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Education for Sustainable Development from a Comparative Subject Didactic Perspective

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Education for sustainable development (ESD) is an approach to teaching that aims to develop students' readiness to take action for sustainability. In policy and research, ESD is described as a generic progressive teaching approach with a holistic content that includes subject matter related to environmental, social and economic issues. Consequently, ESD is a multifaceted teaching approach, and a question that then arises is how teachers, who are trained in one or a few subjects, can contribute to the different facets of ESD. In this article, ESD is viewed from a subject didactic perspective. Based on empirical studies it is shown how teachers from different subject areas (social sciences, natural sciences and linguistics) understand ESD, and what they can contribute to the different facets of ESD based on their subject traditions. Also, how ESD can be strengthened by relating ESD to subject didactic perspectives based on examples from language and biology teaching is provided. The article argues that different subject teachers possess different competences based on their subject didactic traditions that in combination can lead to greater opportunities to develop students' action competencies for sustainability compared to general teaching approaches where these disciplinary competencies are not considered.

Introduction – Education for Sustainable Development and Subject Didactics

Education for sustainable development[1] (ESD) is an approach to teaching that aims to develop students' readiness for sustainability issues. In policy documents for schools from the United Nations Educational, Scientific and Cultural Organization (UNESCO) and other international and national steering groups, ESD is usually described as a generic approach to teaching with a holistic content that includes subject matter related to environmental, social and economic issues (e.g. UNESCO, 2017). In such a generic approach the focus of teaching is on the pedagogy used such as inquiry, self-directed learning, participation and problem-solving irrespective of the content at hand. Moreover, the content in ESD is related to authentic, complex interdisciplinary problems rather than disciplinary knowledge. Consequently, ESD discourse often advocates the inclusion of interdisciplinary perspectives and calls for the development of learners' generic competencies, as for example critical thinking and systems thinking, with the aim of capacity-building so that the learner can take action for sustainable development (Vare, 2022).

In this way ESD, compared to traditional subject based teaching, promotes a progressively oriented teaching approach that emphasizes student-centered, inquiry-based learning, and active engagement. It focuses on cultivating critical thinking, creativity, and social

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responsibility in students. The reason for this progressive perspective within ESD is the aim to engage students in authentic real-world sustainability issues (Gericke, 2022). Based on this description, we can see that ESD is multifaceted, and a question that then arises is how teachers, who are trained in one or a few subjects, can contribute to the different facets of ESD. In this article, I draw on empirical studies that have looked at how teachers from different subject areas (social sciences, natural sciences and linguistics) understand ESD, and what they can contribute to ESD based on their subject traditions (Sund & Gericke, 2020; Sund, Gericke & Bladh, 2020). Also, how ESD can be strengthened by relating ESD to subject didactic perspectives in teaching language and science is argued from theoretical and empirical studies (Lampert et al., 2023a,b,c; Maijala et al., 2023). Different subject teachers possess different competences related to the didactic questions of *what, how* and *why*. Based on these didactic questions, I suggest that a subject didactic perspective, where different subject didactic approaches are combined, can lead to greater opportunities to develop students' action competence than a more general teaching approach where disciplinary aspects of teaching are not used.

The Content Dimension of Education for Sustainable Development

ESD is a concept that has been developed at a policy level in response to an increasing awareness that environmental education, a major curricular area for over 50 years in Sweden and many other countries (Gericke et al., 2020), has not realized its potential to influence the way we live, and has not promoted a more sustainable lifestyle. Environmental education focuses on teaching students about specific environmental problems, such as climate change, eutrophication of fresh water, and ozone layer depletion. These topics have usually been incorporated into the teaching of school subjects most relevant to key aspects of the identified problem, such as biology, geography and civics, but it has also been taught as a specific subject, i.e. environmental science. Independent of the context in which the teaching has occurred, the underlying educational idea has been the same, to transmit factual knowledge about how and why the problems emerge, and what can be done to counter them. The fundamental assumption is that a better understanding of the specific environmental problems will foster a degree of civic knowledge that will then encourage people to act at personal and societal levels in ways that will gradually solve those problems. From this standpoint, environmental issues are seen from a disciplinary perspective, or rather a school-subject perspective, that should be addressed as separate problems that can be solved by improving the level of general knowledge among students and, as students finish their education and leave school, among citizens.

As we now know, greater knowledge of environmental problems does not automatically translate into more environmentally favorable behavior when students leave school and participate in society (Kollmuss & Agyeman, 2002). Therefore, environmental education and environmental education research have been reoriented to address affective aspects of teaching and learning, in addition to cognitive aspects (Marcinkowski & Reid, 2019). In this way environmental education has been reoriented toward sustainability education or ESD.

