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How to teach about sustainable development in physical education? Examples from the perspectives of certified teachers in Sweden

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Introduction: Teachers have a vital role in educating and empowering students to become informed and active agents of change in promoting sustainable development (SD). Little is known what PE teachers teach about SD. The aim of the present study was to explore what certified compulsory school and upper-secondary school physical education (PE) teachers in Sweden teach about SD within their practice.

Methods: An online survey was used to collect data about background information and what the PE teachers had taught about SD in PE. Data from 653 PE teachers was used and the teaching examples were analyzed through thematic analysis.

Results: The analysis resulted in eight themes: *Equality, inclusion, and norms*, *Exploring the local environment*, *Outdoor education and care of nature*, *Interdisciplinary projects*, *Picking waste and recycling*, *Sustainable bodies*, *Sustainable lifestyles, health and well-being*, and *Sustainable use of products and consumption*.

Discussion: The findings suggest that PE can have distinct subject-specific contribution to aspects of the SD agenda, but also a role to empower students of how movement, exercise, and sport can be embedded within a broader ecological perspective. Furthermore, the described themes may open for research about what competences that are particularly relevant for PE teachers in the context of SD.

KEYWORDS

2030 agenda, physical education, sustainability, sustainable development, teaching

1 Introduction

The global challenges that humanity faces, including inequality and climate change, is the point of departure in the sustainable development (SD) agenda. SD refers to a concept that aims to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. It involves finding a balance between, social well-being, environmental protection, and economic growth (Brundtland, 1987). By pursuing SD, societies strive to create a more resilient, inclusive, and prosperous future for all, while preserving the Earth's resources for generations to come. Perhaps the most broad and ambitious action plan for SD is the 2030 agenda that was introduced in 2015 (United Nations, 2015). The 2030 agenda

comprises 17 intertwined SD goals (SDGs) and 169 associated targets that cover social, environmental, and economic dimensions of SD.

Education has the potential to empower people with SD competences where education, can contribute to make decisions in pursuit of a just society and care for the planet in the present and future generations (Kioupi and Voulvoulis, 2019; Lohmann et al., 2021). In many ways, teachers have a vital role in educating and empowering students to become informed and active agents of change in promoting SD. By imparting knowledge, fostering critical thinking, and nurturing values, teachers can inspire a new generation that is committed to building a more sustainable and equitable future (Boeren, 2019). To teach about SD may, however, be challenging since the conceptualization of SD involves an element of ambiguity that inherently requires not only continuous contextualization and re-contextualization, but also re-calibration over time. Moreover, SD lack robust scientific concept with no apparent "rights and wrongs" (Wals, 2019).

From a critical perspective, the global trend of SD is permeated by political dimensions and normative assumptions (Håkansson et al., 2019; Öhman and Östman, 2019). Teaching about SD may arise ethical reflections, moral reactions, and present norms for (socially) correct behavior (Öhman and Östman, 2019). These ethical and moral attitudes may be expressed in various ways but could be understood without sharing the opinion. From a teacher perspective, there may be concerns that the political and normative aspects of SD may take in the form of an orientation toward correct outcomes, such as solutions to specific problems, as pre-determined by the teacher (Håkansson et al., 2019). In the context of education, this has been referred to as instrumental education for SD (Wals, 2011), however, to foster correct behaviors can violate the democratic purpose of education (Håkansson et al., 2019). As an alternative to the instrumental education for SD, emancipatory education for SD focus on fostering SD competences. In this context, teachers should engage students in decision-making processes, encourage and allow for a wide range of ethical reflections and moral reactions, make references to knowledge drawn from multiple disciplines and present information in an objective and balanced manner to avoid the risk of teaching becoming indoctrination (see, e.g., Wals, 2011; Öhman and Östman, 2019).

Although SD is permeated by political dimensions and normative assumptions, the overall primary and secondary school curriculum in several countries, including Sweden, address SD perspectives as common for the whole educational system. With respect to the distinct goals, aims, and core contents, each subject has therefore obligations to contribute to the "whole" and ensure that students are well-informed and equipped to address the complex challenges of SD. Research across multiple subjects shows that SD perspectives is addressed and taught in various ways. For example, outdoor education and fieldwork, experimental and interactive learning, as well as presentations by the teachers, seems to be common teaching methods to address SD perspectives in the subjects Biology and Geography (Jeronen et al., 2017; Yli-Panula et al., 2020). In Sweden, Borg et al. (2012) collected data from 3,229 upper secondary school teachers in the subjects Science, Social science, Language, and Esthetical-practical and vocational studies. They found that the most common teaching methods were group discussions, followed by interactive lectures, group work, interdisciplinary work, and class debates. The results also showed some differences between teaching methods across the subjects, where lectures were most common in Science and Social science One subject that until recently has received limited attention in relation to SD, both internationally and in Sweden, is physical education (PE).

The subject PE is a compulsory part of the school curriculum in many countries (Hardman et al., 2014). Overall, PE plays a crucial role in promoting the physical, psychological, and social health and well-being of students. Furthermore, to equip students with the knowledge and skills necessary for a healthy and active lifestyle throughout their lives. PE has benefits regarding not only the physical domains, such as physical activity and fundamental motor skills, but also to affective, social, and cognitive domains, including enjoyment and motivation, cooperation and problem-solving, and attention, concentration, and decision making, respectively (Ramires et al., 2023).

In the field of PE, we have recently witnessed a growing interest in exploring how PE can contribute to the SD agenda (Baena-Morales and Ferriz-Valero, 2023). Even though little is currently known about how SD can be understood, framed, and integrated in PE, it may be argued that the unique subject characteristics of PE, such as movement education and health, can have distinct contributions to the SD agenda that differ and complement other theoretical and practical school subjects (Lohmann et al., 2021; Baena-Morales and González-Víllora, 2022). Previous studies have also suggested that PE may have an important contribution to the SDGs Good health and well-being (#3), Gender equality (#5), Reduced inequalities (#10), Sustainable cities and communities (#11), and Peace, justice and strong institutions (#16; Baena-Morales et al., 2021a,b; Baena-Morales and González-Víllora, 2022; Lundvall and Fröberg, 2022).

