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A search for the holistic perspective in education for sustainable development

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Abstract

The work in this thesis centers on upper secondary students’ views of the environmental, social and economic dimensions of sustainable development and their interconnectedness. The focus has been to study the diversity of students’ views in various contexts. The research uses as its starting point the aims of education for sustainable development to facilitate a holistic understanding among students, which implies the consideration of environmental, social and economic perspectives when dealing with issues of sustainability.

A mixed methods and iterative approach was applied in this research. Two data sets were collected: one larger-scale data set from 638 students in grade 12 (aged 18-19) on science and social science programs, and one smaller set involving 18 students of similar age and programs. In the first data collection exercise, the students responded to questionnaires investigating their sustainability consciousness and decision-making within different everyday contexts. The aim of the second data collection exercise was to study, in-depth, patterns of students’ views on the interconnectedness of sustainability dimensions.

The results reveal a diversity of student views that specifically relate to the economic dimension in sustainable development. The economic dimension is perceived differently in their sustainability consciousness, and when they encounter the economic dimension in various sustainability contexts. Moreover, there are four distinctly different beliefs among students about the interconnectedness of the economy and sustainable development. The four beliefs are identified as the un-differentiating positive, the nuanced ambivalent, the two-way convinced and the critical, differing in their arguments about the interconnectedness of environmental, social and economic dimensions. The findings indicate the potential resource students’ views and different contexts can represent in teaching that aims at perspective-shifting and learning about the complexity and dynamic nature of sustainability issues.
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Teresa Berglund, Dömle, 19 February 2020
Preface

I have long time had an interest in environmental issues, and how these complex issues can be taught in a meaningful and engaging way. I have considered environmental issues to be of crucial importance and over the years, this feeling has grown stronger. Today, environmental issues are at center of many debates in society, and young people unite to take collective action for the environment and for their future.

As a teacher in upper secondary school, I have approached the teaching and learning of environmental issues in varying ways over the years. Those experiences made it clear to me that many students perceive environmental issues as important. However, deepening their understanding of the complexity concerning environmental issues was a challenge. At the same time, I had the feeling that these issues offered a huge educational potential, could I only figure out how to approach the complexity of the issues and how I could strengthen a meaningful engagement with the issues. Some students would say to me that there are things in society that we as individuals cannot influence or overcome. Students’ perception of a limited possibility to contribute to change felt unsatisfactory to me. I noted what I have come to understand as a cognitive dissonance in the students’ perception of sustainability and actions to deal with it.

When I had the opportunity to start research studies, I took the chance to focus on education for sustainable development. Since then I have learnt a lot about complexity, which does not become simpler by learning more. Moreover, I have not only learnt about challenges related to education for sustainable development; I have also learnt about the opportunities it offers. I have come to understand that subject teachers have a role not only in the development of students’ disciplinary knowledge, but also in students’ experiences of wholeness in their education. So, how can education support the interconnections between subject disciplines, and how can students learning of the issues that include aspects and disciplinary knowledge from a multitude of subjects, such as sustainable development, be supported? These questions have captured my interest during the years that this research project has
lasted. This thesis is a compilation of the four sub-studies that have been conducted during the research project.
List of papers

Paper I
The implementation of education for sustainable development in Sweden: Investigating the sustainability consciousness among upper secondary students

Paper II
Separated and integrated perspectives on environmental, economic, and social dimensions: An investigation of student views on sustainable development

Paper III
Exploring the role of the economy in young adults’ understanding of sustainable development

Paper IV
Diversity in views as a resource for learning? Student perspectives on the interconnectedness of sustainability dimensions
Teresa Berglund and Niklas Gericke.
Manuscript
Authors’ contributions

Paper I
Teresa Berglund, Niklas Gericke and Shu-Nu Chang Rundgren developed the research ideas, the research design and the research questions. Teresa Berglund conducted the collection of data and performed the statistical analysis. Teresa Berglund wrote the first draft of the paper and interpreted the outcomes of the statistical analysis with contribution from Niklas Gericke and Shu-Nu Chang Rundgren.

Papers II-IV
Teresa Berglund and Niklas Gericke developed the research ideas, Teresa Berglund collected and analyzed the data and wrote the first drafts of the papers. Niklas Gericke made substantial contributions to the design, the interpretation of statistical and qualitative data and in the process of writing.

All authors read and approved the papers before submission.
Table of contents

ABSTRACT ........................................................................................................... 1
ACKNOWLEDGEMENTS .................................................................................. 2
PREFACE .......................................................................................................... 4
LIST OF PAPERS .......................................................................................... 6
  PAPER I ........................................................................................................ 6
  PAPER II ....................................................................................................... 6
  PAPER III ..................................................................................................... 6
  PAPER IV ..................................................................................................... 6
AUTHORS’ CONTRIBUTIONS ...................................................................... 7
  PAPER I ........................................................................................................ 7
  PAPERS II-IV .............................................................................................. 7
TABLE OF CONTENTS ................................................................................ 8
INTRODUCTION ............................................................................................ 10
THEORETICAL FRAMEWORK .................................................................. 12
  THE CONCEPT OF SUSTAINABILITY CONSCIOUSNESS ...................... 16
BACKGROUND ............................................................................................ 18
  SUSTAINABLE DEVELOPMENT .............................................................. 18
  The sustainable development concept .................................................. 19
  Models of sustainable development ...................................................... 21
  Positions on sustainable development ................................................ 24
  Students’ perspectives of sustainable development ............................ 27
    Students’ environmental literacy .......................................................... 29
    Students’ financial literacy ................................................................. 30
ENVIRONMENTAL EDUCATION AND ESD .......................................... 31
  The role of education for sustainable development ............................ 31
  The EE-ESD spectrum ............................................................................ 32
  Swedish school system and curricula .................................................. 34
  School-supporting initiatives in Sweden .......................................... 36
  Education for sustainable development ............................................ 37
    A holistic approach ............................................................................... 38
    Content knowledge beyond the environmental perspective .......... 40
AIM OF THE THESIS .................................................................................. 42
RESEARCH DESIGN DEVELOPMENT ................................................... 42
Introduction

Sustainable development (SD) is a major challenge of our time (Randers, Rockström, Stoknes, Golić, Collste, & Cornell, 2018). Few would contest the idea, so why is it so hard to realize? SD has been a central mission for international organizations, national institutions, many corporations and social and environmental organizations for decades, coordinated and guided by the United Nations ever since the emergence of the SD concept in the early 1980s. From the viewpoint of education, SD is a normative perspective, prescribing something to strive towards. Education for sustainable development (ESD) can be associated with several aims: how the perspective of SD and the implementation of ESD can improve education, and, how education can contribute in the drive towards SD. The point of departure for this thesis connects to both these considerations, centering on the second one.

A common way to structure SD is to consider the three dimensions of environment, society and the economy (e.g. Giddings, Hopwood, & O'Brien, 2002; Kates, Parris, & Leiserowitz, 2005; UNESCO, 2006). The concept of SD embraces great complexity as it ranges across many disciplines of knowledge. SD issues are often described in terms of wicked problems: they are difficult to formulate, they have multiple solutions, which are often incompatible, they are characterized by novelty and uniqueness, the timeframes are open-ended, and underlying them are competing objectives or value systems (Seager, Selinger, & Wiek, 2012, p. 469). In the attempt to achieve SD, education plays an important role and has been assigned a goal of its own among the 17 sustainable development goals adopted by the United Nations in 2015 (United Nations, 2019a). However, issues of the type just described that include knowledge from different subject disciplines, are not the sort of content that education has traditionally been concerned with. As such, it constitutes a challenge, but also, an opportunity. What knowledge teaching should focus on and what competencies are needed among young people in relation to SD is an ongoing discussion.

ESD is often described as a learner-centered educational approach, in which the perspectives of the learners constitute an important part of
teaching (e.g. Wals, 2011; 2015). As the roots of the environmental crisis originate within the socio-economic sphere (González-Gaudiano, 2006), and the scientific knowledge regarding human impact on the environment has not yet transformed into sufficient societal action (Boström et al., 2018), environmental, social and economic aspects should be integrated into the teaching. However, research indicates that there are difficulties among both teachers and students in understanding how the environmental, social and economic dimensions of SD are interconnected (Borg, Gericke, Höglund, & Bergman, 2014; Summers & Childs, 2007; Walshe, 2008; Manni, Sporre, & Öttander, 2013).

The importance of holistic approaches that include environmental, social and economic considerations when dealing with SD issues is accentuated in ESD (UNESCO, 2006; Summers & Childs, 2007; Feng, 2012; Wals, 2015). Through such an approach, students’ understanding of the complexity of SD issues can be facilitated, as well as the development of systems thinking, which is an important competence in the context of SD (e.g. Rieckmann, 2018; Wals, 2015).

Another feature of ESD is that it needs to allow for different perspectives and views to meet in order to foster reflexivity, encourage perspective shifts and develop competences such as critical thinking (Wals, 2011). Despite the emphasis on approaches that incorporate student perspectives in teaching and despite the resource that the diversity of perspectives among students is assumed to constitute for learning (see e.g. Wals, 2011), there is a lack of research focusing on diversity (Boström et al., 2018). A recent review of the sustainability education field indicated a tendency towards individualistic, optimistic, cognitivist and harmonious pictures (Boström et al., 2018). The current research aims to fill this gap by investigating perspectives and views of SD and associated issues among students with a particular focus on diversity. The overall research question that this thesis focuses on is:

*How does the diversity in students’ views of SD and its underpinning environmental, social and economic dimensions take shape in sustainability-related contexts?*
As this thesis centers on this overall research question, some findings in each of the four sub-studies are emphasized more in the presentation of the results.

Since students’ views constitute the focus of the investigation, the findings reveal what the students have learned rather than how they learned it. The students taking part in this research attend Swedish schools and are in their final year of upper secondary education (age 18-19 years). The thesis adds depth to sustainability education research by providing empirical examples of students’ views on SD, with a particular focus on the wholeness, the parts and the interconnectedness between them. The research also adds depth to previous educational research focusing on students’ environmental and economic understanding and their understanding of environmental-economic interconnections. Moreover, the results provide analysis and groundwork for teachers and educators designing environmental and sustainability teaching.

**Theoretical framework**

This thesis is grounded in theories within the field of transformative education, in which critical reflection concerning taken-for-granted-assumptions and perspective shifts in relation to others’ viewpoints are essential aspects of the learning process (Mezirov, 2003; Boström et al., 2018). According to Mezirov (1978), transformation of perspectives has the potential to change the criteria for valuing and taking action, which often leads to a change in behaviors. In the sustainability context, the learning process embraces the value of difference and diversity, reflection and reflexivity, the consideration of social cohesion and capital and the power of collaborative action that empowers individuals (Wals, 2011, p. 181). The baseline in transformative learning is change in assumptions, perspectives and mindsets into more reflective, inclusive and discriminating ones (Mezirov, 2003, p. 58), which makes it different from learning focused on adaption (Boström et al., 2018). Assessment of assumptions that support one’s own as well as others’ beliefs, feelings and values takes place through engagement in critical and reflective discourse, in group interaction or individually, in the learning situation (Mezirov, 2003). Juxtaposing one’s own perspectives and
ideas against others’ stimulates the learner to reconsider them in the light of alternative ways of thinking and feeling and thus, transformative learning requires a pluralistic teaching approach (Wals, 2011; Bostrom et al., 2018). Through transformative learning, one’s own views may be challenged as new perspectives are encountered and assessed in a critical and reflective process. As such, transformative learning has a critical-constructivist character, explained by Boström et al. (2018, p. 7):

We develop habitual expectations by assimilating perspectives from our social world, community and culture. They guide our decision-making and actions until we encounter a situation incongruent with our expectation. At that point, we may reject the discrepant perspective or enter into a process that could lead to a transformed perspective.