The field has drawn inspiration, and developed concepts related to attitudes, values, emotions and behavior, from psychological research, recognizing that all aspects of students' consciousness must be addressed for educational initiatives to engender changes in the way they live and act. Consequently, teaching approaches intended to transform learners through education, often described as more progressive, have frequently been advocated in sustainability education research (Eilam & Trop, 2010). These more progressive and holistic teaching approaches, positioned outside the school subject syllabi, are referred to collectively as ESD. The need for ESD has been identified and propagated at a political level, often internationally within the realm of the UN and its subordinated organizations such as UNESCO. The ideas behind ESD have then been developed in a reciprocal process between policy and educational research (Vare et al., 2022). The definition of ESD from UNESCO's educational policy is:

> "ESD does not only integrate contents such as climate change, poverty and sustainable consumption into the curriculum; it also creates interactive, learner-centred teaching and learning settings. What ESD requires is a shift from teaching to learning. It asks for an action-oriented, transformative pedagogy, which supports self-directed learning, participation and collaboration, problem-orientation, inter- and transdisciplinarity and the linking of formal and informal learning. Only such pedagogical approaches make possible the development of the key competencies needed for promoting sustainable development."
> (UNESCO, 2017, p. 7)

The first sentence of this quote mentions "integrate contents", which refers to a multidisciplinary perspective on ESD that relates to predefined learning outcomes, often related to specific content knowledge. This aspect of ESD relates to the *what* question of education, which is at the center of subject didactics research, where content knowledge is viewed as central for a subject.

In the ESD discourse, taught content is viewed holistically, and environmental problems are regarded as socio-political problems, because of the need to resolve socio-economic conflicts of interest (Öhman, 2004). ESD is often related to the United Nation's (UN) 17 global goals for sustainable development (UN DESA, 2023), which are authentic, complex and multidisciplinary goals. Therefore, a holistic perspective on sustainable development, which integrates ecological, economic and social aspects, is promoted in ESD. This way of understanding the content of ESD is often referred to as the three-pillar model (Giddings et al., 2002, see Figure 1), comprising three circles symbolizing three dimensions that overlap each other, with a common area at the center. The three-pillar model is often described as a suitable way of operationalizing ESD, because the work can easily be structured in each of the three areas (e.g. Gough, 2002), and it is often included in official steering documents describing ESD content. However, the model has been criticized. For example, the equal size of the three circles does not generally represent real-life situations, nor is it always an accurate way of portraying their relationships (Giddings et al., 2002). There is also a risk that the dimensions are viewed as being separate, which allows trade-offs between environmental, social and economic perspectives and priorities, and justifies prioritization of one dimension

at the expense of others (Giddings et al., 2002). In many situations, favoring just one of the dimensions is detrimental to the others, such as extracting earth metals for building electric batteries to replace fossil fuels, while not considering the working conditions in the countries where the rare metals are being processed, or creating forest nature reserves while ignoring the needs of communities that have managed the forests for centuries.

Figure 1. The three-pillar model of sustainable development indicating the different dimensions of sustainability (Giddings et al., 2002).

From an eco-justice perspective, the three-pillar model has been criticized for being anthropocentric, focusing on the needs and interests of humans at the expense of other organisms, because the social and economic dimensions only refer to the needs of humans (Kopnina, 2014). Consequently, a nested model has been proposed in which natural resources are given priority and boundaries provided for human wellbeing, i.e. the economy and society (Giddings et al., 2002). More recently, a "doughnut" model was developed by Raworth (2017), where, as a compromise, social needs and natural resources are given equal importance. This model has its roots in social standards and Earth systems science, and thus it illustrates the social demands and ecological boundaries that must be met in the quest for sustainable development (Raworth, 2017). Nevertheless, human perspectives are still the focus, which is an inevitable consequence of addressing sustainability and development simultaneously. However, as stated by Sterling (2020), viewing the relationships between humans and the environment in a dualistic way is an abstraction. In reality, there are no clear or visible boundaries between society and the environment. Humanity is part of nature and not a separate entity. Therefore, from a subject didactic perspective on ESD, the focus of this paper, the content in ESD needs to be addressed from a comparative multidisciplinary perspective taking advantage of insights from several disciplines when disentangling complex ESD issues.

As can be seen, many of these complex issues can be understood with concepts and theories from different disciplines, such as geological sciences, biological sciences, economic theories and political sciences. One very well-known example of the disciplinary implications is the economy and the concept of *economic growth*, which is a contested part of ESD (Costanza et al., 2013). There are competing theories about how to best organize society and define economic progress. One theory is the neo-classical economic concept of sustainability, which

is also referred to as weak sustainable development (Nilsen, 2010). Most economists use this definition of economic progress, and it can be defined as a form of sustainability in which utility or consumption does not decline over time (Pezzey, 2017). Hence, the aim of this theory is never-ending economic growth. This view of sustainable development resonates with the three-pillar model, in which the dimensions are given equal importance, but it would not resonate with a nested model in which priority is given to the environment and natural resources.