By integrating SD perspectives into PE, we argue that students can develop an understanding of the connections between physical active lifestyle, environmental stewardship, and holistic health and well-being. Through transformative perspective on learning, students may also acquire skills and values that promote a sustainable lifestyle and become advocates for sustainable practices within their communities and in relation to the environment (Lundvall and Fröberg, 2022). Even though SD perspectives may be interpreted as an overarching teaching approach, rather than additions of content to an already overcrowded curriculum, one critical question, however, is how PE can contribute to the SD agenda whereas simultaneously tie to the core areas of the subject (e.g., movement, physical activity, health, and lifestyle; Baena-Morales and González-Víllora, 2022). Including SD perspectives in the field of PE involve reconsidering learning perspectives that involve capacity building, critical thinking, and reflections (Lohmann et al., 2021; Lundvall and Fröberg, 2022). In this context, however, it is important to note that researchers argue that PE may already be covering critical SD perspectives without making explicit references to SD (Lohmann et al., 2021; Baena-Morales and González-Víllora, 2022).

Although much of the research to date have been theoretical, arguing for the importance and contribution of PE to SD perspectives, some empirical studies have also been published (Baena-Morales and Ferriz-Valero, 2023). Studies indicate that PE teachers are unclear about the meaning of SD, and that they mainly relate SD to environmental issues (Baena-Morales et al., 2021a). Previously, we have reported results from a survey that included more than 1,100 PE teachers in Sweden. Overall, we found that the PE teachers tended to emphasize the social dimensions of SD, and that 70 percent of them

perceived that they needed professional development education in the area of SD (Fröberg et al., 2022a). The fact that many PE teachers perceive themselves in need of professional development education may indicate that they could benefit from being challenged in terms of their own beliefs and competences, and supported by concrete examples on what to teach about SD in a subject that has received little attention in the field of SD. To support this further, another study from Sweden conducted among upper secondary school teachers within different subjects, including natural science and social science, indicated that many teachers lacked inspiring examples to teach about SD, and we argue that this may apply for PE teachers as well (Borg et al., 2012).

As mentioned earlier, little is known what PE teachers have taught about SD (Baena-Morales and Ferriz-Valero, 2023). Using data from the above-mentioned survey, however, our previous study from Sweden provided an overview of common working areas, activities, or projects that PE teachers have used to teach about SD. Among the examples were outdoor education, picking and sorting waste, and paying attention to material issues (Fröberg et al., 2022a). However, the study had a focus on SD competences among PE teachers, and less attention was allocated to provide a detailed description of what PE teachers address in relation to SD.

In summary, much of the research to date have been theoretical and there is a call for empirical studies to explore SD from the perspectives of PE teachers (see, e.g., Baena-Morales and Ferriz-Valero, 2023). Ultimately, a more detailed account and analysis of empirical examples of what PE teachers address in relation to SD within PE will be an important contribution to the field. In addition, such detailed account and analysis may also serve as inspiration for PE teachers, both in Sweden and other countries.

In light of the scarce research within the area, the aim of the present study was to explore what certified compulsory school and upper-secondary school PE teachers in Sweden currently teach about SD within their practice. Based on this aim, the following two research question were addressed:

1. What do PE teachers in Sweden address when teaching about SD within PE?
2. What possible relations between these examples and specific targets that constitutes the agenda 2030 may be considered?

Since the present study was conducted in the Swedish context, we below briefly outline the overall characteristics and content of PE in Sweden. The primary aim of PE in Sweden is to develop motor skills, promote a healthy lifestyle, and foster a positive attitude toward physical activity and exercise among students (Physical education and health 1 [course syllabus] [Idrott och hälsa – ämnesplan], 2010; Physical education and health [course syllabus] [Idrott och hälsa – kursplan], 2022). In addition, to assist students in cultivating their enthusiasm for and proficiency in engaging in various physical pursuits, outdoor surroundings, environments, and nature to promote overall well-being. PE in Sweden generally covers the core areas of movement, outdoor education, health, and lifestyle habits that include a wide range activities and sports, including individual sports, recreational games, team sports, and outdoor education. The curriculum also emphasizes the importance of maintaining an active lifestyle outside of school and encourages students to engage in physical activities of their choice. In addition to the physical aspect of PE, students may also learn and critically reflect upon the benefits of regular physical activity, the importance of a balanced diet, and strategies for maintaining a healthy lifestyle. Perspectives of norms (e.g., determine standpoints on issues in relation to sports, health, and lifestyle) and ethics (e.g., respect for others) are also part of PE in Sweden. PE in Sweden are typically structured to provide a combination of practical activities, theoretical knowledge, and discussions.

In the context of the present study, it should also be noted that the Swedish overall curricula prescribe teachers to work with SD perspectives but there are no explicit statements related to SD in the PE curriculum for compulsory school and upper-secondary school in Sweden (Fröberg et al., 2022b). In the supporting commentary material, which is expected to provide teachers with a broader and deeper understanding of the selections and positions behind the texts in curriculum, however, we found some explicit statements, although limited to outdoor education (compulsory school and upper-secondary school) and ergonomics (upper-secondary school; Fröberg et al., 2022b).

2 Materials and methods

The present study was based on data collected as part of a survey to explore perceptions of SD, and SD competencies among PE teachers in Sweden. Below, we outline the data used in the present study, and a detailed description of the complete survey is available elsewhere (Fröberg et al., 2022a).

The participants were certified PE teachers in Sweden who were identified and requited through a digital register with e-mail addresses to certified (diplomas of certification) teachers provided by the Swedish National Agency for Education. The Swedish National Agency for Education grants, and keep records of, teacher certifications to those who meet certain national requirements for skills deemed important for working as a teacher in the Swedish school system. The teacher certifications specify the subjects, and school forms and grade levels (e.g., preschool, compulsory school, upper secondary school, special education, and adult education) a teacher is qualified to teach.

Of the totally 2078 certified PE teachers that completed the survey, 31 percent (n = 653) reported having taught about SD and was therefore included in the present study. Descriptive data for the included participants is provided in Table 1. Most of the participants were females (58%), below the age of 50 (59%), and most had graduated after 2000 (59%), and had taught PE for 1–20 years (73%). About 70 percent of the participants taught PE when completing the survey.

