S10.14, S10.15, S10.16 and S10.17 regarding the sustainability dimensions (ecological, economic, social and political):

> *S10.15: I support the large corporations that make their money at the expense of the **environment** and are therefore subsidised even more when they make money. As a result, **people** are oppressed by the corporations or the environment is polluted even more.*
>
> *S10.17: Everyone who buys the products of such a company should realise that they are supporting a Slytherin of destruction and exploitation.*
>
> *S10.16: If you buy cheap meat as a private individual, you are jointly responsible for all **environmental damage** that occurs. You are also jointly responsible for the **human rights** violations in Brazil. The **economy** also suffers because butchers are visited less often where the meat is more expensive.*
>
> *S10.14: Ultimately, the buyer is responsible. If the buyers are of the opinion that they want to change this, then it is up to the **governments** to implement this.*

These participants demonstrate an understanding of the system and its consequences at different levels. They discuss the ecological, social and economic consequences, as well as the responsibilities of consumers, producers and governments. By contrast, participants S8.12, S8.13, S8.14 and S8.15 engage in a written dialogue that does not address the various levels of sustainability (ecological, economic, social and political), as required by the task:

S8.14: If I buy cheap meat, I am responsible to the extent that more meat is produced under poor conditions.

S8.15: I have to decide for myself.

S8.13: I agree with [S8.14].

S8.12: You're right, because if you buy it, more meat is produced.

This conversation does not address the consequences in relation to sustainability, but only the company's own responsibility. Consequently, this conversation remains very superficial. The responsibility of other actors is neither addressed nor discussed. It seems that either this group did not understand the task, or they were not in a position to carry it out.

A similar picture emerges in the written discussions on spatial, group and temporal levels. Participants who discussed their responsibilities using the levels included the responsibilities of more actors and differentiated their positions more precisely. In writing dialogues that do not refer to the levels, discussions tend to be shorter and more general, usually referring to only one actor.

5. Discussion

To encourage students to be able to act sustainably, try out these actions in ESD lessons and encourage them to put them into practice outside of school, students need to have many skills in addition to the ability to act (cf. Egana del Sol 2020, 258). One of these skills is the ability to recognise one's own responsibility and the responsibility of others in a differentiated way. It is important not to view responsibility for sustainability issues as black and white, but rather to be able to judge and provide reasons for one's responsibilities, the extent to which one assumes responsibility, the responsibilities of other actors, and where one's own responsibility ends (cf. Schmiedl-Neuburg 2017, 208; 219). This sense of responsibility also involves being able to distinguish and determine who is responsible for which space, group, sustainability dimension and period of time.

Regarding the first research question, which is about the extent to which students are aware of their own and other actors' responsibility in the context of sustainability problems, the study shows that, before the intervention, the participants had hardly any differentiated awareness of their responsibility and that of other actors. When discussing responsibility for sustainability issues, they typically only consider one or two actor groups. However, a multi-perspective view of the responsibility of different actors is 'a fundamental ability in today's society, and it is important for children's learning processes' (Vasiljuk and Budke 2021, 529). Therefore, it is important that students learn to consider the responsibility of many different actors in geography lessons. In addition to being aware of the responsibility of other actors, it is also crucial to be aware of one's own responsibility in order to solve sustainability problems, as this awareness can lead to well-founded decisions to act (cf. Uzorka, Akiyode, and Isa 2024, 3). The study shows that most participants in the pre-test did not address their own responsibility at all. Only slightly more than one in four participants either accepted or rejected responsibility for sustainability issues. Therefore, a

differentiated sense of responsibility for sustainability problems could not be identified in the pre-test, either with regard to one's own responsibility or that of other actors.

With regard to the second research question concerning the extent to which the 'Pathway to students' Sense of Responsibility in ESD' intervention (see Figure 1) changes students' sense of responsibility, it can be seen that the intervention helped many students develop a more nuanced perspective. During the intervention, almost all participants found it easy to consider the responsibilities of the actors listed in the material. The post-test also showed that the intervention enabled students to discuss the responsibility of significantly more actors than in the pre-test. However, on average, they only discussed responsibility in relation to 2.5 different actors. As a large number of actors can be held responsible for sustainability issues such as plastic pollution and clothing consumption, this result is not satisfactory. Since the study only consisted of a 90-minute intervention, it cannot be assumed that the participants would be able to fully discuss responsibility in the post-test.