A significant feature of transformative learning in the context of SD is the addressing of conflict perspectives, which may arise on both individual and societal levels (Boström et al., 2018). For example, different actors may consider different solutions to be optimal, and at the level of the sustainability dimensions, many environmental problems arise from activities in the economic sphere. The conflict perspective is addressed in the present research, based on theories from the fields of environmental economics and ecological economics, which differ in their view of the interconnections between environmental and economic aspects (Munda, 1997). Environmental economics is based on the weak sustainability view that human-made capital can replace or substitute for natural capital. Thus, the key feature is that the total amount of capital, man-made and natural, remains constant over time. In the SD context, this means that a loss within the environmental dimension may be acceptable if there is a gain in the economic one. This connects to the integrative management conceptualization of SD (Jabareen, 2008), in which the challenge lies in integrating aspects of economic growth, social development and environmental protection. Ecological economists consider incommensurability between environmental and economic aspects, hence they adopt a strong sustainability perspective in which natural capital should be kept stable over time (Daly, 1995; Munda, 1997). As this field addresses tensions between economic activities and environmental sustainability, this connects to the con-
ceptualization of SD as an ethical paradox (Jabareen, 2008), since nature should be maintained and socio-economic conditions developed simultaneously, while the latter implies modification of the former.

The research reported in this thesis addresses students’ different ways of understanding phenomena in the world surrounding them, within the context of SD. The context of the investigation defines what the students are able to express, and the participants decide what to share with the researcher (Treagust, Won, & Duit, 2014). The data in this research was analyzed based on the understanding that what students say and talk about reflects their perspective or view of SD and associated issues. However, the theoretical and methodological departure points have evolved during the research process. An individual-centered perspective dominates the early sub-studies while the last study makes use of the social context in focus group interviews to explore the views of the students. Moreover, the impact of different contexts and approaches to the three dimensions for individual responses are investigated in the second study. Hence, the process has developed from a strict focus on the individual, to increased focus on contexts and social conditions. Thus, both theories of individual construction of knowledge that relate back to the work by Piaget (e.g. 1976), and social construction of knowledge (Vygotsky, 1978) are of relevance. Nevertheless, there is the underlying assumption that the students bring their personal view and understanding into the situation, as in the fourth study, where students were interviewed in groups based on similar responses to a number of sustainability issues in a questionnaire. Investigating students’ views and perceptions in this way can be associated with constructivist theories of learning, which fundamentally concern the view that individuals create individual meanings, sometimes in social situations (Tobin, 1993; Carlsen, 2007). However, parts of the investigation focus on the significance of contexts and approaches to the issues, and the use of social contexts and co-construction through group interviews, which implies that knowledge is not static but varying with the context. Thus, the research can be regarded as grounded in a social constructivist perspective in which learning is viewed as a process and product of the individual during interaction with others in social and institutional settings (Scott, Asoko, & Leach, 2007; Lundholm, Hopwood, & Rickinson, 2013).
Three of the four studies are quantitative, and the last study applies a qualitative approach. All the studies reflect different ways of understanding or perceiving phenomena related to SD and associated environmental, social and economic dimensions. The research process can be described as iterative, which in this context means that the findings of earlier sub-studies shaped the focus in the later work.

There are several concepts applied in this thesis to denote the perspectives of the students. Study I uses the concept of ‘consciousness’ to encompass the cognitive and affective domains of knowingness, attitudes and behaviors. As such, consciousness is a comprehensive concept, based on the idea of considering the three sub-constructs as a whole and not as separate parts. Studies II and III use the concept of ‘views’ to represent the students’ perspectives. ‘Views’ relate to ‘beliefs’, ‘opinions’ or ‘ideas’, and can be defined as the way someone thinks about something (View, n.d.). ‘Views’ is used because of its broad connotations that allow for indefinite underlying reasons for a certain response, as there may be cognitive, value-based or any combination of factors that explained the responses of the students. Other studies have applied the concept of ‘views’ in a similar broad and comprehensive way (see e.g. Songer & Linn, 1991; Hanrahan & Isaacs, 2001; Çimer, 2012). As such, the concept of ‘consciousness’ is considered to underlie the broad, all-encompassing concept of ‘views’, in the context of this thesis and in relation to its overall aim. In study IV, the word ‘beliefs’ is used to denote the four views that emerged from study III. Beliefs are concerned with the state of mind in which someone thinks something to be the case, i.e. an individual judgment of the truth (Pajares, 1992, p. 316; Murray, 2011). In study IV, the concept of ‘views’ is used to denote the interpretations of the students’ expressions in the analysis.

In addition to the concepts of ‘consciousness’ and ‘views’, other central concepts for the thesis are holism, pluralism and interconnectedness. In the context of this thesis, ‘holism’ means an approach in which the parts, the whole, and the interconnections between them (with reference to the environmental, social and economic dimensions of SD) are considered in the context of sustainability/SD. ‘Pluralism’ in this con-
text refers to an approach that strives to illuminate the variety of viewpoints and perspectives that exist in relation to sustainability/SD issues. ‘Interconnectedness’ in the context of this thesis refers to any interrelationship between two or more of the environmental, social and/or economic dimensions underpinning sustainability/SD.

The concept of sustainability consciousness

Sustainability consciousness (SC) as a concept was developed and operationalized by a research group that I am part, and which was established in 2012 (see Gericke, Boeve-de Pauw, Berglund, & Olsson, 2019). The purpose was to develop a concept and an instrument to measure outcomes at student level of the ESD implementation strategies used in the Swedish school system. The point of departure was that an investigation of effects of the implementation of ESD must consider outcomes among students in terms of broad educational goals within the sustainability context. The concept of SC is rooted in the field of environmental psychology, within which human-environment interactions are studied (Gifford, 2016). The ‘environment’ in environmental psychology is approached in a broad sense and refers to the surroundings of a person. Within the field of environmental psychology, the investigation of the relationships between different factors such as beliefs, values, attitudes and behaviors is common, as is the study of such factors in relation to a specific environmental circumstance, such as different educational experiences among groups of students (Hine, Kormos, & Marks, 2016). For the present research project, a broad approach incorporating both cognitive and affective aspects was considered appropriate, in order to align to goals of ESD and general education, and at the same time conform to a spectrum of strategies that schools may use. After an extensive review of the literature in the field of ESD, it was decided that the concept of SC should include facets of knowledge, attitudes and behaviors in relation to environmental, social and economic dimensions of SD. From the literature review it was found that these aspects were often included in studies that evaluated outcomes at student level of various initiatives and interventions connected to environmental education (EE). An extensive review of literature published between 1999 and 2010 concerning outcomes of EE programs by Stern, Powell and Hill (2014) confirms these factors among the most commonly occurring ones. The internationally agreed Framework for
the Decade of ESD (UNESCO, 2006) described knowledge, values, attitudes and skills as important learning objectives during the decade.

Consciousness as a concept has been studied within the environmental context. Kollmuss and Agyeman (2002) based their concept of 'pro-environmental consciousness' on environmental knowledge, emotional involvement, values and attitudes. Jiménez Sánchez and Lafuente (2010) built their concept of environmental consciousness on cognitive, affective, behavioral and dispositional (feelings of self-efficacy and individual responsibility together with positive attitudes towards specific behaviors) factors, which they identified as involved in individual engagement in pro-environmental behaviors.

The concept of SC targets the level of the individual. However, personal responsibility, actions and behaviors such as lifestyle and consumer choices are generally considered insufficient to accomplish the necessary change towards SD (e.g. Stevenson, 2006; Isenhour, 2010). The critique addressing approaches focusing on the self-regulating market and individual choices is generally concerned with downplaying the need for political interventions and the regulation of markets (Isenhour, 2010). In the context of consumerism, social and cultural norms are more influential on consumer behavior than individual choice (Ibid.), suggesting that even if knowledge and awareness about environmental impact exists, this may not be accompanied by actions in line with environmental concerns.

The main purpose of including knowingness, attitudes and behaviors was to apply a broad, inclusive and holistic approach to the investigation, in terms of both general educational outcomes and the environmental, social and economic dimensions of SD. Hence, the concept and survey instrument for SC were not developed to study the learning process, but rather, relevant outcomes of it. Certainly, there are other aspects of importance concerning outcomes of ESD. However, a curriculum in line with ESD would reasonably affect students’ knowingness, attitudes and behaviors, even if the teaching is not specifically targeted towards all of these aspects.
The realm of SD is grounded in large-scale human-environmental systems with complex interconnections. Hence, there is often uncertainty concerning what actions would be most sustainable in specific situations. There are multiple ways of understanding the human and non-human environments and their relationships, and thus, there is no “one true story” (Gough, 2013, p. 381). Still, there is a substantial amount of knowledge that may be considered robust, indicating that some aspects or actions are more sustainable than their alternatives (Gough, 2002; Wals, 2015). The SC survey instrument measures outcomes based on a holistic perspective of the dimensions of SD, but also considers the cognitive and affective aspects relevant in the educational context. Since the SC instrument targets general outcomes which are relevant for more than just the school context, the instrument has been promoted as a scale that can be used for different stakeholders to investigate and evaluate sustainability-related issues or efforts (Gericke et al., 2019).

**Background**

The first part of the background concerns the complexity of SD. The section starts with a description of the concept and history of SD, and thereafter, there is an outline of different positions on how SD should or could be accomplished. The second part concerns the role of education in SD, and the development of approaches to environmental education and ESD in the Swedish and other contexts.

**Sustainable development**

Human impact on the environment, huge gaps in resource distribution, and remaining poverty in the world despite prolonged growth in economic systems constitute complex challenges in the context of SD. Some environmental problems presented greater challenges some decades ago than they do today, yet others are increasingly exacerbated, for example biodiversity loss, climate change, and ocean acidification (Rockström et al., 2009). According to Oxfam (2015), the richest 10 per cent of the world’s citizens are responsible for half of the world’s carbon emissions, while the poorest half of the world’s people emit only 10 per cent, indicating some interconnections between environmental, social and economic dimensions at the large scale. Across the world, people
living under poor conditions struggle to cope with issues such as drought, flooding and crop failures, which create poverty traps.

Numerous reports and researchers have highlighted the interconnections between economic affluence in some parts of the world and environmental problems and consequences for other parts of the world, adversely affecting their ability to improve their own economic conditions. Increased economic activity has been shown to be accompanied by degradation of the environment in parallel processes (e.g. Steffen, Broadgate, Deutsch, Gaffney, & Ludwig, 2015). Another fundamental challenge relating to the economic dimension of SD is the alleviation of poverty in the world. An increasing number of studies point to the fact that growth in the economy mostly benefited countries that do not suffer from poverty, thus highlighting equity and distribution issues as another challenge (Steffen et al., 2015).

In a recent publication for the Swedish Environmental Protection Agency, interdependencies between the three SD dimensions and between the 17 sustainable development goals were investigated (Ekener & Catzeff, 2018). The report indicated that, within the government policies studied, one dimension of SD is generally considered at a time and often, goals are addressed in “silos” focusing on only one dimension, such as environmental protection or economic objectives. The report points out the need for integrated approaches that simultaneously consider environmental, social and economic dimensions and suggests environmental sustainability as a foundation for accomplishing socio-economic goals. The growing field of sustainability science that crosses borders between disciplines addresses the challenges of how our society and our way of living can be organized in a sustainable way. As part of the transformation of society towards SD, learning to consider actions in an integrated framework of environmental, social and economic perspectives is essential. School and education has an important role to play in this respect.