The study design and its procedures were in accordance with the ethical standards of the Declaration of Helsinki. Prior to the completion of the survey, the participants receive information regarding the aim and procedure of the study. Contact information were also addressed if the participants had additional questions related to the study, its design, and procedure. Participation were voluntary and indirect informed consent was obtained, meaning that the participants agreed to the terms and conditions of the study when they had filled out and submitted the survey.

TABLE 1 Study participant characteristics (n = 653).

Variable	Proportion (%)
Sex	
Male	42%
Female	58%
Age groups	
20–30 years	6%
31–40 years	23%
41–50 years	30%
50+ years	41%
Graduation year	
−1990	17%
1991–2000	24%
2001–2010	30%
2011-	29%
Grade levels PE certificate valid*	
Pre-school to compulsory school, grade level 3	73%
Compulsory school, grade 4 to grade 6	73%
Compulsory school, grade 7 to grade 9	59%
Upper secondary school, grade 10–12	54%
Number of years teaching PE	
1–10 years	43%
11–20 years	33%
21–30 years	18%
30+ years	7%
Taught PE when completing the survey	
Yes	71%
No	29%

*The participants could have valid PE certificate for more than one grade level. Therefore, the percentages do not add up to 100 percent.

2.1 Survey

An online survey was used to collect data. Webropol 3.0[1] was used to distribute the survey to the available e-mail addresses. Data collection was conducted between June and October 2022. The survey contained one section to collect data about background, and one section to collect data about SD in relation to PE.

In the first part of the survey, we asked the participants to provide information on sex (male, female or other), year of birth, graduation year, and for which grade levels their PE certifications were valid. Furthermore, we asked whether they were employed as a PE teacher when completing the survey, in what grade levels, and in what type of school organization (public, independent or governmental), as well as how many years they had been employed as a PE teacher.

In the second part of the survey, the participants indicated whether they ever had taught about SD in PE. The specific item was "Have you ever taught about sustainable development in physical education?," and the participants indicated either "yes" or "no." If "yes," the participant was presented with a follow-up item where s/he was encouraged to describe how s/he had taught about SD in PE. The exact wording was: "Give examples of how you have taught sustainable development within physical education and health. Describe, for example, work areas/themes, activities and/or projects." The participants could provide examples and explain to the extent that s/he desired. Prior to the above two items, the participants were provided with the following description of SD: "Sustainable development may be defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

In the survey, more than 547 participants provided at least one example of what they teach about SD in PE. The extent of the descriptions varied from single words to longer sentences.

2.2 Analysis

In relation to the first research question, collected data was analyzed through thematic analysis. Thematic analysis is a qualitative data analysis method that involves reading through a set of data and identifying themes in the meaning of the data (Braun and Clarke, 2006, 2019; Nowell et al., 2017). In thematic analysis, the researchers themselves are deemed critical instruments, and we therefore undertook a collaborative approach, involving all four authors, thus allowing for a nuanced reading and interpretation of the collected data.

The analysis was conducted in several steps, following previous recommendations (Braun and Clarke, 2006, 2019; Nowell et al., 2017). Firstly, we familiarized ourselves with the collected data by exporting the examples to an external spreadsheet, read them through and took notes and marked initial ideas for the analysis. In the next step, we undertook an in-depth reading and arranged together (merged) different working areas, activities, or projects that reflected similar content. Based on the examples provided. we critically analyzed the examples of working areas, activities, or projects, inspired by a transformative and emancipatory perspective on education for SD. In doing so, we produced tentative themes that we reviewed and revised until a final set was decided on. Finally, we defined and labeled the themes according to the core content.

In thematic analysis, including sections of data in multiple themes may occur, with some thematic overlap. However, it is recommended that researchers thoroughly assess how each theme contributes to the overall narrative of the entire dataset in relation to the research questions addressed (Nowell et al., 2017). In the present study, there was some minor overlap between the produced themes. For example, some content represented in the theme *Outdoor education and care of nature* overlap with the theme *Picking waste and recycling* as some participants had taught about outdoor education while emphasizing the importance of taking care of the waste (picking and sorting) resulting from the activity. However, as part of the analyze process described above, we produced themes to avoid overlap as much as possible and in this way create a set of themes that contributes to the overall narrative in relation to our research questions. By being systematic and transparent in this process, and giving examples of how themes could overlap, we try to avoid distorting the results.

1 https://webropol.com/

Our analysis resulted in eight themes that reflected the overall content. Below, Figure 1 provide an overview of the eight themes (in alphabetical order) that are presented in the result section with examples drawn from the survey.

In relation to the second research question, we employed an iterative review strategy. We began by pinpointing possible relations between each theme and SDG or specific target. Subsequently, through group discussions and thorough review, we refined these possible relations and established a framework that represent our interpretation of possible relations between the produced themes and SDGs and specific targets.

3 Results

Below, we present the eight themes (in alphabetical order) that we produced with examples drawn from the survey (the first research question). Throughout the result section, we also present possible relations between each generated theme and its corresponding SDG and specific target, using excerpts from our description of the themes (the second research question).

3.1 Theme 1: equality, inclusion, and norms

The first theme we generated from the analysis was *Equality, inclusion, and norms*. This theme contains statements of how the participants actively and deliberately plan and deliver PE lessons to promote student influence, among other things based on the common interests within the student group. In addition, some participants consciously plan and deliver inclusive teaching to reduce gender inequality and promoting equality among vulnerable students. The examples also concerned the promotion of social relations between both teacher and students and between students, with some of the examples being promotion of friendship, learning how to treat and show consideration toward each other and the environment, as well as the importance of feeling comfortable and experiencing cohesion of peer groups. Some examples of statement indicated that the participants conscientiously worked with equality and inclusion by "ensuring equal participation opportunities for all," and "including everyone, reducing gender inequality, and promoting equity for vulnerable students." Other statements that relate to this theme include actively working with issues to show "consideration for each other," and "promotion of […] positive relationships."