The intervention also helped most students to take more responsibility for their own actions. However, this was perceived in different ways. Some students saw themselves as fully responsible, some as partially responsible, and some firmly rejected responsibility altogether. ESD lessons are not responsible for making students fully accountable for sustainability issues (cf. Sombetzki 2014, 143). Lessons that pursue this goal try to force or indoctrinate students into adopting a particular opinion. This is prohibited in Germany by the Beutelsbach Consensus (cf. Pohl and Will 2016, 40). Instead, students should be free to decide what they feel responsible for and learn to justify their views professionally. Nevertheless, ESD is often misunderstood, particularly within educational policy, as a tool intended to highlight and encourage students to take responsibility for their misbehaviour and adopt sustainable behaviour. This misconception is still evident today in German educational standards, which set out clear behavioural objectives, such as purchasing eco-friendly products (cf. DGfG 2020, 28). Therefore, pedagogical approaches are needed that teach responsibility in a way that preserves students' free will. Although more students discuss their responsibility as a result of the intervention, the results show that their sense of responsibility still varies greatly. Therefore, examining responsibility at different levels does not force students to accept or reject full responsibility, but enables them to develop a more nuanced and personalised perspective. In terms of teaching, this result suggests that working with the pathway can encourage students to recognise their own responsibilities and discuss them with each other. This argumentation process, whereby students negotiate their own opinions, is highly relevant in geography lessons (cf. Budke, Schiefele, and Uhlenwinkel 2010, 181).

The results of the study show that governments, as responsible actors, are mentioned less frequently by students than other actors. This is evident in all tasks of the intervention, as well as in the pre- and post-tests. This raises the question of why most students were hardly or not at all aware of governments' responsibility for solving global sustainability problems. One possible reason is that social discourse usually focuses on the individual or society as a whole (cf. Rat für nachhaltige Entwicklung (RNE) 2025, 5). Approaches such as the individual ecological footprint, often mentioned in school textbooks, suggest that major sustainability problems can be solved by changing the behaviour of many individuals. However, this

representation is problematic as it shifts responsibility away from other actors, such as governments and large companies (cf. Defloor et al. 2022, 3). In reality, politics is one of the areas with the greatest potential to impact the sustainable development of our planet (cf. RNE 2025, 6). It is therefore crucial in ESD lessons that students also become aware of governments' responsibilities and consider how they can influence politics in class. Only through this awareness can a democratic society persuade governments to act. Longo et al. (2021, 8) describe this as follows: 'When it comes to tackling sustainability challenges, we further highlight collective action in the form of social movements. We do so given their capacity for putting new issues on the political agenda and their potential to bring about changes that in the absence of pressure from (many) citizens would be highly unlikely, due to misalignment between those changes and the interests of powerful individuals and groups'. Therefore, a key task for ESD and teachers involved in ESD is to clearly communicate the importance of governments responsibility. Further research is required to develop pedagogical approaches that demonstrate how this can be achieved. Such pedagogical approaches can already be found, for example, in the field of systemic thinking (Brockmüller and Sigmund 2020), inquiry-based learning (Setiyaningsih et al. 2024) or service learning (Thönnessen 2016).