**The sustainable development concept**

The rise of the SD concept has taken place through an international policy process, which started with a focus on the environment and
broadened to include both the environment and development. The concept received wide recognition in 1987, as a result of the Brundtland report *Our common future* (World Commission on Environment and Development, 1987). The task for the commission was to formulate a global strategy for change. However, the challenge of SD had already been placed on the international stage in 1972, at the UN conference on Human Environment in Stockholm. The conference put the environment on the international political agenda (Kidd, 1992; Waas, Hugé, Verbruggen, & Wright, 2011) and the conflict between environment and development was acknowledged for the first time (Kates et al., 2005). In the years following the Stockholm conference, global awareness grew concerning the need to explore the interconnections between socio-economic issues of poverty and underdevelopment, and environmental issues (UNESCO, 2006). Eight years after the conference, the concept of SD was introduced through the influential document *World conservation strategy: Living resource conservation for sustainable development* (International Union for Conservation of Nature and Natural Resources, 1980). The document primarily addressed ecological sustainability (Lelé, 1991) through conservation of living resources (Waas et al., 2011). At the Earth summit in Rio in 1992, SD was adopted as an intergenerational concept. The extensive document *Agenda 21* (United Nations Division for Sustainable Development, 1992) that came out of the Earth summit was adopted by a large number of countries, and the document constituted the starting point for the planning and implementation of ESD (Hopkins & McKeown, 2002). At the UN World Summit on Sustainable Development, which was held in Johannesburg ten years later, an implementation plan was developed that brought forward the three pillars of economic development, social development and environmental protection (United Nations, 2019b; Kates et al., 2005). In 2012, the UN member states adopted the document *The future we want*, in which they committed to develop a number of sustainable development goals (SDGs) that were built on the millennium development goals (United Nations, 2012). At the UN Sustainable Development Summit in New York in 2015, the 2030 Agenda for Sustainable Development was adopted and this included the 17 SDGs, which call for developing and developed countries to work in global partnerships (United Nations, 2015). Thus, the concept grew out of
concerns that human development needs to take account of environmental limits. The exploitative industrialization model, often referred to as “business as usual”, which implies no change of lifestyle, values or economic systems (Kates et al., 2005), was to be replaced with sustainable development (Waas et al., 2011).

Over the years, the concept of SD has developed and has become associated with various interpretations and meanings. Jabareen (2008) identified seven different conceptualizations of SD through his analysis of multidisciplinary literature. Sauvé (1996) presented a similar typology based on conceptualizations of the environment and SD and related these to educational approaches. Among the different conceptualizations described by Jabareen, the ethical paradox acknowledges the tensions between the goals of environmental protection and economic growth as current models of development destroy nature. The natural capital stock focuses on the importance of maintaining a constant amount of natural capital, in order to ensure the well-being of future generations, thus applying the strong sustainability perspective (see e.g. Neumayer, 2003). Integrative management accentuates holistic approaches to management and planning, in which aspects of environmental protection, social development and economic growth are integrated. The concept of utopianism views creating a society where justice and peace prevail and people live their lives content and in harmony with nature as central (Jabareen, 2008).

**Models of sustainable development**

A number of different models have been developed to represent the comprehensive concept of SD. The usefulness of the concept is questioned, however, its vagueness is regarded as a strength by some, and a weakness by others. On the positive side, it seeks to embrace the relationships between environmental and socio-economic dimensions, and therefore, it encompasses numerous issues and is applicable to many different situations (Kates et al., 2005). The downside is that it can mean anything that anyone would like it to mean, and “beneath its covers lies a multitude of sins” (Giddings et al., 2002, p. 188). Some argue that the concept reinforces anthropocentric perspectives in favor of
ecocentric ones (e.g. Kopnina, 2014), that it is built upon a basic contradiction in terms of sustainability and development, and that it promotes unprecedented economic growth (Le Grange, 2013).

The Venn diagram is an oft-used representation of SD (Figure 1a). It consists of three rings that overlap each other with a joint area in the center. This can be considered a suitable way to operationalize SD, as work can easily be structured within each of the three areas (e.g. Gough, 2002). However, the model has been criticized for several reasons. First, the equal size of the three rings generally does not represent the case in real situations. Second, there is a risk that the dimensions are viewed as being separate, which allows for trade-offs between environmental, social and economic perspectives and priorities, justifying prioritizing of one dimension at the expense of others (Giddings et al., 2002). In many situations, favoring one of the dimensions leads to deterioration in others, such as cutting down forests despite leaving people without homes or subsistence, or ignoring the impact on global temperature or the impact on animals dependent on the particular conditions that the habitat provides.

The nested model (Figure 1b) takes account of interrelationships between the environmental, social and economic dimensions. It places the economy at the center because it is a subset of society, which in turn, is a subset of the environment. Thus, without the environment, there will be neither a society nor an economy. Almost all human activities have an impact on the environment and our life is dependent on the environment. Material needs, food, light, clothes, consumer goods, heat and medicines are examples of what the environment provides us with (Giddings et al., 2002; Stevenson, 2006). However, 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 (Sterling, 2010). Humans are part of nature and not a separate entity. Recently, the 17 SDGs were placed into the layers of the nested model (Stockholm Resilience Center, 2016). In that model, the paradigm for development is changed and the sectorial division into the environment, society and the economy is no longer appropriate. Instead, societies and economies are embedded within the biosphere.
Another recent model to conceptualize SD is the ‘Doughnut’, developed by Raworth (2017). The 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 SD. The inner layer of the doughnut is composed of twelve social dimensions of human well-being, dealing with aspects such as health, poverty, education, gender equality and energy. Placement towards the middle of the doughnut implies shortfalls in social wellbeing. The outer layer constitutes an ecological ceiling above which there is overshoot in life-supporting systems of the Earth, as defined by the planetary boundaries framework of Rockström et al. (2009). Planetary boundaries are defined in terms of nine categories; climate change, ocean acidification, ozone layer depletion, nitrogen and phosphorous flow cycles, use of global freshwater, use of land, loss of biodiversity, loading of atmospheric aerosols and chemical pollution (Rockström et al., 2009). The economic dimension is not represented explicitly in the model. According to Raworth (2017), the economy is in need of renewal in order to bring humanity within the environmental and social boundaries of the doughnut. Thus, this model uses the economy as a means rather than a goal in itself. Economy as an objective of its own in SD has long been questioned in the debate, as it does not automatically result in either environmental sustainability or poverty alleviation (e.g. Lelé, 1991; Stevenson, 2006).
Some people make a distinction between the terms “sustainable development” and “sustainability”, while others view the two as synonymous. One way to understand the difference is that “sustainable development” is used if economic growth and development is the primary perspective, although considering the environment, while “sustainability” is considered to place emphasis on the environment and challenges the perspective of economic growth in relation to SD (Waas et al., 2011). In this thesis, no distinction is made between the two in terms of their meaning and thus, they are regarded as synonymous. In some places, however, “sustainability” may be used when talking about a desired destination or endpoint, and “sustainable development” may be used when referring to the process of getting there.

**Positions on sustainable development**

According to Kates et al. (2005), one way of defining SD is by the ways it is operationalized in practice. In society, groups of people or organizations often support nature and the environment or economic development or the improvement of human conditions. To operationalize SD in various situations often implies a negotiation between aspects of environmental, social and economic dimensions. There are different perspectives on what needs to be favored in decisions, i.e. what the main compromises between environmental, social and economic dimensions should be (Kates et al., 2005). For this reason, many definitions of SD include declarations about the importance of open and democratic decision-making processes (*Ibid.*).

Within the SD discourse, a distinction can be made between proponents of weak and strong sustainability (e.g. Daly, 1995; Neumayer, 2003). These two perspectives are grounded in different ways of viewing the relationships between humanity and the environment and a basic difference in what change is considered to be needed in the transformation towards SD. People advocating weak sustainability view the total amount of capital as being what matters rather than the form it takes. Thus, human and built capital can substitute for natural capital. Thus, these proponents consider trade-offs between dimensions of SD to be justified. Proponents of strong sustainability criticize this perspective, considering different forms of capital as complementary rather than substitutable. From this perspective, human-created capital
cannot substitute for a number of processes that human life depends upon, such as photosynthesis and the water cycle (Hopwood, Mellor, & O’Brien, 2005).

Within environmental theory, the two positions of ecocentrism and anthropocentrism differ in the extent to which nature constitutes a criterion of value (Le Grange, 2013). In the ecocentric perspective, the ecosphere has intrinsic value, which implies that it has value of its own, irrespective of its usefulness for human existence and ways of living. Proponents of strongly ecocentric perspectives, consider that the use of nature to serve the needs of humans is ethically unjustifiable. At the other end of the scale, the anthropocentric perspective holds that nature has instrumental value to humans, i.e. nature is valued for its role in serving human needs. According to Le Grange (2013), nature is not inherently of low value within the anthropocentric perspective, but its value is defined by human needs. In light of these perspectives, it is understandable that proponents of ecocentrism have remarked on the perceived anthropocentric bias of the Brundtland definition of SD:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (World Commission on Environment and Development, 1987, p. 43).

Hopwood et al. (2005) presented a classification of views on SD and corresponding attitudes towards change and how change should be accomplished. Three different views were identified, briefly outlined here. Proponents of the status quo view consider that some change is needed although this can occur within present structures and ways of organizing life and society. They are generally unwilling to use regulations and laws to facilitate SD. Rather, responsibility of the individual citizen, e.g. as consumers, companies practicing ethical business, new management techniques and technological development are regarded as solutions to achieve change. Supporters of this view equate development with growth. Business is considered to be the driving force towards SD and the relationship between economic growth and environmental stability and poverty alleviation is considered as being positive. Sauvé (1996) identified a similar concept in her critical analysis of different conceptions, in which free trade and technological development are considered to facilitate further development, and economic growth
 Reformers consider large shifts in lifestyle and policy necessary at some point, but fundamental changes to the current ways of organizing and structuring society in social and economic terms are not seen as necessary (Hopwood et al., 2005). More information and knowledge, major reforms of government, market modification, and technological development for environmental protection and social and economic improvements for humanity are the solutions that will help overcome the SD challenge. Increased democracy and participation are other aspects of importance, possibly by reform of political systems. Governments should push businesses towards SD, and subsidies and taxes are important tools in this respect (Hopwood et al., 2005). Proponents of transformation see the SD challenge as grounded in fundamental aspects of today’s society and the interactions between humanity and the environment. The power structures and the economic system are organized neither for human well-being nor for environmental stability. Within this group there are those concerned with SD in social and economic terms, environmental sustainability, or both. They allocate specific importance to increasing the power of those commonly deprived of power, such as poorer people or women. Many see a link between the struggle for justice and environmental protection. Some regard the return to a simple life as a solution, while others view human capacity free from the forces of capitalism as a way forward (Hopwood et al., 2005). Sauvé (1996) identified the analogous view of alternative development, in which its proponents, in line with the transformation view, advocate a complete shift in choices and values as being necessary for SD in order to live within our means. In this conceptualization, decentralization and local autonomy are promoted and the environment is viewed as a project for the community (Sauvé, 1996).