Perceiving wealth this way has also been criticized, and a competing theory exists that is often presented by professionals who refer to themselves as ecological economists (Nilsen, 2020). They argue that natural capital should be preserved for future generations and consider zero economic growth to be a viable option. In other words, nature is seen to be central, and it must be sustained before considering economic growth. The ecological economist view of sustainable development is also referred to as strong sustainable development (Nilsen, 2010). Consequently, from a content perspective, there is a need for a holistic perspective within ESD that draws from different disciplinary theories in order to understand and disentangle issues related to sustainable development (Juuti & Gericke, 2022). However, one discipline is not enough: a multidisciplinary perspective is needed, including perspectives from the sciences (environment) and social sciences (economy and society). After reviewing the content let us now turn to the purposes and teaching approaches for ESD, which also have implications for subject-specific education.

The Purpose and Approaches to Education for Sustainable Development

ESD may be described and understood in various ways, as discussed by Vare and Scott (2007), who used the terms ESD 1 (promotion of informed skilled behavior) and ESD 2 (capacity-building and action competence) as a typology to describe the two main educational approaches to ESD in policy and research. References to both ESD 1 and 2 are evident in international policies (e.g. UNESCO, 2017), national curricula such as in Sweden (Education, 2011) and research literature (e.g. Eilam & Trop, 2010), but I would argue that the more progressive and transformative ideas of ESD 2 are the most apparent, addressing the purpose and approaches to teaching, with less focus on the content.

Most of the UNESCO quote defining ESD (see above) does not describe content knowledge, but rather refers to the purpose, the 'why?', and the teaching approach, the 'how?'. The policy text talks about "key competencies" that should be developed by using "learner-centered" teaching approaches of "self-directed learning, participation and collaboration". Here, the focus is on the students, or the learners, and how to develop the students' identity and motivation, to become agents themselves. This definition resonates more with an ESD 2 perspective, using the vocabulary of Vare and Scott (2007), with the aim of capacity-building to take action for sustainable development. The teaching also revolves around complex questions for which there are no definite answers, and pluralistic perspectives are necessary to reach decisions that affect many stakeholders with different interests and values. Thus, ESD applies learner-centered, interactive teaching strategies that involve critical thinking,

participatory decision-making, value-based learning and multi-method approaches (Öhman, 2004).

If we relate this policy view to scholarly writings and definitions from educational research, a similar picture emerges. The research literature on ESD calls for developing students' competences (Vare et al., 2022) rather than their conceptual knowledge. Important competences mentioned in the literature include systems thinking (such as multidimensionality, scales from local to global and feedback loops), future thinking (such as understanding deep time and scenario thinking), values thinking (such as risk analysis and ethical issues), strategic competence (such as organizational change and transformations) and interpersonal competence (reflexivity, participation and teamwork) (Wiek et al., 2011). Hence, in the ESD discourse of teaching and learning, it is not the knowledge that is the focus, to tutor well-educated citizens. Instead, the focus is on the way we as citizens can make use of this knowledge by taking action. This ability of action taking has been termed in the ESD discourse as competences or competencies (e.g. Wiek et al., 2011), skills (Rieckmann, 2018) and capabilities (Sen, 1999; Nussbaum, 2011). This move toward competence-based education instead of knowledge-based education has been referred to by Vare (2022) as "the competence turn", and is reflected both in policy and research in ESD. The competence turn marks a shift away from what is taught (the content) to what is learned (the outcomes of learning), and the competences that can be developed by schooling. The main idea behind this is to empower students to be able to make decisions and act upon them regarding complex sustainability questions in which both values and facts need to be considered for issues with no easy solutions.

Within the ESD discourse there is also a distinction to be made between sustainability competence frameworks, which describe what all of us should learn, and ESD competence frameworks, which describe the professional competences that teachers need to teach ESD in a way that develops students' competencies (Vare, 2022). None of these frameworks considers the subject-specific aspect, but rather they all regard the competences as generic attributes. Besides the previously mentioned competence framework by Wiek et al. (2011), many frameworks have been developed by different policy makers, such as the Curriculum, Sustainable Development Model by the organization Environment and School Initiatives (Sleurs, 2008), and the Definition and Selection of Competences (DeSeCo) by OECD (2002). The more recent GreenComp framework (Bianchi et al., 2021) defines four areas containing 12 competencies: embodying sustainability values, including the competences of valuing sustainability, supporting fairness and promoting nature; embracing complexity in sustainability, including the competences of systems thinking, critical thinking and problem framing; envisioning sustainable futures, including the competences of futures literacy, adaptability and exploratory thinking; and acting for sustainability, including the competences of political agency, collective action and individual behavior. Perhaps the most influential framework comprises the ESD competences for educators developed by the United Nations Economy Commission for Europe (UNECE, 2012). This summarizes 39 competences under three broad headings that should be accommodated: a holistic approach, envisioning change and achieving transformation.