The first theme also contains statements of how the participants cover areas, such as body ideals, stereotypes, and equality in relation to exercise and sport, and health and well-being. This involves, among others, critical discussions in relation to gender issues, ethnicity, and sexual orientation, and some participants occasionally cover these aspects in relation to the contemporary social media landscape. For example, one participant stated that they worked with "body ideals, stereotypical perceptions, and equality related to physical education," and "discussions about appearance, gender, ethnicity, sexual orientation." Another participant stated that they actively worked with "social inclusion, such as LGBTQ (i.e., lesbian, gay, bisexual, transgender, and queer) and equality issues in sports."

Table 2 shows possible relations between the first theme and SDGs and specific target.

3.2 Theme 2: exploring the local environment

The second theme we produced was *Exploring the local environment*. This theme contains of statements of how the participants not only use the local environment during PE lessons, and

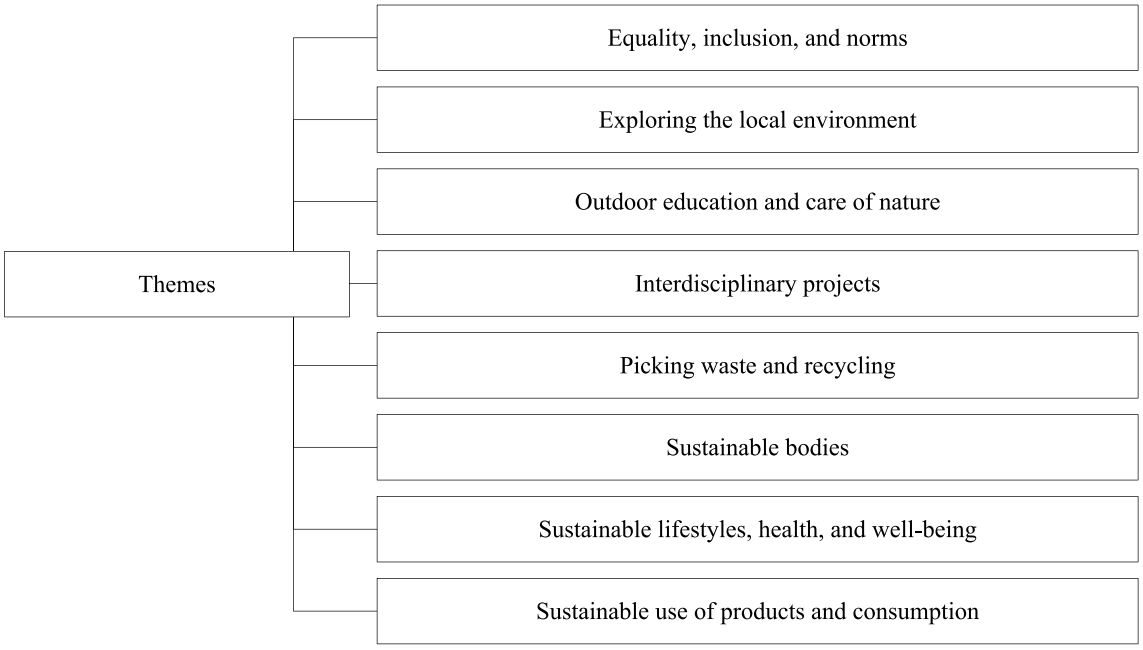

FIGURE 1
The eight themes that we produced during the analysis (in alphabetical order).

TABLE 2 Possible relations between the theme Equality, inclusion, and norms and SDGs and specific targets.

Text excerpt	SDG	Specific target
”ensuring equal participation opportunities for all”	SDG 5: Gender Equality	5.1: End all forms of discrimination against all women and girls everywhere.
”including everyone, reducing gender inequality, and promoting equity for vulnerable students”	SDG 4: Quality Education SDG 5: Gender Equality SDG 10: Reduced Inequality	4.5: Eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable. 5.1: End all forms of discrimination against all women and girls everywhere. 10.2: Empower and promote the social, economic, and political inclusion of all.
”consideration for each other” &” promotion of […] positive relationships”	SDG 16: Peace, Justice, and Strong Institutions	16.7: Ensure responsive, inclusive, participatory, and representative decision-making at all levels.
”body ideals, stereotypical perceptions, and equality related to physical education,” and” discussions about appearance, gender, ethnicity, sexual orientation”	SDG 5: Gender Equality SDG 10: Reduced Inequality	5.1: End all forms of discrimination against all women and girls everywhere. 10.3: Ensure equal opportunity and reduce inequalities of outcome.
”social inclusion, such as LGBTQ [i.e., lesbian, gay, bisexual, transgender, and queer] and equality issues in sports”	SDG 5: Gender Equality SDG 10: Reduced Inequality	5.1: End all forms of discrimination against all women and girls everywhere. 10.3: Ensure equal opportunity and reduce inequalities of outcome.

thereby indirectly provide opportunities for students to take notice of their local environment and its potential for being physically active, but also how they raise awareness regarding the access of (free of charge) running tracks, outdoor gyms and play areas, and green parks in the local environment. Examples of statements include working areas “about the local area, sports facilities, playgrounds, and parks,” “using nearby natural resources“, “using nature as a gym,” and “municipal opportunities for exercise, such as running tracks and outdoor gyms, which are free of charge.”

In the second theme, there were also several examples that explicitly related to outdoor activities. For example, one participant described a project with the overall aim of raising awareness about social, cultural, and economic conditions for different outdoor activities. The project focused on peri-urban outdoor education where students explore access to green areas in urban environments. Another participant described a project where students explore their local environment to find a place in their vicinity where they experience happiness and joyfulness and that they could reach and stay without negatively affecting the environment. There was also a project where the student photographs the local environment and analyze how they may use it from a SD perspective.

Possible relations between the second theme and SDGs and specific target are shown in Table 3.