To sum up, the status quo view acknowledges change through management and the transformation view acknowledges change through political action within and outside of present structures and systems. The
reformers must consider whether the necessary change actually will self-reform. The relationships between SD and economic objectives such as growth are central, and are increasingly becoming a public issue of relevance (Drews & van den Bergh, 2016). A recent study based on a questionnaire survey investigated Canadians’ views on economic growth and the environment (Tomaselli, Sheppard, Kozak, & Gifford, 2019). Indications of a shift in public opinion concerning economic growth as a central societal goal were found, causing the authors to question the assumed social consensus of the desirability of growth. Three different views were identified, one giving highest priority to economic growth, one prioritizing social well-being and one prioritizing environmental issues. Slightly more than half of the respondents viewed environmental sustainability and economic growth to be compatible goals, while the rest indicated hesitation or disagreement. The findings indicated that ecological priorities are gaining ground in public opinion (Tomaselli et al., 2019). The most recent World Values Survey, for the period 2010-2014, indicated that nearly 60 per cent of the Swedish respondents consider looking after the environment to be an important personal value, and more than 60 per cent give priority to the environment over economic growth (World Values Survey, 2020).

**Students’ perspectives of sustainable development**

The centrality of the environment in conceptions of SD has been confirmed at different levels within the education system in various contexts: students (university students, Kagawa, 2007; upper secondary students, Kramming, 2017), student teachers (Summers, Corney, & Childs, 2004), teachers (Borg et al., 2014), and school leaders (Dyment, Hill, & Emery, 2015). A study by Manni et al. (2013) showed that pupils aged 10-12 years have difficulties in seeing interconnections between environmental, social and economic dimensions of SD. Most frequently, the pupils connected economic aspects to other sustainability dimensions, and the social aspects were related least to other dimensions. Similar findings have been shown for older students: Wilks and Harris (2016) found a lack of holistic understanding of how environmental issues are connected to issues of other sustainability dimensions among high school students in Australia, and Walshe (2008) confirmed the same picture among secondary students in the UK. Sternäng and Lundholm (2012) investigated tensions between environmental
and economic aspects in a sustainability dilemma related to climate change. They found that Chinese 15-16 year old students gave priority to economic growth and social welfare in their discussions, and viewed economic development as a necessary condition for environmental protection. Torbjörnsson (2011) found a positive relationship between attitudes among upper secondary students towards solidarity and equality, which were considered representatives of the social and economic dimensions of SD. A positive correlation was also identified between these aspects and biocentric attitudes.

The study by Kagawa (2007), explored university students’ understandings of and attitudes towards SD (N=1889). The findings indicated higher representation of male students in favoring technological solutions to SD issues. More female than male students advocated a decentralized and ecological future. Many students emphasized the need for government actions and regulations, instead of putting responsibility on the individual consumer, a view that has also been confirmed among high school students (Wilks & Harris, 2016). However, consumer change was most frequently highlighted among actions to deliver SD, although only one per cent focused on reducing the amount of items purchased. More common was a focus on conscious selection of products, e.g. organic, locally produced, Fairtrade, or boycotting unsustainable businesses with respect to environmental or social concerns. According to Kagawa (2007), most actions suggested by the students can be categorized into a reformist approach, since few of the students showed critical stances in relation to present lifestyle and ways of structuring society. In the study by Wilks and Harris (2016), the students similarly endorsed individual actions over collective and political ones, which the authors explain by a sense of hopelessness with respect to endorsing political actions for the environment.

Kramming (2017) identified that upper secondary students in Sweden tend to apply a dualistic way of thinking when talking about the relationships between humans and their environment, future perspectives in terms of environmental collapse or SD, or the level of responsibility for dealing with environmental issues in terms of individual actions or large-scale societal solutions. According to Kramming, developing students’ systems thinking can reduce their perception of barriers to
change. A multifaceted way of thinking can support their action competence as it improves their understanding of environmental issues as societal issues. Clearly, several studies indicate that students perceive a conflict between the need for collective action and the actions they themselves could contribute. The findings of Kramming show that the social pressure to conform to norms and trends in society is strong, and prevents the students from limiting their consumption although they acknowledge the need for it. Thus, they perceive a cognitive dissonance in this respect (Ibid.), for which they presumably get little support in dealing with, since a number of studies indicate that these aspects are left out of education that concerns SD issues (Kagawa, 2007; Sternäng & Lundholm, 2012; Stagell, Almers, Askerlund, & Apelqvist, 2014; Dyment et al., 2015; Ignell, Davies, & Lundholm, 2017; Aarnio-Linnanvuori, 2019). According to Isenhour (2010), consumption is closely connected to identity construction. Kramming (2017) points to the need for research in which the approaches are less focused on consensus concerning SD issues.

In order to understand how students perceive environmental and economic perspectives in SD and their interconnectedness, an outline of students’ environmental and financial literacy is appropriate at this stage.

Students’ environmental literacy
In recent years, a number of national assessments related to the outcomes of environmental education have focused on students’ environmental literacy, defined by the components of knowledge, skills, affect, and behavior (Marcinkowski et al., 2013; Juntunen & Aksela, 2013). Students’ environmental literacy and components thereof have been shown to vary across different national contexts (Marcinkowski et al., 2013). For example, in the US and in Israel, students display moderate knowledge scores, while students in Turkey score relatively highly in environmental knowledge. With respect to environmental affect, students from all the contexts mentioned score highly, while scores for cognitive skills are generally low. Scores for environmental behavior are moderately high in the US and Israel, and moderate in the Turkish sample. The same patterns of weaker environmental behavior than en-
environmental attitudes have been confirmed in investigations of environmental literacy among upper secondary students in Finland (Juntunen & Aksela, 2013). Regarding environmental behavior, younger students tend to outscore older students (Marcinkowski et al., 2013). In assessments of students’ environmental awareness, the results from PISA2006 showed that Swedish 15 year-old students’ scored lower than the average for the 57 participating countries (The Swedish National Agency for Education, 2007).

**Students’ financial literacy**

The first large-scale study of the financial literacy of youth was introduced in PISA2012 and was conducted in 18 countries. In the PISA assessment, financial literacy was defined as follows:

> ...knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life. (OECD, 2014, p. 33).

The assessment showed that 15-year-old students, to a great extent, displayed basic levels of financial literacy (Lusardi, 2015), and this has been confirmed in several European countries, e.g. Germany (Frühauf & Retzmann, 2016; Erner, Goedde-Menke, & Oberste, 2016), Switzerland (Ackermann & Eberle, 2016) and the UK (Stillwell, 2016). Young people in the US, UK and Australia have weak understanding of how the economic systems in their societies function (Davies, 2006). Arguments for increased financial literacy have been raised with reference to the increasing individualization of economic decision-making that has taken place in recent years (Davies, 2006; Lusardi, 2015). Moreover, the possibility of influencing economic policies in society is restricted by low levels of understanding, however, the ability of schools to enable development of critical economic understanding has been questioned (Davies, 2006). Thus, it is also a question of democracy (Davies, 2015). Lucey (2007) argues for combining financial education with social education, since it has been shown that opposing the social pressure of consumerism strengthens self-worth.
Developing an understanding of different perspectives, positions and views on sustainability issues can be a way to promote understanding of the complexity that surrounds sustainability issues, and the complexity involved in decision-making in relation to sustainability issues. Diversity of perspectives among learners is an underexplored resource in this respect, and is not widely applied in ESD (de Kraker, Lansu, & van Dam Mieras, 2007). This research contributes to filling this gap by focusing on the diversity of views among students in the context of SD, in order to develop knowledge of whether and how diversity can advance teaching and learning in line with the holistic and pluralistic intentions of ESD.

**Environmental education and ESD**

Hitherto, this background section has discussed the complexity of SD and the variety of views associated with it. The forthcoming sections focus on the opportunities and challenges this brings for education. An outline of the history and international context of ESD is presented first, then follows an outline of ESD in Sweden.

**The role of education for sustainable development**

In a similar way to SD, ESD has emerged through international agreements at the policy level. Today, ESD as a field of research is fast developing and growing. The *Agenda 21* document that emerged from the Earth summit in Rio in 1992 was the first document to emphasize the essential role that education has to play in SD. Education is mentioned in every chapter of the extensive document (United Nations Division for Sustainable Development, 1992). The essential role of education was re-affirmed at the Johannesburg summit in 2002 (United Nations, 2019b). The summit proposed that there should be a decade focusing on ESD to enhance the role of education in promoting SD. At the end of 2002, the United Nations General Assembly declared the ten year period between 2005 and 2014 to be a Decade of Education for Sustainable Development, and designated UNESCO to guide the implementation process (UNESCO, 2006). Towards the end of the decade, UNESCO launched the Global Action Programme to advance the efforts on ESD (UNESCO, 2014), at the World Conference on Education for Sustainable Development in Aichi-Nagoya, Japan. In 2015, the United Nations General Assembly adopted the 17 SDGs, in which the
role of education is emphasized in a goal of its own and ESD is one of the specific targets in the *Agenda 2030* (United Nations, 2015).

**The EE-ESD spectrum**

Historically, there has been a strong tradition of environmental education (EE) in Sweden along with many other countries. In Sweden, EE was introduced into the school curriculum in the 1960s, a time when environmental problems mostly concerned issues of pollution (Cars & West, 2015). In the early 1970s, international policies were focused on human impact on the environment and emphasized the need for environmental protection (McKeown & Hopkins, 2003). In recent decades, there has been a transition into ESD-related approaches focusing on the inclusion of social and economic considerations alongside environmental ones.

Parallel to the discourse on ESD, there are different discourses of EE, some based on a broader conception including social and economic concerns and impacts and some maintaining the focus on the environment (McKeown & Hopkins, 2003; Wals, 2009). Comparing the focus at the Stockholm conference in 1972 with the focus in *Agenda 21* twenty years later, there was a clear shift in emphasis from “environment” to “environment and development”, affecting EE during this period of time and, at the same time, enabling ESD to emerge (McKeown & Hopkins, 2003). Over the years, scholars have debated the meanings and purposes of EE and ESD and their possible differences. According to Cars and West (2015), differences and similarities between the two vary depending on national and local context and educational traditions. González-Gaudiano (2006, p. 298) argues that “The environmental crisis is more social than ecological in nature, but that should not lead us thoughtlessly to subsume the environmental within social issues...”, thus warning about neglecting environmental perspectives in favor of social and economic ones. According to Stevenson (2006) and Kopnina (2014), ESD risks maintaining an instrumental and anthropocentric perspective that excludes eco- or biocentric considerations. On the other hand, González-Gaudiano considers focusing on ESD to be an opportunity to adjust the weaknesses of EE to deal with the challenges that the world faces. Another difference is according to Stevenson (2006) that ESD allows a positive point of departure by focusing on the
The term “environmental and sustainability education” (ESE) has been adopted in recent years (see Laessøe & Öhman, 2010). In this thesis, no conceptual difference is drawn between ESD and ESE, even though there is a point in emphasizing the environmental perspective within ESD. However, this thesis starts from the perspective that development that does not account for the limits of the environment cannot be considered sustainable over time, even from a social point of view. As Griggs et al. (2013) argue, a stable environment is a prerequisite for a thriving global society.

EE was formally introduced into the Swedish curriculum in the 1960s as mentioned previously. In the 1980s, the goal of EE in Sweden was to prompt students to consider and evaluate their own personal impact on the environment (Cars & West, 2015). ESD started to gain ground in Sweden in the 1990s. During this period, different programs to support schools in their efforts arose, such as the Green Flag initiative (Ibid.).