From these more eminent examples of competence frameworks, we can see that the competence-based ESD aligns with the ESD 2 tradition of teaching that does not consider the discipline. Hence, in most of these frameworks the disciplinary aspect of schooling is a low priority, and an authentic and more whole-school approach to teaching is the norm. Interestingly, however, in the more specialized literature on specific competences, whether or not the competences are general or subject specific is a lively debate. For example, critical thinking is regarded as an important aspect of ESD (Munkebye & Gericke, 2022). Within the literature on critical thinking, there has long been a discussion about whether competences of critical thinking are domain specific or can be generalized across different contexts and disciplines (Lai, 2011). There is a broad consensus that content knowledge plays an important role when thinking critically, because we need to know something to think critically about it (Willingham, 2008). However, on the one hand, Ennis (1989) has suggested that critical thinking is generic and can be taught separately from any specific discipline-based content. While, based on a Delphi study, Facione (1990) supports this view, McPeck (1981), on the other hand, claims that critical thinking is expressed differently according to the discipline that it is practiced within, and criteria for critical thinking that apply in one discipline do not necessarily apply in another. For example, the competence to use mathematical statistics could be viewed as important to thinking critically and without mathematical content knowledge it would be difficult to assess statistics critically.

In this article the assumption that competences are generic is problematized, as often assumed in competence frameworks. The many different competences, such as the 39 proposed by UNECE (2012), might actually be related in different ways to different disciplines or school subjects. To draw from the GreenComp framework (Bianchi, 2021), the competence of promoting nature might be more strongly associated within environmental science or biology, while supporting fairness could be linked to ethics education, and political agency to civics. The argument being made is that school subjects and disciplines might also be of importance in a competence-driven ESD curriculum based on an ESD 2 perspective.

Still, the multiple competences promoted by ESD are hard to place within content regulated curriculum and school organization, raising the question of who should teach and implement all these competences. One method commonly proposed to address this problem is to organize all the competences under one umbrella of ESD (UNESCO, 2017). The general aim of ESD is often described as fostering the development of action-competent citizens. The concept of action competence has been defined to promote three main categories of interconnected sub-competences or dispositions: knowledge of action possibilities, confidence in one's own influence, and the willingness to act (Breiting & Mogensen, 1999).

The first sub-competence relates to a knowledge of action possibilities and involves strategies for future actions (Bandura, 2006). It is about strengthening people's competences to seek information and build knowledge. The second sub-competence is about the empowerment of people and their self-confidence, enhancing their feeling of confidence and competence to enact the knowledge. This implies that competence does not solely depend on knowing what is needed and possible. Self-efficacy, feeling competent to deal with complex sustainability issues, is also important (Bandura, 2001). The need to be effective therefore corresponds to

the second sub-construct of action competence toward ESD. The third sub-competence relates to the need for meaningful actions, which stems from people's need and willingness to engage and make a difference (Kaplan & Kaplan, 2009). Within the action competence concept, this is defined as a latent capacity among individuals; the need for meaningful actions is described as the willingness to act for sustainability. To conclude, to develop action competence people need to have knowledge and the confidence that their actions will make a difference, and to be willing to take action; if one of these sub-components is missing, they will probably not act (Olsson et al., 2020). An action-competent person can be described as:

> "[…] someone who is committed and passionate about solving a societal issue, has the relevant knowledge about the issue at stake as well as about the democratic processes involved, takes a critical but positive stance toward different ways for solving it, and has confidence in their own skills and capacities for changing the conditions for the better." (Sass et al., 2020, p. 303)

Empowering present and future citizens with the ability to take action for sustainability is often proposed as the ideal goal for ESD in both policy and research (Mogensen & Schnack, 2010; Olsson et al., 2022; UNESCO, 2017). To promote action competence becomes an overarching goal of ESD that all teachers, regardless of subject specialty, should educate for. The way to enable students to develop this competence might be to act in informed ways and participate in debates, discussions and decisions about developmental and future oriented issues at both a private everyday level and a societal level (Jensen & Schnack, 1997). In the literature, this is often coupled with authentic learning outside the decontextualized classroom of subject-specific teaching. Consequently, interdisciplinary teaching approaches are suggested within the ESD discourse (e.g. Munkebye et al., 2020). Likewise, for individual competences, teaching for action competence might also be dependent on subject-specific contexts, which will be discussed later in this article. The main question then is how to promote action competence for sustainability in subject-driven education.