The results also show that the majority of participants found it easy to analyse the consequences of unsustainable actions based on the four levels (space, groups, sustainability dimensions and time). However, when asked to discuss responsibility based on these levels, very few were able to do so. Those respondents who did succeed, however, discussed responsibility in much more detail, considered the responsibility of more actors, and positioned themselves much more precisely. This suggests that, while considering responsibility based on the levels of the pathway can have a positive effect, this was not achievable for most students in the intervention. This is surprising given that all four levels form a central part of German geography lessons (cf. Fögele and Mehren 2023, 53), and their importance has already been emphasised in the field of international geography education (cf. Cheek, LaDue, and Shipley 2017, 463; Glavič and Lukman 2007, 1877; Shin and Bednarz 2019, 2; Vasiljuk and Budke 2021, 531). As the participants found it relatively easy to analyse the consequences using the levels, the problem appears to lie in linking the levels with responsibility. It does not seem possible to achieve this effectively in lessons through the one-off application of the pathway alone. Complex topics such as responsibility in sustainability issues need to be explored and tested over a longer period of time in lessons. As there is currently no research on how to specifically promote students' sense of responsibility, the Pathway could be a tool to help students learn to assess their own and others' responsibility if used in lessons over a longer period of time. Further research is required to investigate the effects of prolonged use of the Pathway. Teachers also need support in the form of learning materials and lesson plans to help them integrate the pathway into lessons meaningfully and promote students' sense of responsibility effectively. In this way, the pathway could become a metacognitive strategy applicable to many different tasks. Gebele et al. (2022, 968) have demonstrated the positive impact of such strategies on students' learning processes, emphasising that 'to address the demands of modern societies, especially in the era of digital transformation, […] the role of metacognition is necessary'.

The aim of promoting a sense of responsibility is to help students understand and decide what they are responsible for with regard to sustainability issues, and to encourage them to act sustainably based on this understanding. Implementing sustainable actions in ESD lessons is probably the most complex ESD task. For students to be able to initiate their own sustainable actions, various components such as action competence, motivation and structural conditions must be in place (cf. Egana del Sol 2020, 258). The students' sense of responsibility is an important building block here. It helps them to understand their role in global sustainability issues and limits their responsibility in such a way that they are capable of acting. This study has shown that students find it difficult to differentiate between their own responsibility and that of other actors. The pathway can be used to promote a sense of responsibility in a targeted and differentiated way in ESD lessons. However, due to the small number of participants, the short 90-minute intervention and the focus on just two German school classes, the study should be considered exploratory. It can only provide an initial indication of students' sense of responsibility and how effective the pathway is. It does not claim to be able to make general statements about students' sense of responsibility. Further didactic research is therefore required to promote students' sense of responsibility and implement sustainable actions meaningfully in ESD lessons. Particular attention must be paid to how students' sense of responsibility can be used to motivate sustainable actions without making them feel hopeless. Teachers also require additional support in the form of models, methods and experiences from other teachers to help them align their lessons with the goal of ESD, which is to 'empowers learners to take informed decisions and act responsibly for environmental integrity, economic viability and a just society, for present and future generations' (UNESCO 2017, 63).

ESD is a large field of didactic research, and the sense of responsibility can be seen as one of its components. In addition, there are numerous pedagogical approaches, such as 'lifelong learning, social learning, problem-based learning, active and experiential learning, critical pedagogy, dialogue education, transformative or transformational learning, and constructivist approaches' (Hussain et al. 2024, 1) (cf. Aribowo, Nadiroh, and Faesal 2025; Kostoulas-Makrakis 2010; Liu and Constable 2010; Nöthen and Schreiber 2023; Svanström et al. 2012; Wals 2015). All these approaches have in common that ESD should not be taught in traditional lessons, but requires new approaches and perspectives. Further didactic work is needed to integrate a sense of responsibility into these educational approaches and thereby implement it in ESD teaching.

Disclosure statement

The authors declare the research was conducted in the absence of any conflicts of interest.

Ethical statement

There is no ethics committee for didactic studies at science faculty of the University of Cologne. It is only mandatory to adhere to the ethics guidelines when conducting studies with students. In this study, the students and their legal guardians were informed about every aspect of the study and their written consent was obtained. The study was conducted in such a way as to rule out any ethical conflict.

Author contributions

CRediT: **Robin Felix Schönstein**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Visualization, Writing – original draft; **Alexandra Budke**: Conceptualization, Supervision, Writing – review & editing.

Data availability statement

The qualitative data from which information identifying personal data has been removed can be made available on request to the corresponding author.

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