In Sweden, EE has developed from mainly transmissive approaches into more transformative ones (see e.g. Östman, 2003; Sandell, Öhman, & Östman, 2005). Transmissive approaches build upon reproduction as the focus of the learning process while transformative approaches focus on change (Mezirov, 2003; Wals, 2009; Mogren & Gericke, 2017). Three different teaching traditions have been identified in relation to EE in the Swedish school system, the fact-based, the normative and the pluralistic, or ESD tradition (The Swedish National Agency for Education, 2001; Öhman, 2004). These traditions reflect the process of EE partly transforming into ESD, with the parallel process of moving environmental issues from a strong science subject focus into the integration of all school subjects to promote a holistic perspective of SD among students. The teaching traditions are described as selective, indicating that the way environmental teaching is carried out by the individual teacher is generally based on one tradition as they are rooted in different perceptions of knowledge and associated educational practices (Sandell et al., 2005). The approaches have shifted
from the transmission of facts, through the transmission of correct behaviors and attitudes, into a focus on the empowerment of students with abilities or competencies to support their development into autonomous and capable citizens, which has a transformative character. The pluralistic or ESD tradition aims for change towards sustainability without being prescriptive. In this tradition, environmental and developmental problems are regarded as political and moral problems (e.g. Sandell et al., 2005; Van Poeck & Östman, 2017). Finding solutions is a complex challenge because the problems are caused by conflicts between different human interests. The environmental focus is widened to embrace social and economic dimensions, thus focusing on SD rather than the environment in isolation. The conflict-based perspective puts the democratic process at the center. Different opinions and views are regarded as equally relevant to include in the teaching and learning process, and the focus lies on discussions and critical evaluation of the different perspectives of the ways forward. The main priority is to improve quality of life now and in the future (Sandell et al., 2005).

A large-scale study of upper secondary teachers in Sweden indicated that the teachers’ disciplinary background influences their teaching (Borg, Gericke, Höglund, & Bergman, 2012). Social science teachers are the most likely to use an approach in line with ESD, whereas science teachers are more likely to apply a fact-based approach to the issues. Many teachers expressed a lack of expertise as a barrier to including SD issues in their teaching, and the economic dimension of SD was associated with the greatest uncertainty in the teachers’ conceptual understanding of SD (Borg et al., 2014). Shortage of time was perceived as another barrier, impeding their ability to make the required changes to their teaching (Borg et al., 2012).

**Swedish school system and curricula**

The Swedish compulsory school system ranges from pre-school classes (children aged 5-6) to grade nine (students aged 15-16). Swedish upper secondary school (grades 10-12) is voluntary, as is pre-school, which children aged 1-5 can attend. Public education in Sweden is free from pre-school classes up to grade 12. Most students continue into upper secondary education, which includes five introductory programs and
18 national programs, of which 12 are vocational and six preparatory for tertiary studies.

Present curricula in Sweden are influenced by international policy agreements that Sweden has been part of (Cars & West, 2015). During the 1980s, the Swedish Education Act was influenced by the Tbilisi declaration that resulted from the UNESCO Intergovernmental Conference on Environmental Education (Cars & West, 2015). As a result, environmental education was introduced into the natural science subjects in Sweden (Breiting & Wickenberg, 2010). The concept of SD was addressed in the 1994 curriculum for upper secondary schools, but program goals and syllabi for different subjects mostly included statements about the environment in general. Program goals and syllabi were revised in 2000, resulting in an increased focus on SD with its broader inclusion of social and economic perspectives (The Swedish National Agency for Education, 2002). Advancing the educational and curriculum focus on SD has occurred in a process parallel to the development of international policy agreements on EE and ESD, such as Agenda 21 and the Johannesburg summit (Cars & West, 2015). In the present curriculum for upper secondary schools in Sweden, SD is emphasized as a perspective that should permeate teaching in all subjects, along with an international, an ethical and a historical perspective. Among the fundamental values and tasks of the school, the curriculum states that

Environmental perspectives in education should provide students with insights so that they can not only contribute to preventing harmful environmental effects, but also develop a personal approach to overarching, global environmental issues. Education should illuminate how the functions of society and our ways of living and working can best be adapted to create sustainable development. (The Swedish National Agency for Education, 2013, p. 6).

Clearly, SD is a perspective that more than the natural science subjects should include. The cross-disciplinary nature is further visible as SD is mentioned in the syllabi of many subjects. Additionally, it is an objective within many degree targets of the eighteen national programs of the upper secondary school (The Swedish National Agency for Education, 2019a).
School-supporting initiatives in Sweden

In Sweden, a number of initiatives have been developed to assist schools in their work with ESD. Some of these initiatives are governmental while others are coordinated by NGOs. These efforts include concrete plans on how to work with SD issues, in-service training and certifications. The Global School is part of The Swedish Council for Higher Education (2019). They support schools through seminars and activities for teachers, school leaders and policy makers with the aim of contributing knowledge and the development of teaching approaches in the field of ESD. In 2004, the Swedish National Agency for Education established the certification 'School for sustainable development' (The Swedish National Agency for Education, 2019b). Guidance and support are provided to schools within the whole range from pre-school to adult education, to build a structure that involves school leaders, teachers and students in a joint effort, with focus on interdisciplinary approaches, diversity of teaching methods and participative student involvement. To maintain the certification, the school has to send a report that includes an evaluation of the work and goals for their future work. Another certification is the 'Green Flag', which is administered within the international network 'Eco-schools' by the Keep Sweden Tidy foundation (Keep Sweden Tidy, 2019). The pre-school or school is supposed to establish a committee and develop an action plan that is submitted and later evaluated. The work is carried out within specific themes in cycles of one year, progressing towards the guidelines and goals of the curriculum. These certifications have broadened the environmental focus into a focus on sustainability, thus including social and economic dimensions in addition to the environmental dimension.

As SD is a common responsibility of different school subjects, collaboration is promoted with focus on thematic work or school projects involving several subjects. Teaching materials for this kind of work are provided by several NGOs, for example The Swedish UN Association (2018) and Keep Sweden Tidy (2019). During the years since the certifications were first established, the number of pre-schools and schools involved has continuously increased (The Swedish National Agency for Education, 2018; Keep Sweden Tidy, 2019).
Education for sustainable development

The difference between educating ‘for’ and educating ‘about’ or ‘in’ SD has been discussed among scholars (e.g. Scott & Gough, 2003); the latter being more of a theoretical discussion or a lesson targeted towards developing awareness. Mochizuki and Yarime (2016) describe education ‘about’ sustainability as a content-based sustainability literacy in which knowledge from traditional academic disciplines is assembled in a multi-disciplinary approach. Education ‘for’ sustainability is described as an interdisciplinary approach in which knowledge from different disciplines is integrated to enhance understanding of the complexity involved in human-environment systems. According to Mochizuki and Yarime (2016), there is also a fourth approach referred to as education ‘as’ sustainability, building on transdisciplinarity that creates conditions for mutual learning among science and society by promoting collaboration between different stakeholders. ESD has been criticized for being a normative educational concept, as indicated by the use of the word ‘for’. According to Jickling (1992), education is concerned with enabling people to think for themselves, and educating ‘for’ something opposes this general purpose of autonomy. In general, whether ESD should take an instrumental or an emancipatory approach is an issue of debate, focusing either on established facts and known actions for SD, or on new ways of thinking, doing and valuing (Wals & Jickling, 2002; Wals, 2011). Vare and Scott (2007) describe the two approaches of ESD 1 and 2 that they consider interrelated and complementary, rather than applying an ‘either/or’ point of view. ESD 1 is a reactive approach to current challenges, which aims to change behaviors and how people think about sustainability issues. It is expert-driven, relying on established facts and technological development, and focuses on concrete and obvious actions, such as recycling and energy saving. ESD 2 on the other hand, is characterized by a proactive approach focused on dynamic qualities and it aims to empower citizens to act with a high degree of autonomy. It focuses on critical thinking and exploration of the contradictions that sustainability issues embrace. While ESD 1 has measurable effects in the short term, ESD 2 has effects that may be observable over time. Vare and Scott (2007) emphasize that it may be necessary to adjust the current balance between these in favor of ESD 2 approaches. Studies indicate that the teaching
in Swedish schools also emphasizes normative approaches and outcomes in line with ESD 1 (Borg et al., 2012; Stagell et al., 2014). However, upper secondary students in the ESD-profiled schools experience pluralism to higher extent than do students in regular schools (Boev-de Pauw, Gericke, Olsson, & Berglund, 2015).

**A holistic approach**

According to Mebratu (1998), narrow scientific thinking in the understanding of the environmental crisis has its limitations. According to Mebratu, a holistic perspective implies taking the whole as the conceptual departure point, seeing the components as "add-ons". A reductionist view implies that the parts are considered as the point of departure, and the whole is regarded as a linear sum of all the parts (Mebratu, 1998). Generally, representatives of both perspectives would consider themselves to apply the holistic perspective. However, Mebratu (1998, p. 513) points out that in any framework, the parts, the whole and especially the interactions between them must be considered; this is also pointed out in research that relates to ESD (Feng, 2012; Ignell, Davies, & Lundholm, 2013; Öhman, 2014).

However, the argument raised by Quental, Lourenço and da Silva (2011, p. 261) on challenges for sustainability science also poses a challenge for education:

> Scientists split systems into their constituent parts so that interactions between them can be conveniently studied and replicated. This reductionist approach is the basis of the scientific method, but its limitations become apparent when dealing with complex phenomena. [...] How to effectively incorporate information from different disciplines into meaningful theses is of primary importance for sustainable development. It is clear that traditional cause and effect mechanisms do not fit or cannot embrace the complexity of coupled human–environment systems from where the main environmental problems arise.

Using a holistic approach to the environmental, social and economic dimensions of SD has long been acknowledged as being essential in ESD (UNESCO, 2006). Interdisciplinary approaches are considered to promote the holistic perspective of SD. However, interdisciplinary approaches are challenging to accomplish among teachers in schools as this is generally not the way teaching is organized (Summers, Childs, & Corney, 2005). To be successful, broad and deep subject-matter
knowledge is an important pre-condition (Kysilka, 1998). Interconnectedness between environmental, social and economic dimensions can be established in different ways in the school context. Öhman and Öhman (2012) found that when upper secondary students worked with a sustainable urban planning task, they established harmonious relationships between the three dimensions and consequently left out the acknowledgement of any conflicts between ecological, economic and social objectives. Several studies show that opportunities for students to explore the tensions inherent in the concept of SD are important to promote learning about the complexity underlying SD and develop competencies such as systems and critical thinking (Herremans & Reid, 2003; Sternäng & Lundholm, 2012; Öhman & Öhman, 2012; see also Knutsson, 2013). Thus, dealing with sustainability issues only from a perspective of harmony is not sufficient if the students are to fully comprehend the complexity involved in sustainability issues, and how solutions to those issues should be approached.