The Role of Disciplinary and Multidisciplinary Perspectives on Education for Sustainable Development

As already pointed out, ESD is considered to be of paramount importance to deliver quality education in international policy (UNESCO, 2017). This is also reflected in the national curricula of Nordic countries such as Finland (FNBE, 2014), Norway (Ministry of Education, 2017) and Sweden (Education, 2011), where sustainability is an overriding goal that all teachers, irrespective of the subject they teach, should address. Also, in subject didactic research sustainability has gained importance (Krogh et al., 2022). Needless to say, this perspective is also evident in environmental and sustainability research, based on the argument that sustainability needs to be at the center of all education because of the contemporary global threats facing humankind (Wals & Kieft, 2010). However, there is no consensus within the educational research community of what content or teaching approaches should constitute ESD, although holism, pluralism and action orientation have been proposed as vital components (Sinakou et al., 2019). At a policy level, like the UNESCO quote above, ESD is a container concept including a variety of definitions, often portrayed as long lists of

what ESD can be, but without describing how these ideas about content and teaching relate to each other. Consequently, the ESD discourse often relates to ESD 1 or ESD 2, expanding the gap between the two, and separating subject-specific issues from the progressive approaches of pluralism and participation, which tend toward progressive educational ideals. This gap makes it difficult to enact ESD in real classrooms because ESD 1 lacks the student participation perspective, and ESD 2 lacks the knowledge dimension.

However, Eilam & Trop (2010), in a review of the ESD field, did take a holistic approach, without differentiating between ESD 1 and ESD 2, and outlined a framework comprising four essential components of ESD pedagogy based on accumulated theory and experience in the field. The framework aspires to encompass most prevailing teaching approaches within a set of four basic principles. The first principle, the traditional academic style of teaching and learning, takes place within traditional school subjects and is decontextualized from the learning objective. Eilam & Trop (2010) argue that this principle supports the development of analytical–rational modes of intelligence in the students. The second principle is multidisciplinary learning (inter- and/or multidisciplinary). This approach combines knowledge from a variety of disciplines and is considered capable of supporting the development of competences such as systemic thinking and the formation of linkages between cause and effect within systems (Eilam & Trop, 2010). The third principle, multidimensional learning, can be achieved when the academic learning of the first principle and the multidisciplinary system of the second principle are combined with diachronic and spatial dimensions. It facilitates the development of contextual ways of thinking (Hopkins & McKeown, 2002) and the acquisition of an ability to think "outside the box" and investigate systems in their relation to other systems in space and time. Eilam and Trop (2010) denote the fourth principle as emotional learning, which incorporates emotions in a learning activity that simultaneously activates processes of value and ethics clarification. With this type of learning, students are motivated to carry out activities that make them feel any emotion, ranging from enjoyment to distress, that resonates with the willingness component of action competence. In other words, according to Eilam and Trop (2010), they are led along a path of emotional learning to care. Eilam & Trop (2010) argue further that it is necessary to include all these principles for learning opportunities within ESD teaching to achieve action competence in line with sustainability (Mogensen & Schnack, 2010). However, the principles also represent a hierarchy where each step precedes the other in the development of true ESD.

The framework of Eilam and Trop (2010) is useful in that it recognizes the value of both ESD 1 and ESD 2 perspectives. After considering the importance of their framework, we return to our question of how to enact ESD in regular teaching practice. Most of the literature recommends that ESD should be taught in an interdisciplinary way, based on a holistic perspective of content and pluralistic teaching approaches (e.g. Öhman, 2004; Lijmbach et al., 2002). In education, pluralism emphasizes a democratic approach by striving to promote different perspectives, views, values and emotions when dealing with authentic questions and problems concerning the future of our world (Lijmbach et al., 2002). Moreover, pluralistic teaching has been found to affect students' self-reported pro-sustainability actions (Boeve-de Pauw et al., 2015). Hence, there is good evidence for advocating this aspect of ESD.

However, in this context, the role of the school subject is not entirely clear because of the interdisciplinary nature. Is it even possible for a subject-specific teacher to provide everything that is needed for pluralistic teaching?

Eilam and Trop (2010) argue that ESD teaching, when encompassing all four of their steps, often evolves from being characterized as unidisciplinary, unidimensional and rational, to multidisciplinary, multidimensional and emotional. I would argue that this is not entirely true, because this perspective takes its starting point from the sciences, and possibly social sciences, which have a subject tradition of promoting rational fact-based reasoning. Research has shown, repeatedly, that science teachers tend to focus on scientific facts and concepts in their environmental and sustainability teaching, and have difficulty addressing the more multidisciplinary and emotional aspects of ESD (e.g. Borg et al., 2012; Oulton et al., 2004). The opposite is also true: many humanistic and language teachers do not see meaning in teaching ESD because they cannot identify any knowledge of relevance within ESD according to their disciplinary tradition (Borg et al., 2012; Uitto & Saloranta, 2017). Who, then, should teach ESD, and which subject teachers can contribute to the complex amalgam denoted as ESD?