3.3 Theme 3: outdoor education and care of nature

The third theme we produced was *Outdoor education and care of nature*. This theme contains statements of how the participants teach about outdoor education and care of nature in various ways. As part of this theme, the participants frequently stated that they teach about the right of public access,[2] thus the right to access certain public or privately owned land, lakes, and rivers for recreation and exercise among the general public. When teaching about the right of public access, the teachers described how this also needed to be linked to the sense of care for the nature. The participants highlighted that with this freedom and right providing opportunities to explore and enjoy nature also comes obligations. As stated by one participant, “by working with the right of public access and conducting activities in nature, we teach the students to take care of the environment according to the rules of the right of public access.” Another participant stated that “through the instruction of outdoor education, and how to prepare and conduct outdoor activities, one can highlight the importance of sustainable development, so that we can continue to benefit from the natural values that are accessible to everyone through the right of public access.” One participant also described activities conducted in the forest to allow for the students to learn “the fundamentals of the right of public access, and [allow them] to develop a positive connection with nature that they carry into their stance on sustainable development.”

In relation to outdoor education, participants also stated that they focus on knowledge about animals and plants, occasionally in the context of concepts such as biological diversity, natural resources, and ecosystems, as well as knowledge about decomposition time of various materials. Moreover, participants stated that they arrange discussions about the impact of outdoor life on protected forest and land, extinct species and vegetation, nature reserves and animal protection. Within this theme participants described projects where students plan outdoor activities based on a SD perspective, such as social and economic perspectives of SD, as well as how individual choices of outdoor activities may affect the environment.

Possible relations between the third theme and SDGs and specific target are shown in Table 4.

3.4 Theme 4: interdisciplinary projects

The fourth theme we produced was *Interdisciplinary projects*. This theme contains statements indicating that participants collaborate with teachers from other school subjects, such as civics and social

2 In Swedish, this is referred to as “allemansrätten.” In English, this may also be referred to as “freedom to roam.”

TABLE 3 Possible relations between the theme exploring the local environment and SDGs and specific targets.

Text excerpt	SDG	Specific target
”about the local area, sports facilities, playgrounds, and parks”	SDG 11: Sustainable Cities and Communities	11.7: Provide universal access to safe, inclusive and accessible, green and public spaces.
”using nearby natural resources”	SDG 15: Life on Land	15.1: Conserve and restore terrestrial ecosystems.
”using nature as a gym”	SDG 3: Good Health and Well-being	3.9: Reduce illnesses and death from environmental pollution.
”municipal opportunities for exercise, such as running tracks and outdoor gyms, which are free of charge”	SDG 3: Good Health and Well-being SDG 10: Reduced Inequality	3.4: Promote mental health and well-being. 10.2: Empower and promote the social, economic and political inclusion of all.
”raising awareness about social, cultural, and economic conditions for different outdoor activities”	SDG 4: Quality Education SDG 11: Sustainable Cities and Communities	4.7: Ensure all learners acquire knowledge and skills needed to promote sustainable development. 11.a: Strengthen links between urban, peri-urban and rural areas.
”access to green areas in urban environments”	SDG 11: Sustainable Cities and Communities	11.7: Provide universal access to safe, inclusive and accessible, green and public spaces.
”find a place in their vicinity where they experience happiness and joyfulness and that they could reach and stay without negatively affecting the environment”	SDG 3: Good Health and Well-being SDG 12: Responsible Consumption and Production	3.9: Reduce illnesses and death from environmental pollution. 12.8: Ensure people have relevant information and awareness for sustainable lifestyles.

TABLE 4 Possible relations between the theme outdoor education and care of nature and SDGs and specific targets.

Text excerpt	SDG	Specific target
”teach about the right of public access”	SDG 15: Life on Land SDG 16: Peace, Justice and Strong Institutions	15.1: Conserve and sustainably use terrestrial ecosystems. 16.3: Promote the rule of law and ensure equal access to justice.
“by working with the right of public access and conducting activities in nature, we teach the students to take care of the environment according to the rules of the right of public access”	SDG 4: Quality Education SDG 15: Life on Land	4.7: Ensure all learners acquire knowledge and skills needed to promote sustainable development. 15.2: Promote sustainable forest management.
“through the instruction of outdoor education, and how to prepare and conduct outdoor activities, one can highlight the importance of sustainable development, so that we can continue to benefit from the natural values that are accessible to everyone through the right of public access”	SDG 4: Quality Education SDG 12: Responsible Consumption and Production	4.7: Ensure all learners acquire knowledge and skills needed to promote sustainable development. 12.2: Achieve sustainable management and efficient use of natural resources.
“the fundamentals of the right of public access, and [allow them] to develop a positive connection with nature that they carry into their stance on sustainable development”	SDG 4: Quality Education SDG 15: Life on Land	4.7: Ensure all learners acquire knowledge and skills needed to promote sustainable development. 15.3: Combat desertification and restore degraded land and soil.
”knowledge about animals and plants”	SDG 15: Life on Land	15.5: Take urgent and significant action to reduce the degradation of natural habitats and halt the loss of biodiversity.
”knowledge about decomposition time of various materials”	SDG 12: Responsible Consumption and Production	12.5: Reduce waste generation through prevention, reduction, recycling, and reuse.
”impact of outdoor life on protected forest and land, extinct species and vegetation, nature reserves and animal protection”	SDG 15: Life on Land	15.1: Conserve and sustainably use terrestrial ecosystems. 15.5: Take urgent action to reduce the degradation of natural habitats and halt biodiversity loss.
”plan outdoor activities based on a SD perspective, such as social and economic perspectives of SD, as well as how individual choices of outdoor activities may affect the environment”	SDG 4: Quality Education SDG 12: Responsible Consumption and Production	4.7: Ensure all learners acquire knowledge and skills needed to promote sustainable development. 12.8: Ensure people have information and awareness for sustainable lifestyles.

studies, science studies, biology, geography, and home and consumer studies. Some participants teach multiple subjects and combine content from PE with science studies, home and consumer studies, etc., to address SD perspectives more comprehensively. Many examples mentioned were whole-school projects with various themes, and with PE content integrated. The themes focused on SD, the SDGs,

TABLE 5 Possible relations between the theme interdisciplinary projects and SDGs and specific targets.