When Kramming (2017) interviewed Swedish upper secondary students about their experiences of EE, she found that the students perceived EE as being focused on problems and thus not on solutions. Several students expressed the idea that the teaching focused on basic knowledge concerning environmental issues and their solutions. However, they considered they were left alone in combining this into a wholeness that could help them to develop a personal approach to the issues. It seems as if the holistic approach, which aims to work with interconnections between environmental, social and economic dimensions and not only the parts in isolation, has not been established. Borg et al. (2014) also confirmed this at the teacher level. This is also shown to be the case outside Sweden (e.g. Kagawa, 2007; Dyment et al., 2015). At the student level, Wilks and Harris (2016) found that young people lack a broader holistic understanding of the interconnectedness of sustainability issues, and the authors point out the need for more research on the interconnectedness of environmental and sustainability issues in education and how this can be dealt with in teaching. Feng (2012) points to the difference between multidisciplinary and interdisciplinary approaches and argues that in order to accomplish interdisciplinary approaches, it takes more than teachers with different disciplinary backgrounds working together. They also have to find ways to integrate
and explore different perspectives and promote students' engagement with divergent views and ways of thinking concerning the sustainability challenge. Recently, Boeve-de Pauw et al. (2015) showed that holism strengthens knowledge-related aspects at the student level. However, research from Swedish upper secondary schools shows that teachers seldom work in an interdisciplinary way and feel unprepared to teach sustainability (Borg et al., 2012).

To allow students to contribute with their own ideas and views on the issues strengthens their autonomous thinking and may help them to understand the holistic perspective and the complexity involved in SD. Such a pluralistic approach in ESD is advocated by many scholars (e.g., Öhman, 2004; Wals, 2011; Sund, 2015; Van Poeck & Östman, 2017). Pluralism has been discussed as a way for students to learn key competencies such as participatory and democratic competence and decision-making (e.g., Öhman, 2008), systems and critical thinking (e.g., Rieckmann, 2018) and action competence (Jensen & Schnack, 1997; Breiting & Mogensen, 1999; Mogensen & Schnack, 2010). As such, holistic and pluralistic approaches in ESD go hand in hand and constitute beneficial preconditions for one another. Few studies have looked into the divergence in students’ views on SD issues from a holistic perspective as a resource for pluralistic approaches in teaching. This thesis contributes new knowledge in this respect.

Content knowledge beyond the environmental perspective

As previously discussed, the environmental focus in conceptual understanding of SD has been identified at different levels of the school system, which presumably impede the potential for education to promote a holistic understanding of SD that includes the interconnectedness with social and economic dimensions. The roots as well as the solutions to today’s environmental problems are found in social and economic spheres. The economic dimension is the one mostly connected to other dimensions of SD, which is confirmed in sustainability science (Schoolman, Guest, Bush, & Bell, 2012) as well as in sustainability education research (Manni et al., 2013). Therefore, exclusion of these perspectives when teaching environmental issues risks making the students perceive education as distant from the reality outside school and thus less relevant. The lack of economic perspectives is troublesome if the
status quo is to be challenged and facilitation of students’ understanding of the complexity involved in decision-making concerning sustainability issues is to be promoted (Sternäng & Lundholm, 2012; Dyment et al., 2015). No matter how big a challenge the integrated perspective can be to accomplish, there should also be acknowledgement of what potential such an approach has, not only for the goal of SD but also for education in general.
Aim of the thesis

The overall aim of this thesis is to investigate the diversity in students’ views on the environmental, social and economic dimensions of SD and their interconnectedness. The reason for focusing on students’ views is to advance knowledge about the pre-conditions for a learner centered pluralistic approach in ESD, and if and how a holistic and complex understanding of sustainability issues can be facilitated through approaches that focus on the student perspective. Thus, the overall research question that has guided the research presented in this thesis is:

*How does the diversity in students’ views of SD and its underpinning environmental, social and economic dimensions take shape in sustainability-related contexts?*

Research design development

Throughout the research process, the findings of each study have shaped the focus of investigation for the subsequent ones. This process resulted in the investigation of increasingly specific issues throughout the four studies. A mix of methods was applied to align with the overall research aim and answer the research question posed in this thesis. The mixed methods design relates to the whole research project. In three of the four studies, a quantitative approach was applied and in the last study, a qualitative approach was used. Thus, each of the four studies applied either a quantitative or a qualitative approach. Treagust et al. (2014) discuss whether the mixed methods approach is a paradigm of its own. Researchers using mixed approaches often consider the mix of quantitative and qualitative approaches to be complementary and to strengthen their findings and therefore, some oppose the division into paradigms. The approach can be associated with research design rather than with a research paradigm (Treagust et al., 2014), and a pragmatic stance is often taken, directing attention to the methodological aspects (Robson, 2011).

The research evolved through an iterative process, which means that research questions in later parts of the work were formulated based on results from earlier parts. To be more specific, the results and approach in the first study shaped the research question in the second, which
uses a different approach to investigate students’ perspectives on SD. The results from studies I and II together shaped the research questions in study III. Study IV builds specifically on the results of study III and provides a deeper insight into the results of that study. The iterative process is explained in more detail below, and illustrated in Figure 2.

Figure 2. The iterative research process.

In the context of this thesis, it has been possible to answer different questions because of the mixed methods approach and iterative research process, which is a clear strength with this type of research design (Robson, 2011). The quantitative parts have answered questions that concern *what* students know, believe, think, and so on. Through the concept of students’ SC, the investigation concerned what students know, what they think or feel, and what they do. The second study investigated what students give priority to in terms of environmental, social and economic reasons in various contexts. The third study investigated what interconnections students make between economic objectives and SD. The qualitative data in the fourth study provided answers to questions that concern *why* and *how* students view the interconnectedness of economic objectives and SD in a certain way, as it focused on
the arguments used by the students about their motivation. The meaning of SD was also explored, which reveals how they understand the SD concept.

To conclude, the mixed method approach was not primarily concerned with triangulation. Instead, the different approaches have been applied to be able to answer different types of research questions in an iterative process which, taken together, have resulted in a more thorough response to the aim of the thesis. This kind of approach is discussed by Robson (2011, p. 167), who argues that the completeness that can be achieved by a combination of methods may provide a more comprehensive picture of the research topic. Moreover, the ability to deal with complex phenomena that embrace a range of perspectives is enhanced. As such, the mixed methods design may produce more than the sum of its parts (Ibid.).

The choices that were made throughout the research process aimed to deepen or complement the understanding of previous results. The focus of the research questions in guiding the research in mixed method designs is essential, and the researcher has to clarify in what way the mix of methods has helped to answer them (Robson, 2011). Therefore, a description of the four studies is outlined below and this includes clarification of the methods used in each study and how each study contributes to answering the overall research question in this thesis. Table 1 provides an overview of the foci of the four studies.

The purpose of study I was to investigate and compare the SC of students from ESD-profiled and regular schools. To fulfil this, the study needed to include a large number of students through a quantitative approach. The concept and construct of SC was developed and operationalized into a questionnaire, which probed cognitive and affective domains related to environmental, social and economic dimensions of SD. Participants were chosen in a thorough selection process to identify the most ESD-active schools in Sweden, and comparable schools without specific focus on ESD. The students’ responses to the SC questionnaire were analyzed through multivariate analysis of variance. In addition to the comparison of SC between students in ESD-profiled and regular schools, the results contribute to the overall research question
about diversity in views as the analysis reveals whether there are differences in the extent to which students recognize or acknowledge the environmental, social and economic dimensions of SD. The findings shaped the focus of the next study.

The purpose of the second study was to investigate how the students’ views took shape when encountering environmental, social and economic dimensions in isolation or when they were integrated. To accomplish this, an additional questionnaire instrument that investigated students’ views of SD in different contexts was developed. In this instrument, the students were asked to consider the environmental, social and economic dimensions of SD in relation to each other, by being asked to prioritize reasons for different actions. Thus, the students had to consider tensions between the three dimensions. These results were compared with the students’ answers to the SC instrument, in which the dimensions were presented separately. Hence, study II contributes to the overall research question on diversity by reporting how students’ views differ depending on whether they encounter the environmental, social and economic dimensions separately or in an integrated way. Results showing differences in how the environmental, social and economic dimensions are prioritized among the students further contribute to the overall research question on diversity.

Findings from studies I and II contributed to shaping the investigation in the third study, which was intended to investigate patterns of views of the interconnections between economic aspects and SD. More specifically, the study focused on students’ views on the interconnections between economic growth, economic development and SD. Since few studies focus on the economic dimension in an integrated way in relation to environmental and social dimensions, the study was not based on any predefined assumptions about data categories. Hence, no statistical hypothesis testing was conducted. Instead, an explorative approach was applied in order to identify patterns. The dataset was explored in a more inductive way through statistical cluster analysis, which is a multivariate technique that groups respondents into clusters with similar features based on a pre-defined set of characteristics (Hair, Black, Babin, Anderson, & Tatham, 2006). The analysis focused on
identifying patterns of views in the data and, thus, it contributed to addressing the overall research question on diversity.

In the fourth study, the patterns of views on environmental, economic and social interconnections identified in study III were investigated in more depth. Students’ views of SD and arguments about the interconnections between the SD dimensions were investigated qualitatively through focus group interviews with students representing the distinct beliefs identified in study III. Hence, the design of study IV builds strongly on the findings from study III. For this study, new data collection was undertaken. The data were investigated using thematic analysis, which focused specifically on students’ remarks about interconnections between environmental, social and economic issues. By investigating students’ views and motivations in relation to how the dimensions interconnect, the findings provide insights into what underlying reasons there may be for diverging ways of viewing and understanding SD.
Table 1. The research process and foci of the four studies in relation to the aim of the thesis.

<table>
<thead>
<tr>
<th>Study</th>
<th>Research questions</th>
<th>Instrument</th>
<th>Sample</th>
<th>Method/Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is there a difference in sustainability consciousness between upper secondary students from schools with an ESD approach and students from regular schools?</td>
<td>a) SC q. b) Scenario q. c) Economic items q. d) Interview guide</td>
<td>I) 638 students from 8 ESD-profiled and 7 regular schools II) 18 students from 2 schools</td>
<td>a) Multi-/univariate b) Descriptive c) Explorative cluster d) Thematic</td>
</tr>
<tr>
<td>2</td>
<td>What are the differences in students' views from separated and integrated perspectives?</td>
<td>a, b</td>
<td>I</td>
<td>Quantitative/a, b</td>
</tr>
<tr>
<td>3</td>
<td>What are Swedish upper secondary students' views of economic growth and economic development in relation to sustainable development? Can dissenting views on these relationships be related to differences in their environmental consciousness?</td>
<td>a (Environmental sub-section), c</td>
<td>I</td>
<td>Quantitative/c, a</td>
</tr>
<tr>
<td>4</td>
<td>How do students, representing the different categories of beliefs regarding economy and SD, explain and give arguments for their view of the interconnections between economic objectives and SD? - What interconnections between environmental, social and economic dimensions of SD do students, representing these different categories of beliefs regarding economy and SD, express?</td>
<td>a (short version), c, d</td>
<td>II</td>
<td>Qualitative/d</td>
</tr>
</tbody>
</table>
Methods

This section describes the selection of participants, the data collection process, the instruments used and finally, the analysis of data. The section on data analysis focuses on the methodology, whilst the technical details can be found in each of the four papers.

Sample and collection of data

Two data collection exercises were undertaken for the research in this thesis (Table 1). The process and the two different samples of students are described in the next section.