Together with colleagues, I have investigated this issue empirically using large-scale generalizable studies, to identify the nature of the differences that have already been addressed in previous sections of this article (Borg et al., 2012; 2014). In subsequent studies, we turned our interest from describing differences and identifying barriers to a more constructive perspective, trying to identify in what ways teachers from different disciplines and school subjects can contribute to ESD based on their disciplinary traditions (Lampert et al., 2023a,b,c; Maijala et al., 2023; Sund & Gericke, 2020; Sund et al., 2020). Hence, ESD is then viewed from a subject didactic perspective in which disciplinary traditions and competences can be considered complementary to fulfilling different aspects of ESD and developing action competence among students.

In light of this perspective, in the next section I provide three case studies showing how a subject didactic perspective can be productive in enacting ESD. In the first study, Per Sund and myself carried out focus group discussions with 43 teachers of science, social science or language (including literature) from five lower secondary school (years 7–9) in two municipalities in mid-Sweden. The teachers were divided into 10 subject-specific groups, and asked to discuss their possible contributions to ESD as subject teachers. The findings from this study have been published in two articles (Sund & Gericke, 2020; Sund et al., 2020). In the next section I summarize the results of the study, to shed light on the issue of how we can enact ESD based on a holistic view where aspects of both ESD 1 and ESD 2 can be presented in an integrated way by embracing a subject didactic perspective.

In the second study, with Peter Lampert and Daniel Olsson, we investigated how the generic concept of action competence can be transformed into a content-related topic, i.e. biodiversity, to demonstrate how teaching to develop students' action competence benefits from being contextualized within the realm of a school subject. In this particular case study, biology education was related to the issue of insect decline, and how we can reorient our

teaching in response to that issue to promote action competence for insect biodiversity (Lampert et al., 2023a,b,c). In this project, an educational design research-based approach (McKenny & Reeves, 2018) was developed and evaluated with students in three secondary schools, comprising several hundred students.

In the third study, Minna Maijala, myself and other language education researchers developed a conceptual model on how a transformative language teaching perspective can support ESD teaching (Maijala et al., 2023). Considered together, these studies present a picture of how a subject didactic perspective can contribute to the ESD discourse.

How Can Different School Subjects or Disciplinary Traditions Contribute to Education for Sustainable Development?

Turning to the first example, 43 teachers discussed their contribution to ESD from their respective subject traditions as teachers in science, social science and language (including literature). The discussions from the focus groups were fully transcribed and analyzed based on the didactic what, how and why dimensions of teaching (Sund & Gericke , 2020; Sund et al., 2020). Analysis of the transcripts revealed aspects of ESD teaching that different subject areas shared, and others that were unique contributions, as visualized in Figure 2, where each circle represents the teaching contribution of a specific subject area (including what, how and why aspects), and the overlaps indicate commonalities. In the following text the identified contributions are presented.

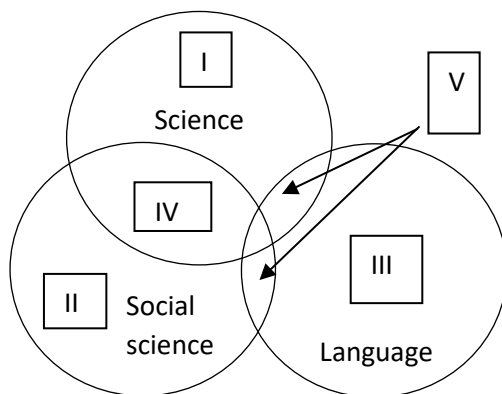**Figure 2**. A Venn diagram illustrating the contributions of science, social science and language subject teaching areas to ESD (from Sund & Gericke, 2020).

The findings regarding the commonalities and unique aspects, indicated by the Roman numerals in Figure 2, are presented in detail in Sund and Gericke (2020), but can be summarized as follows. The science teachers (I; Figure 2) primarily saw their main

contribution as providing scientific facts, connected to the what question, largely relating to the environmental dimension of ESD, such as the consequences of energy use and production, eutrophication, contamination and global warming, which to a large degree could be referred to as ESD 1. Their how question was teacher-centered lecturing, the main aims being to transmit science knowledge and certain competences such as inquiry skills. Their why was to convey knowledge to students that had a perceived value for solving societal and environmental problems such as climate change.

Social science teachers saw their main contribution to ESD primarily to be connected with their disciplinary tradition concerning social justice, international relations, politics, trade and peace (II; Figure 2). Their teaching approach, the how question, differed from the science teachers' methods, often incorporating, for example, critical investigation and group discussions about the consequences of climate change and social justice toward other people and cultures that more resonates with ESD 2. These approaches and methods related to a different why, with the aim of enabling action competence in societal issues.