Text excerpt	SDG	Specific target
”collaborate with teachers from other school subjects, such as civics and social studies, science studies, biology, geography, and home and consumer studies”	SDG 4: Quality Education	4.7: Ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles.
”whole-school projects with various themes, and with PE content integrated”	SDG 4: Quality Education	4.7: Ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles.
”SDGs, environmental perspectives, recycling and re-use, lifestyles, health, and well-being”	SDG 3: Good Health and Well-being SDG 12: Responsible Consumption and Production SDG 13: Climate Action	3.4: Reduce mortality from non-communicable diseases and promote mental health. 12.5: Reduce waste generation through prevention, reduction, recycling, and reuse. 13.3: Improve education, awareness, and human and institutional capacity on climate change mitigation and adaptation.
”friendship and cohesion among peer groups”	SDG 10: Reduced Inequality SDG 4: Quality Education	10.2: Promote the social, economic, and political inclusion of all. 4.7: Ensure all learners acquire knowledge for sustainable development, including fostering tolerance and peace.
”Keep Sweden Tidy Foundation, which promotes recycling through public awareness campaigns and environmental education”	SDG 12: Responsible Consumption and Production SDG 4: Quality Education	12.5: Reduce waste generation through prevention, reduction, recycling, and reuse. 4.7: Ensure all learners acquire knowledge and skills needed to promote sustainable lifestyles.
”focusing on sustainability at all levels – global, regional, local, individual – where subjects like social studies, biology, home and consumer economics, and physical education collaborated”	SDG 4: Quality Education SDG 11: Sustainable Cities and Communities SDG 17: Partnership for the Goals	4.7: Ensure all learners acquire knowledge and skills needed to promote sustainable development. 11.a: Strengthen links between urban, peri-urban, and rural areas. 17.17: Encourage effective partnerships and multi-stakeholder partnerships.
”sustainable development woven through multiple school subjects, such as home and consumer economics, science, and social studies”	SDG 4: Quality Education SDG 12: Responsible Consumption and Production	4.7: Ensure all learners acquire knowledge and skills needed to promote sustainable development. 12.8: Ensure people have relevant information and awareness for sustainable lifestyles.

environmental perspectives, recycling and re-use, lifestyles, health, and well-being, as well as friendship and cohesion among peer groups. Some participants explicitly mentioned incorporating activities from the Keep Sweden Tidy Foundation, which promotes recycling through public awareness campaigns and environmental education. Statements in this theme include projects “focusing on sustainability at all levels – global, regional, local, individual – where subjects like social studies, biology, home and consumer economics, and physical education collaborated,” as well as projects with focus on “sustainable development woven through multiple school subjects, such as home and consumer economics, science, and social studies.”

Table 5 shows possible relations between the first theme and SDGs and specific target.

3.5 Theme 5: picking waste and recycling

The fifth theme we produced was *Picking waste and recycling*. A frequently stated activity was plogging. The term “plogging” is the result of merging the Swedish verbs for pick up (“plocka upp”) and jog (“jogga”) and represent an environment friendly waste collection technique that combines jogging with litter gathering. There were also statements about organizing waste and litter picking lessons (e.g., as part of orienteering or outdoor education) with elements of recycling. Examples of statements include “‘plogging’ […] where [students] are given the task of jogging and picking up litter, which we then discuss how we would recycle,” and “litter collection in connection with outdoor activities.” Some teachers describe how they discuss with their students how waste and litter affect our local environment and the ecosystem.

Some examples in the fifth theme were explicitly related to right of public access. In this sense, participants stated that they inform and discuss that the freedom and right to access certain public or privately owned land, lakes, and rivers for recreation and exercise comes with obligations to sense of care for the nature, such as leaving the site free from waste and litter.

Possible relations between the fifth theme and SDGs and specific target are shown in Table 6.

3.6 Theme 6: sustainable bodies

The sixth theme we produced was *Sustainable bodies*. The theme contains statements of how participants teach about ergonomics (in general) and ergonomics for working life. Some participants state that they teach about *sustainable* working life with the common

TABLE 6 Possible relations between the theme picking waste and recycling and SDGs and specific targets.

Text excerpt	SDG	Specific target
"plogging […] where [students] are given the task of jogging and picking up litter, which we then discuss how we would recycle"	SDG 3: Good Health and Well-being SDG 4: Quality Education SDG 12: Responsible Consumption and Production	3.4: Promote mental health and well-being. 4.7: Ensure all learners acquire knowledge for sustainable development. 12.5: Reduce waste generation through prevention, reduction, recycling, and reuse.
"litter collection in connection with outdoor activities"	SDG 12: Responsible Consumption and Production SDG 15: Life on Land	12.5: Reduce waste generation through prevention, reduction, recycling, and reuse. 15.1: Conserve and sustainably use terrestrial ecosystems.
"how waste and litter affect our local environment and the ecosystem"	SDG 4: Quality Education SDG 12: Responsible Consumption and Production SDG 15: Life on Land	4.7: Ensure all learners acquire knowledge for sustainable development. 12.8: Ensure people have relevant information for sustainable development. 15.9: Integrate ecosystem and biodiversity values into planning.
"explicitly related to right of public access"	SDG 15: Life on Land SDG 16: Peace, Justice and Strong Institutions	15.1: Conserve and sustainably use terrestrial ecosystems. 16.3: Promote the rule of law and ensure equal access to justice.
"freedom and right to access certain public or privately owned land, lakes, and rivers for recreation and exercise comes with obligations to sense of care for the nature, such as leaving the site free from waste and litter"	SDG 15: Life on Land SDG 16: Peace, Justice and Strong Institutions	15.2: Promote sustainable forest management. 16.3: Promote the rule of law and ensure equal access to justice.

denominator of focusing on developing physical abilities and knowledge and skills required to prepare the body to be able to function and sustain throughout the course of a working life, including working postures and loads. Some statements include focusing on "sustainable health [and] establishing favorable conditions for the body in preparation for future professional life, including ergonomic," and working with themes, such as "ergonomics, work environment, postures, and physical strain".

Furthermore, several participants mention projects labeled as the "sustainable body" where they teach about the value of taking care of the body, both from physiological and psychological perspectives. In relation to this, there were examples that focus on the importance of developing healthy habits in early stages of life, as well as how students actively could affect their health over time.

Table 7 shows possible relations between the sixth theme and SDGs and specific target.