Part I

Since the first data collection exercise was undertaken to investigate differences in SC between students from ESD-profiled schools (here: ESD schools) and other schools for reference (here: REF schools), an important part of the process was to identify the schools that had made most progress in terms of implementing ESD. As one indicator of the schools’ ESD activity, records were examined that indicated how long a school had received support from external organizations providing relevant certification, as described in the background (see section about school-supporting initiatives in Sweden). Thus, a ranked list was created based on how long the schools had been involved in an ESD-related program or certification. In the next step, records from The Global School were used that provided information on the schools’ level of participation in in-service ESD activities for school leaders and teachers organized by The Global School. The schools’ websites were examined to search for indications of ESD activities and approaches. Finally, school leaders and in some cases teachers were interviewed in order to verify the ESD activity level of each school. A sample of schools that did not have ESD as a focus were also identified, and these are referred to as reference schools. In this process, indicators that were considered were the presence of similar national educational programs, the schools’ geographical location, school size, and socio-cultural background factors at group level available in public records.

The data collection took about two months to complete and was conducted during spring 2013. All schools, except for one, were visited by
the researcher or a colleague. This was done to ensure that all students were given the same instructions on how to complete the questionnaire. In one of the schools, it was not possible to find a day were the researcher could visit all the selected classes on the same day. With assistance from a teacher who had been given thorough instructions, the students completed the online survey. As the schools were involved in lots of administrative work at the time of data collection in late spring, it was difficult to find time for the survey. Therefore, the number of students per school varied more than intended, and two schools in the ESD group did not have corresponding schools in the REF group. A total of 647 students completed the questionnaire. 638 remained after removing questionnaires of low quality, such as those having the same response to most or all items across the whole questionnaire, or questionnaires that were mostly incomplete. An overview of the sample is shown in Table 2.

Ethical guidelines were followed as prescribed by The Swedish Research Council (2017). One week before the researcher’s visit to the school, a letter containing information about the study was sent to the selected groups of students. Since all participants were 18 years or older, they could decide for themselves whether they wanted to take part in the study. They were informed about the purpose of the study, that their participation was voluntary and that they could withdraw their participation at any time during completion of the questionnaire. Most students responded online and no information was collected that could connect a response to a person. Thus, anonymity was guaranteed.

Table 2. The sample in the first data collection.

<table>
<thead>
<tr>
<th></th>
<th>Science</th>
<th>Social science</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESD-group</td>
<td>53.8%</td>
<td>45.3%</td>
<td>57.5%</td>
<td>41.3%</td>
<td>400</td>
</tr>
<tr>
<td>REF-group</td>
<td>55.5%</td>
<td>37.4%</td>
<td>50.4%</td>
<td>49.2%</td>
<td>238</td>
</tr>
</tbody>
</table>

Part II

The last part of this research project investigates students’ reasoning concerning their views on the interconnections between environmental, social and economic dimensions of SD. As the fourth study is based on the patterns of views identified in previous studies, interview data
were collected from a new sample of students. The second data collection exercise was undertaken during spring 2018. Two upper secondary schools were contacted that offered the same national programs as those that the students in the first data collection exercise attended. In one of the schools, students on science programs were invited to participate in the study and in the other school, students on social science programs were invited.

Data were collected in a two-step process, where the first step was conducted to identify potential participants to invite to take part in the second step, which was the group interviews. In the first step, three classes per school completed the questionnaire (short version of part a, and c, see Table 1), which was used only to identify representatives of the views that emerged from study III. After the identification of potential participants, a smaller number of students were invited to participate in group interviews. Four group interviews were carried out at each of the two schools, each group representing a specific view on the interconnections between economic objectives and SD as found in study III. The group interviews lasted between 40 and 60 minutes, depending on the number of students in each group and how much they had to say concerning the topics of the conversation. In total, 19 students participated in the group interviews of which 18 student responses were included in the analysis. It was found that one student only nearly represented the specific belief as described in study III, and therefore, the responses of that student were excluded from the analysis. Between two and four students took part in each group interview (Table 3).
Table 3. The sample in the second data collection exercise. Abbreviations: F = Female, M = Male, Soc Sci = Social science program, Sci = Science program.

<table>
<thead>
<tr>
<th>Interview group</th>
<th>Gender</th>
<th>Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belief 1 Group 1</td>
<td>1F, 1M</td>
<td>Soc Sci</td>
</tr>
<tr>
<td>Group 2</td>
<td>3F, 1M</td>
<td>Sci</td>
</tr>
<tr>
<td>Belief 2 Group 1</td>
<td>2F, 1M</td>
<td>Sci</td>
</tr>
<tr>
<td>Group 2</td>
<td>1F, 1M</td>
<td>Soc Sci</td>
</tr>
<tr>
<td>Belief 3 Group 1</td>
<td>(1F,) 1M</td>
<td>Soc Sci</td>
</tr>
<tr>
<td>Group 2</td>
<td>1F, 1M</td>
<td>Sci</td>
</tr>
<tr>
<td>Belief 4 Group 1</td>
<td>2F</td>
<td>Soc Sci</td>
</tr>
<tr>
<td>Group 2</td>
<td>1F, 1N/A</td>
<td>Sci</td>
</tr>
<tr>
<td>Total</td>
<td>18 (+1)</td>
<td></td>
</tr>
</tbody>
</table>

The use of focus groups has advantages when investigating views of collective phenomena, since participants generally enjoy taking part and become stimulated to make their own comments in response to others’ comments (Robson, 2011). During the interviews, the students responded to each other’s comments in a conversation with a friendly atmosphere. Thus, there was rich material to explore after the eight focus group interviews. The researcher focused on what- and how-related open-ended questions, and encouraged the students to explain and elaborate on their reasoning. The researcher endeavored to follow up and clarify relevant aspects of the students’ responses and tried to verify the interpretations during the interviews as much as possible. Thus, the recommendations to achieve a high quality interview outlined by Kvale (1997) were followed.

The students were informed about the two-step process and its purpose, and that the responses to the questionnaire formed the basis for how the interview groups were selected. After the identification of possible participants based on the questionnaire responses, the teacher assisted in arranging a time for meeting with the groups to inform them about the study, allow them to ask questions and decide a time for the interview with those who wanted to participate. Before the interviews, the students were informed that the groups were based on similar responses to the questionnaire items, but not about any details concerning the similarity of responses. The reason for this was that this information could have affected their responses during the interview. For all
who wanted, the researcher explained this after the interview and asked the participants for renewed permission to use the data. The researcher perceived the students to be positive in relation to the topic, and several students stated that the topic of the interview was interesting and they felt that it would be fruitful to talk about sustainability issues in this way more often in school.

**Instruments**

This section presents the instruments used for the collection of data. Three of the instruments are found in appendices 1-3. The fourth is presented in the text below.

**The SC questionnaire**

The whole SC questionnaire was used in studies I and II. In study III, only the environmental sub-section was used. In addition, a short version was used in study IV to identify representatives of different beliefs as identified in study III.

Cognitive, affective and behavioral components interplay in complex ways in our ways of relating to and engaging with our surroundings. When surveys are constructed that measure these components, formulations are often used that separate them in order to guide the respondents towards certain ways of relating to the items. Items probing cognitive aspects are often factual statements to which the response may be “true” or “false”, alternatively there may be multiple choice questions for which respondents select responses that match their option(s). Attitudinal items are often phrased in such a way as to invoke a positive or negative emotional response towards an object or an action (Robson & McCartan, 2016). Items targeting behaviors and actions are usually formulated based on some kind of timescale (either in the statement or in the scale), i.e. how often or seldom some action is performed.

The SC questionnaire was designed with the purpose of applying a holistic approach to the environmental, social and economic dimensions of SD, which were measured in terms of knowingness, attitudes and behaviors. An illustration of the SC concept is presented in Figure 3.
The intention was to investigate these components as a whole and not in relation to each other.

Figure 3. A representation of the sustainability consciousness (SC) concept (see also Olsson, 2018). K: Knowingness; A: Attitudes; B: Behaviors. ENV: Environmental dimension; SOC: Social dimension; ECO: Economic dimension.

A search through the research field indicated that many instruments of relevance for ESD only target a single dimension of SD rather than taking them all into account. Several survey instruments specifically probe the environmental dimension, e.g. The environmental attitudes inventory (Milfont & Duckitt, 2010), The new environmental paradigm (Dunlap, Van Liere, Mertig, & Jones, 2000) and The second order model of environmental values (Bogner & Wiseman, 2006). Few instruments exist within the broader environmental, social and economic context relevant for SD. Recently, Biasutti and Frate (2017) developed and validated The attitudes toward sustainable development scale, which covers the three-dimensional sustainability context. However, their scale focuses on attitudes only. One instrument was found that focused on the sustainability context, which included the components of knowledge, attitudes and behaviors (Michalos et al., 2012). Building on their instrument, an instrument was developed that fitted the specific research purposes of our research group. In this process, some of the items were excluded and others added, and the language was rephrased in order to be clear and comprehensible for students. The process of development included categorization of items into environmental, social and economic dimensions, validation of the categorization
through collegial review, piloting the questionnaires with appropriate student groups, and translation and back translation of the questionnaire from Swedish into English. The initial categorization of items was undertaken by our research group. The categorization was based upon the UNESCO (2006, pp. 18-21) definitions of the environmental, social and economic dimensions of SD. A group of four researchers from the center for Science, Mathematics and Engineering Education Research (SMEER3) at Karlstad university were then asked to categorize the items through a similar process in order to validate the original allocation of categories. After finishing this process, the questionnaire was piloted in two different groups of grade 12 students (N=45). The students were asked to complete the questions and mark any items they had trouble with. This was followed by a focus group discussion in which the problematic items were discussed. The students gave suggestions concerning how the items could be improved so that the intended meaning was made clear, and were asked about whether the instrument was able to capture all possible opinions on the issues that the students considered relevant.

In total, the SC questionnaire included 50 items (Table 4). Within our research group, Gericke et al. (2019) reported the development and validation process of the SC scale. The SC instrument was also used to investigate effects of the implementation of ESD in grade six and nine (Olsson, 2018; Olsson & Gericke, 2016; 2017; Olsson, Gericke, & Chang Rundgren, 2016), and in studies conducted in Taiwan (Olsson, Gericke, Boeve-de Pauw, Berglund, & Chang, 2019), and in comparative studies between students from Sweden and Taiwan (Berglund, Gericke, Boeve-de Pauw, Olsson, & Chang, 2019).

**Table 4.** The number of questionnaire items and their categorization.

<table>
<thead>
<tr>
<th></th>
<th>Knowing‐ness</th>
<th>Attitudes</th>
<th>Behaviors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>Economic</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Social</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>19</strong></td>
<td><strong>14</strong></td>
<td><strong>17</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>
The scenario questionnaire

In order to investigate students’ views and decision-making concerning the environmental, social and economic dimensions in relation to each other, another collection of items was developed in which the students had to consider reasons for their decision-making or prioritization related to all three dimensions simultaneously. In this instrument, the students were asked to prioritize between environmental, social and economic reasons for their actions in three different everyday life situations, which concerned grocery shopping, global warming and waste disposal. This is referred to as an integrated perspective on the environmental, social and economic dimensions of SD. As mentioned above, the scale measuring the construct of SC uses items that consider one SD dimension at a time. That is, each item addresses knowingness, attitude or behavioral responses related to the environmental, the social or the economic dimension. Hence, the respondents consider only one SD dimension at a time when responding to the SC items. This approach is referred to as a separated perspective on the environmental, social and economic dimensions of SD. However, in many situations in everyday life, decisions are made based upon consideration of and prioritizations between environmental, social and economic factors. In many situations, decisions must be taken when environmental, social and economic factors are in conflict. To give a simple example from the personal and everyday sphere: cycling to work as a sustainability action probably has simultaneous environmental, social and economic benefits, whereas in the grocery store, one may have to give precedence to environmental, social or economic factors when choosing what to buy. Consumption and global warming are common topics in students’ discursive texts about socio-scientific issues, and they occur frequently in the media and in discussions in the classroom (Christenson, Chang Rundgren, & Höglund, 2012). The items of this instrument were developed in collaboration with two research colleagues, one specializing in the field of argumentation. This instrument was piloted using the same procedure as the SC questionnaire described above.