The language and literature teachers did not have any specific disciplinary content that they considered to be related to ESD, instead they often used media material such as news and nature TV channels as sources of content; in that way their content was assumed to be close to the students' everyday lives. Their teaching included teacher-planned approaches, but also relied on the use of information and communication technology tools for self-study and group work, which meant the lessons could be connected with the world outside school, and there was the potential for students to practice communication. The language teachers considered their main contribution to ESD to be their long-term goal, the why dimension, concerning students' personal development and identity formation, enabling them to feel capable and encouraged to participate in the general development of society (III; Figure 2), which is an important feature of ESD 2.

Shared features of the science and social science teachers' teaching of ESD included curricular commonalities (IV; Figure 2), such as climate change issues. These teacher groups felt that they had the most in common, and could therefore easily collaborate within ESD 1 related issues using multidimensional and multidisciplinary perspectives. The language teachers felt they had the least in common with the other teacher groups, any overlap mostly relating to media content (V; Figure 2), and therefore had the least incentive for collaboration (for more details see Sund & Gericke, 2020). What this study shows is that, if we are looking beyond the content perspective for ESD, and also address a more progressive and holistic perspective, different subject traditions contribute unique subject didactic perspectives linked not only to the content (ESD 1), but also to the approach and purpose of education (ESD 2). At the same time, there are also overlaps that can function as collaborative starting points within multidisciplinary ESD. Overall conclusions based on these results will be presented below, after presenting the results of the other two case studies.

The second study shows how the generic and overriding purpose of ESD, to develop students' action competence for sustainability, as in ESD 2, can be operationalized in a subject-specific curriculum (Lampert et al., 2023a,b,c). Teachers and teaching are always

occupied with teaching about something. Although more progressive teaching aims to develop competences, the actual teaching enacted needs to address some content, and, as discussed earlier in this article, content also matters in ESD. If we want students to develop action competence, they need to develop it in relation to an issue of relevance for sustainability. In this project, the teaching design, comprising the previously mentioned sub-concepts of action competence, was connected with suggestions of direct and indirect actions, as proposed in the literature, to sustain action biodiversity. This led to the development of the Action Competence for Insect Conservation (ACIP) framework, which is an educational framework for transformational change in biology and sustainability education (Lampert et al., 2023a). A teaching design consisting of eight modules was developed and tested in three schools. The teaching design focused on students developing competences relating to direct actions, such as creating a diversity of plants in gardens, to create space and food for insects, avoiding using pesticides, and mowing the lawn less often. Indirect actions included buying insect friendly products and promoting positive attitudes towards insects among friends and relatives. These actions were included within progressive teaching approaches that were also enacted in authentic learning environments outside the school as from an ESD 2 perspective (for an overview see https://www.actionsforinsects.com/). In conclusion, a subject didactic perspective of biology education on insects, their ecology and their relationship with humans was applied referring to ESD 1. The argument being made here is that the subject perspective of biology was decisive for operationalizing ESD 2-directed teaching aiming to develop action competence. Once again, the subject didactic perspective was important to enable the full potential of ESD relating ESD 1 and ESD 2 to each other.

In the third study, a project investigating a subject didactic perspective within language education, Maijala et al. (2023) developed a didactic model for teaching ESD in language education. The most important difference between the teaching of languages compared with the teaching of subjects such as science and social science is that the goal of language learning is communication, which can only be achieved through communication, i.e. by practicing the competences being developed. Consequently, the teaching approaches and the learner are at the fore within the language teaching tradition, which very much overlaps with the progressive ideas of ESD (Maijala et al., 2023). Contemporary and relevant theories of language education view language learning as a dynamic process in which the learner should be active and acquire competencies by participating in democratic processes. Hence, the current goal of language teaching is not simply to transmit knowledge; rather, besides communication, the goal is to teach how to reflect on cultural differences and understand representatives of other cultures in that language (Liddicoat, 2014).

The Common European Framework of Reference for Languages (CEFR) (Council of Europe, 2001; 2018) has defined general goals of language teaching in Europe since the beginning of the 21st century. CEFR offers an action-oriented approach to language teaching and learning presented within an educational framework. Based on the similarities and overlap between the CEFR framework (Council of Europe, 2001; 2018) and the action-oriented ESD framework by Sinakou et al. (2019), Maijala et al. (2023) developed a didactic model for transformative language teaching for sustainability, which relates to ESD 2. This model

shows how contemporary, learner-oriented language teaching can foster the important competencies and skills needed to achieve the goals of ESD. A framework is developed that integrates transformation-oriented ESD into subject didactic-oriented language teaching in a way that considers and utilizes the special features of language teaching. This third example again shows that ESD teaching can benefit from, and be developed by, a basis in subject didactic perspectives.