3.7 Theme 7: sustainable lifestyles, health, and well-being

The seventh theme we produced was *Sustainable lifestyles, health, and well-being*. The theme contains statements of how the participants teach about the importance of engaging in everyday physical activity, sometimes with focus on meaningful physical activity. As part of this, participants pay attention to active transportation, such as walking and cycling to school, leisure time activities or work, and its implication for health and well-being, as well as the environment. Some examples include teaching about different modes of active transportation and estimate, among other things, the ecological footprint. Some examples of statements are "encouraging cycling [..], promoting the use of stairs, and incorporating more movement into everyday life," and "encouraging walking or cycling to and from school to increase daily physical activity." In addition, "discussions about the importance of everyone doing their part. Opting for cycling or walking instead of using a car benefit both health and the environment," and "we talked about sustainability and what choices one can make to make as little impact on the environment but big imprints on our health."

Among others, some exemplified projects focus on exercise for health and performance to acquire the knowledge and skills necessary to live an active life. Some statements included "activities linked to understanding one's own body and how it is affected by movement" and teaching about how to "make the body resilient for a lifelong active lifestyle." The participants also described projects where students chose and formulate goals for physical activity and exercise, and then plan, implement, and evaluate the effects of different exercise. As part of the seventh theme, participants also stated that they teach about food and nutrition with attention to not only individual health and well-being but also toward how food habits may affect the environment.

Finally, possible relations between the seventh theme and SDGs and specific target are shown in Table 8.

3.8 Theme 8: sustainable use of products and consumption

The eighth and final theme we produced was *Sustainable use of products and consumption*. This theme contains statements of how participants pay attention to material issues. For instance, they are mindful of selecting sport clothing, shoes, and other sport-related products, considering the importance of reusing available items and opting for eco-friendly or second-hand purchases. Participants also emphasize the value of borrowing instead of buying new sport-related products. Additionally, they discuss the significance of taking care of existing sport-related clothes and challenged the notion that

TABLE 7 Possible relations between the theme sustainable bodies and SDGs and specific targets.

Text excerpt	SDG	Specific target
”ergonomics (in general) and ergonomics for working life”	SDG 3: Good Health and Well-being SDG 8: Decent Work and Economic Growth	3.4: Promote mental health and well-being. 8.8: Protect labor rights and promote safe and secure working environments.
“sustainable health [and] establishing favorable conditions for the body in preparation for future professional life, including ergonomic”	SDG 3: Good Health and Well-being SDG 4: Quality Education SDG 8: Decent Work and Economic Growth	3.4: Promote mental health and well-being. 4.4: Increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment. 8.8: Protect labor rights and promote safe and secure working environments.
“ergonomics, work environment, postures, and physical strain“	SDG 3: Good Health and Well-being SDG 8: Decent Work and Economic Growth	3.4: Promote mental health and well-being. 8.8: Protect labor rights and promote safe and secure working environments.
”projects labeled as the “sustainable body” where they teach about the value of taking care of the body, both from physiological and psychological perspectives”	SDG 3: Good Health and Well-being SDG 4: Quality Education	3.4: Promote mental health and well-being. 4.7: Ensure all learners acquire knowledge for sustainable development.
”importance of developing healthy habits in early stages of life, as well as how students actively could affect their health over time”	SDG 3: Good Health and Well-being SDG 4: Quality Education	3.5: Prevent and treat substance abuse. 4.7: Ensure all learners acquire knowledge for sustainable development.

TABLE 8 Possible relations between the theme sustainable lifestyles, health, and well-being and SDGs and specific targets.

Text excerpt	SDG	Specific target
”importance of engaging in everyday physical activity”	SDG 3: Good Health and Well-being	3.4: Promote mental health and well-being.
”active transportation, such as walking and cycling”	SDG 3: Good Health and Well-being SDG 11: Sustainable Cities and Communities SDG 13: Climate Action	3.6: Improve road safety. 11.2: Accessible and sustainable transport systems. 13.3: Improve education on climate change.
“encouraging cycling [...], promoting the use of stairs, and incorporating more movement into everyday life”	SDG 3: Good Health and Well-being SDG 11: Sustainable Cities and Communities	3.4: Promote mental health and well-being. 11.2: Accessible and sustainable transport systems.
”ecological footprint”	SDG 12: Responsible Consumption and Production	12.2: Sustainable management and efficient use of natural resources.
“discussions about the importance of everyone doing their part. Opting for cycling or walking instead of using a car benefit both health and the environment”	SDG 3: Good Health and Well-being SDG 11: Sustainable Cities and Communities SDG 13: Climate Action	3.4: Promote mental health and well-being. 11.2: Accessible and sustainable transport systems. 13.3: Improve education on climate change.
”we talked about sustainability and what choices one can make to make as little impact on the environment but big imprints on our health”	SDG 3: Good Health and Well-being SDG 12: Responsible Consumption and Production	3.4: Promote mental health and well-being. 12.1: Implement the 10-year framework of sustainable consumption and production.

fashionable clothing is necessary for physical activity and exercise. The participants stated, for example, that they have paid attention to “consumption of sport-related equipment,” “taking care of the [sport-related] material,” “repairing items instead of buying new ones,” and “reusing [sport-related] materials and equipment.” This theme also includes statements about teaching exercises that utilize one's own body weight instead of relying on exercise equipment and facilities that require production resources, transportation, and maintenance.

Table 9 shows possible relations between the eight theme and SDGs and specific target.

4 Discussion

The aim of the present study was to explore what certified compulsory school and upper-secondary school PE teachers in Sweden have taught about SD within their practice. In relation to the first research question, we believe that the examples suggest that the participating PE teachers see distinct subject-specific contributions to aspects of the SD agenda. From our-point-of-view, many of the examples logically differ from other school subjects. The examples tie to the core areas of the subject, which is movement, including physical activity, exercise, and sport, and health and lifestyle, and may not only be an important contribution to the field, but also serve as inspiring examples on what to teach about SD in PE. This may be critical as many PE teachers perceived that they needed professional development education in the area of SD (Fröberg et al., 2022a).

Moreover, SD can be perceived as an elusive concept that challenges teachers' beliefs and perceptions of competence and presupposes major changes in teaching practice. However, several examples, as presented in this study, indicate that it may be possible to include and develop perspectives of SD through minor adjustments

TABLE 9 Possible relations between the theme sustainable use of products and consumption and SDGs and specific targets.