Conclusion – The Contribution of a Comparative Subject Didactic Perspective to Education for Sustainable Development

The aim of this paper is to show how a subject didactic perspective of ESD can facilitate different aspects of ESD including ESD 1 and ESD 2 perspectives. Empirical examples have been used to illustrate how a subject didactic perspective can strengthen the ESD discourse. As evidenced in a study of science, social science and language teachers, the teachers' own subject-specific traditions and competences cover different aspects of ESD (Sund & Gericke, 2020). Hence, a multidisciplinary perspective using the different subject didactic traditions and competences are almost a prerequisite for enacting a more progressive-oriented ESD, incorporating aspects of what Vare & Scott (2007) denote ESD 1 and 2. However, studies also show that language teachers do not usually consider ESD relevant within their teaching (Borg et al., 2012; Uitto & Saloranta, 2017), and instead consider language to be a help-subject, with the assignment of developing basic competences such as reading and writing, and communicative skills such as argumentation. The reason for this alienation of language teachers in ESD discourse is due to that ESD often is interpreted with a lens from ESD 1, but as shown here, when also embracing ESD 2, subject traditions of language education become a crucial and important facet of ESD.

The most interesting findings in the study by Sund and Gericke (2020) were that literature and language teachers identified the possibility of developing students' agency and identity formation, enabling them to feel capable and encouraged to participate in the general development of society. In literature and language education, the disciplinary tradition is not to teach predefined concepts, as in science and social science education. Instead, besides developing skills such as reading and argumentation, the very purpose of the subject is self-formation, helping students build self-identity and self-efficacy, and become independent actors in society. This subject-specific purpose of literature and language education very much resonates with an ESD 2 perspective and the idea of action competence. As shown in the study by Maijala et al. (2023), it is even possible to conceptualize how language teaching can support ESD. The point being made here is that literature and language teachers include disciplinary competence in how to teach important aspects connected with emotional and affective issues, which research has shown are often difficult to enact in ESD (Eilam & Trop, 2010). If ESD, as argued by Eilam & Trop (2010), is to develop from unidisciplinary and unidimensional teaching toward multidisciplinary, multidimensional and emotional teaching, it will be beneficial to include the subject didactic traditions of different disciplines, and have a broad focus emphasizing all of the why, what and how perspectives of teaching. If so, the potential for developing a more holistic ESD teaching is favorable. I would argue that the subject didactic perspective has been neglected within the ESD discourse, and such a

perspective opens up new possibilities for developing ESD practices with the potential to develop action competence for sustainability. The study by Lampert et al. (2023a,b,c) provides an example of how the subject didactic perspective in biology education can be operationalized and provide content for the overriding educational purpose of ESD: to promote action competence for sustainability.

The comparative subject didactic perspective in this article has contributed to an understanding of ESD in a different way than commonly understood in ESD discourse. According to Nielsen (2012) there is a controversy whether subject didactic research only should address subject specific issues at the core of a discipline, or if it should address subject specific issues also in relation to more general didactic or pedagogical issues where the subject is one aspect among others. This article has shown, I would argue, that a subject didactic perspective is very useful also in more holistic perspectives on education such as ESD. Especially, the subject didactic perspective is important in secondary school, where teachers most often identify themselves as subject teachers, and their teaching mostly rely on the subject syllabi of the curriculum. Consequently, if teachers are supposed to adopt to ESD in their teaching practice a subject didactic perspective is important. In addition, the comparative subject didactic perspective of ESD might provide the incentives for subject teachers to participate in ESD. One teacher cannot fulfill all the promises of ESD, but the comparative subject didactic perspective, as exemplified in this article, shows what a teacher with a specific subject specialization can contribute with, and actually what the teacher is already an expert in contributing. To be given the opportunity to enact this expertise makes it much more probable that subject specific teachers will engage in inter- and multidisciplinary teaching, which is needed in relation to teaching approaches such as ESD.

More studies are needed to investigate the full potential of what the subject didactic perspective can contribute to ESD. Hence, this paper is a call to develop more studies from a comparative perspective, integrating subject didactics and ESD.

Notes

1. In the literature various terminology, with similar meanings, has been used to address Education for Sustainable Development (ESD) such as Environmental Education, Education for Sustainability, Sustainability Education etc. Therefore, Environmental and Sustainability Education (ESE) has been proposed as a common label to all these approaches in order to focus on what they have in common rather than addressing possible differences between them. Here I have chosen to use the label of ESD rather than ESE because it is the most commonly used term in policy and steering documents. However, I consider ESD more or less synonymous with the other approaches here mentioned, i.e. they all aim to transform the actions of the students in a more sustainable way based on teaching approaches. Further, the possible differences in meaning between the approaches are not meaningful to outline herein considering it is not the focus of the article. For the interested reader I refer to other publications, see for example Smyth (2008).

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