Text excerpt	SDG	Specific target
”consumption of sport-related equipment”	SDG 12: Responsible Consumption and Production	12.2: Sustainably manage and efficiently use natural resources.
”taking care of the [sport-related] material”	SDG 12: Responsible Consumption and Production	12.5: Substantially reduce waste generation through prevention, reduction, recycling, and reuse.
”repairing items instead of buying new ones”	SDG 12: Responsible Consumption and Production	12.2: Sustainably manage and efficiently use natural resources.
”reusing [sport-related] materials and equipment”	SDG 12: Responsible Consumption and Production	12.5: Substantially reduce waste generation through prevention, reduction, recycling, and reuse.

to teaching strategies, such as focusing on peri-urban outdoor education to explore access to green areas in urban environments, including picking waste as part of orienteering, or paying attention to sport-related products and consumption. Similar to previous studies among teachers in other subjects, our findings shows that PE teachers use interactive learning and discussions to reflect over issues and understandings related to SD that may include aspects on transformative learning (see, e.g., Borg et al., 2012; Jeronen et al., 2017; Yli-Panula et al., 2020).

In this context, it is also possible that some of the teachers who indicated that they do not teach about SD in PE (69% of the 2078 participant who completed the survey) have in fact touched on one or more activities, areas or projects that has been described in the present study. On this basis, these PE teachers may already be covering SD perspectives without making explicit references to SD, similar to the arguments by researchers, such as Baena-Morales and González-Víllora (2022) and Lohmann et al. (2021).

It is interesting to note that our previous study indicated that PE teachers in Sweden were relatively skeptical about their ability as teachers to influence areas within the environmental and economic dimensions of SD (Fröberg et al., 2022b). Also, that around 70 percent reported that they were in great need of professional development in the area of SD (Fröberg et al., 2022b). As shown from our analysis, however, several themes may reflect content relevant for these two dimensions of SD. In addition, it should be noted that only two of the eight themes cover areas that has been explicitly related to SD in the supporting commentary material of the PE curriculum in Sweden, i.e., the themes *Outdoor education and care of nature* and *Sustainable bodies* (i.e., ergonomics; see overview in Fröberg et al., 2022a).

In relation to the second research question, we believe that the themes we produced may be related to at least 11 SDGs and 27 specific targets. Together, these themes reflect the social, environmental, and economic dimensions of SD in different ways. For example, the three themes *Equality, inclusion, and norms* (e.g., body ideals, stereotypes, and equality), *Sustainable lifestyles, health, and well-being* (e.g., knowledge and skills necessary for a healthy and active lifestyle), and *Sustainable bodies* (e.g., knowledge and skills required to prepare the body to be able to function and sustain) may reflect the social dimension of SD. The four themes *Outdoor education and care of nature* (e.g., sense of care for the nature, leaving no footprints), *Picking waste and recycling*, *Sustainable use of products and consumption* (e.g., purchasing ecofriendly or second-hand products), and *Sustainable lifestyles, health, and well-being* (e.g., active transportation, accessible space and place for physical activities) may reflect content relevant for the environmental dimensions of SD. Finally, the two themes *Sustainable use of products and consumption* (e.g., re-using available products), and *Sustainable bodies* (e.g., ergonomics for working life) may reflect content relevant to the economic dimension of SD.

The strengths of the present study include the relatively large sample of PE teachers that provided examples of what they have addressed and taught about SD in PE. In terms of limitation, however, those who responded to the survey may also be those who are interested in SD, thus potentially introducing selection bias. Another limitation is that the extent of the descriptions sometimes only contained single words which, in a didactic sense, made a rigorous and robust analysis challenging. For example, some of the described examples for the theme *Outdoor education and care of nature* included single words, such as “outdoor education and right of public access.” In terms of educational goals, aims, actual lesson content etc., we therefore lack detailed information on how the PE teachers plan and deliver the exemplified work areas, activities and/or projects in the classroom. The examples do not concern the design, which is selection of pedagogical and didactic strategy, such as student-centered, authentic learning tasks and critical reflections, which typically is recommended in relation to developing and stimulating SD competences among students.

In relation to above, this study opens for continued research about teachers’ beliefs and professional competence that may challenge the epistemic culture in PE and normative aspects of SD. We suggest that a next step may be to explore in-depth how PE teachers make sense of their teaching and how they interpret and position themselves as policy enactors of curriculum reforms. Teachers often have a great freedom to form their practices but also are also expected to be part of shaping policy directions and practice, for example in relation to SD (Lambert and Penney, 2020). Future studies may also involve professional development studies that include teachers in action research to co-create and outline lesson plans that relates to SD without overlooking the core areas of the subject.

5 Conclusion

The present study indicates that PE teachers in Sweden have addressed and taught about SD in various ways. The findings suggest that PE can have distinct subject-specific contribution to aspects of the SD agenda, but also a role to empower students of how movement, exercise, and sport can be embedded within a broader ecological perspective. The described themes may open for research about what competences that are particularly relevant for PE teachers in the context of SD. The main limitation is the brief descriptions of the examples that, in a didactic sense, made a rigorous and robust analysis challenging. Furthermore, there is a need for practice-based research and systematic professional development where transformative perspectives of learning and models for SD competences and engagement are explored and examined in order to increase knowledge of teaching and learning processes in relation to SD in PE among both teachers and students.

Data availability statement

The generated datasets are available upon reasonable request to the corresponding author. Requests to access the datasets should be directed to andreas.froberg@gu.se.

Ethics statement

Ethical approval was not required for the studies involving humans because the study design and its procedures were in accordance with the ethical standards of the Declaration of Helsinki. The study does not deal with sensitive topics, and no personal information was collected. Prior to the completion of the survey, the participants receive information regarding the aim and procedure of the study. Contact information were also addressed if the participants had additional questions related to the study, its design, and procedure. Participation were voluntary and indirect informed consent was obtained, meaning that the participants agreed to the terms and conditions of the study when they had filled out and submitted the survey. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

AF: Conceptualization, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. PW: Formal analysis, Writing – review & editing. SB-M: Formal analysis, Writing – review & editing. SL: Formal analysis, Methodology, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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