With the inclusion of this questionnaire in the survey instrument, it was possible to study SD from a context-based and integrated perspective concerning the environmental, social and economic dimensions.
The economic items

The three economic items that were used in study III to investigate the students’ views of the interconnectedness of economic objectives in society and SD were placed within the 50-item battery of the SC survey. One item (Q3, see below) related to economic development and was also a part of the SC instrument. Two items (Q1, Q2, see below) were placed within the attitude construct (not following one another) but were not part of the SC instrument. The items were as follows:

Q1: I think that economic growth is necessary for sustainable development
Q2: I think that economic growth is a threat to sustainable development
Q3: Economic development is necessary for sustainable development

The interview guide

For the fourth study, a semi-structured interview guide was developed in line with the phenomenographical interview approach (Bruce, 1994; Fejes & Thornberg, 2015), in order to investigate, in depth, views on the interconnections between environmental, social and economic dimensions in SD. The guide contained three main themes, of which the first and third were included in study IV: the meaning of SD (what it is and what it means); issues of SD and their possible interconnections; and finally, the meaning of economic objectives in society (economic growth and economic development) and their possible interconnections with SD. The aim of the interview was in line with the description by Bruce (1994, p. 50), ‘to elicit the qualitatively different conceptions of a phenomenon which are seen, experienced or understood by interviewees’. Thus, the focus was neither on the topic, nor on the person, but rather on how the topic or theme appears to, or is experienced by, the individuals being interviewed (Bruce, 1994, p. 50; Marton, 1988).

The interview guide was piloted in a two-step process. First, an interview was conducted with one person outside the field of ESD research. Second, the revised interview guide was used in an interview with three university students. The interview guide was finalized based on suggestions from the interviewees on how to improve the questions.
Before the interview started, the participants were informed that the purpose of the interview was not to look for “correct” answers, since the sustainability context is related to a multitude of different ways of thinking. Instead, the purpose was to learn about their ways of thinking about and viewing issues and solutions related to SD. With the purpose of studying the students’ arguments concerning possible interconnections between the SD dimensions, students’ comments were followed up with questions that allowed them to develop their line of reasoning or further explain their viewpoint. Thus, the dialogue was, to a great extent, developed from the students’ responses (Bruce, 1994; Fejes & Thornberg, 2015).

**Analysis of data**

The data for the quantitative parts of this research project were analyzed using IBM SPSS Statistics, version 20. The analysis included factor analysis, internal consistency and correlation analysis, multivariate analysis of variance, and hierarchical cluster analysis. Some of the analyses were performed to ensure validity and reliability of the SC instrument and others were used in order to answer the research questions posed in studies I, II, and III.

**Multivariate analysis of variance**

Each item in the SC questionnaire probed knowingness, attitude, or behavior, in relation to the environmental, the social, or the economic dimension of SD. Thus, the analysis of SC must take all of these factors into account. Multivariate analysis of variance (MANOVA) is a statistical test that is suitable when the purpose is to measure more than one outcome variable simultaneously. To avoid the risk of making type I errors by performing multiple tests on one variable at a time, a single test is performed that includes all the dependent variables (Field, 2013). In addition to the multivariate result, the MANOVA reports the univariate results for each of the included dependent variables. The MANOVA included environmental knowingness, attitudes, and behavior (KAB), social KAB and economic KAB as dependent variables. In the analysis, independent variables that are unbalanced within the subgroups of the sample and not the focus of the investigation can be controlled for. This implies that the results obtained are not actually the results of other variables that are overrepresented in one of the groups.
For the research questions posed, the factors of gender and program distribution were controlled for in the analysis. In addition, the MANOVA reports interactions between variables. A significant interaction implies that more than one independent variable is needed to explain the result. Thus, the outcome from a MANOVA reveals whether groups differ along a combination of dimensions (Field, 2013).

MANOVA relies on a number of assumptions, which should not be equated with requirements. For example, MANOVA assumes normal distribution. However, the test is resilient to violations of this assumption, especially when samples are large (Schmider, Ziegler, Danay, Beyer, & Bühner, 2010; Field, 2013). It is important to test for outliers, and to check that variance is equal across groups. As for many statistical tests, small differences without practical significance can be statistically significant in large samples. Checking the data based on these assumptions means establishing whether differences, if they exist, are meaningful or not (Field, 2013). Assumptions and requirements were checked and when considered satisfactory, MANOVA was performed to answer aspects of the research questions posed in studies I, II, and III.

Several steps to ensure validity have already been described that concern the selection of samples, piloting of the questionnaire and the collegial categorization of items into environmental, social and economic dimensions. The piloting ensured that the students understood the items as intended. The collegial categorization of the items into environmental, social and economic dimensions established content or face validity (e.g. Hair, Black, Babin, & Anderson, 2010) of the items and their associated dimensions. Construct validity concerns whether the survey instrument measures what it is intended to measure. This question is answered by verifying that the dimensions exist in the data and not only as theoretical constructs. This can be explored through factor analysis, which is a multivariate technique for exploring clusters of variables in the data. Principal axis factoring (PAF) was used to explore whether the environmental, social and economic dimensions were discernible factors in the data. PAF is a technique that allows for correlation between the factors, which there was reason to expect. Research
on students’ perceptions shows that environmental, social and economic aspects in the context of SD are correlated (e.g. Torbjörnsson, 2011). The PAF was conducted within each of the knowingness, attitudes and behavior constructs. Had the PAF been conducted on the whole SC construct of 50 items, it would probably have identified the constructs of knowingness, attitudes and behaviors rather than the environmental, social and economic dimensions. Results of the PAF for the whole student sample were thoroughly reported in the licentiate thesis produced halfway through this research project (Berglund, 2014). To summarize, the results showed the existence of environmental and social dimensions within the three constructs of knowingness, attitudes and behaviors. The economic items were also identified, but were less clear than the other two, indicating stronger autonomy of the environmental and social dimensions. Within the knowingness- and behavior-constructs, the economic items were identified in a factor of their own, however, with some interference from other items.

Analysis of Pearson’s correlation between the identified factors and the items within each dimension confirmed all the three dimensions, with the exception of the economic dimension within the attitudinal construct, which was not identified. In general, the attitude section indicated some ceiling effects, possibly causing dimensional factors to be less identifiable within this construct. Conclusions from the analysis were that the three dimensions were discernible in the data. However, considering that SD is defined by the interconnectedness of environmental, social and economic dimensions, it should be no surprise that there is interference between some of the variables. From a theoretical perspective, the economic dimension is cross-border in its nature. For example, issues of poverty reduction were categorized as economic based on the UNESCO (2006) framework, but these issues are probably perceived as social issues by the students. In addition, research from both the sustainability science field as well as the sustainability education field shows that the economic dimension is the one mostly connected to the other dimensions of SD, and the environmental dimension is the least connected (Schoolman et al., 2012; Manni et al., 2013). Thus, anything other than finding some interference between economic items and items of the other two dimensions would be unex-
pected. An alternative, instead of PAF, could have been to use confirmatory factor analysis (CFA), in which the theory behind the constructs is tested on the data. This was performed by Gericke et al. (2019), and the results of that analysis confirmed the environmental, social and economic dimensions in the data.

Whereas validity is concerned with what is measured, i.e. the accuracy of a measurement, reliability concerns how the measurement is undertaken and refers to stability of the measurement (Winter, 2000). In the case of the SC construct, reliability was measured in terms of Cronbach’s Alpha, which reports the internal consistency among the variables in a summated scale (Hair et al., 2010, p. 124). The threshold for acceptance is generally 0.7 (Hair et al., 2010; Field, 2013). However, this should always be considered in light of what is measured. Levels of 0.6 may be acceptable if the diversity of the construct is large (Field, 2013). Moreover, the number of items building up a construct has significance for the Cronbach’s Alpha value, and increasing the number of items generally results in an increase. The Cronbach’s Alpha of the SC construct for the environmental, social and economic KAB-constructs ranged between 0.684 and 0.805, lowest for the economic dimension, which also included the fewest items. For the whole construct of SC, based upon all 50 items, the value was 0.902. All values were considered to be within acceptable limits in relation to the psychological constructs included.

Cluster analysis
Cluster analysis refers to a number of multivariate techniques that can be used when the aim is to explore and identify the latent structure in a set of data (Hair et al., 2006). It can be used in situations when the aim is to develop hypotheses concerning the nature of data. The purpose of the cluster analysis in study III was to explore patterns of views on the interconnections between economic objectives and SD in the data. The cluster analysis techniques resemble factor analysis techniques in several respects. Both are multivariate and explorative methods, assessing structure in the data. The difference is that factor analysis techniques group variables based on similarities in some respect, whereas cluster analysis techniques group individuals based on similarities in some respect (Hair et al., 2010). Moreover, factor analysis
bases groupings on patterns of variation while cluster analysis bases groupings on distance (Hair et al., 2010, p. 481). Despite being a method that can be applied to large datasets, cluster analysis is inductive in the sense that it can generate theory from natural groupings of the data.

Key issues to consider in the process of clustering are how similarity should be measured, how clusters should be formed and how the number of clusters that most accurately represent structure, and therefore should be kept in the final solution, should be determined (Hair et al., 2010, pp. 483, 486). In study III, hierarchical agglomerative cluster analysis was applied; this classified the individuals into mutually exclusive groups based on similarities in their responses to the relationships between economic objectives and SD. Starting from a position where all individuals are different clusters, the analysis combines the two clusters with the smallest distance between their average points, reducing the number of clusters one at a time, until only one cluster remains. The next step is to decide on the number of clusters that carry meaning and hence, are meaningful to retain. For example, clusters that are too small are generally not meaningful. Thereafter, the clusters are described and labeled according to their character based on some theoretical foundation. A central aspect in cluster analysis is the need for strong conceptual support for the variables used, since these exclusively decide the outcome (Hair et al., 2010).

**Thematic analysis**

The qualitative data that was collected from the group interviews were analyzed using a thematic analysis approach as described by Braun & Clarke (2006). The thematic analysis was theory-driven (see Braun & Clarke, 2006) in the sense that the themes of relevance for this thesis were decided before the analysis commenced. The themes that were decided in advance were based upon the findings from the previous studies that investigated students’ views of SD through a quantitative approach. Two pre-defined themes were used for the analysis of the study; the themes of DIMENSIONS and INTERCONNECTEDNESS. The first theme was identified in the data through the codes ENV, SOC and ECO, thus representing expressions of the environmental, social and economic dimensions of SD by the students. The coding was based
upon the definitions of the three dimensions as defined by UNESCO (2006, pp. 18-21):

- Environmental: Natural resources (water, energy, biodiversity, agriculture), climate change, rural development, sustainable urbanization, disaster prevention and mitigation.
- Social: Human rights, peace and human security, cultural diversity and intercultural understanding, health, gender equality, HIV/AIDS, governance.
- Economic: Poverty reduction, corporate responsibility and accountability, market economy.

The second theme of interconnectedness was treated as a sub-theme of the first, and concerned how students reasoned about environmental, social and economic issues. Did the students consider them in relation to one another, thus making interconnections between them? If so, their expression was given the code of INTEG, which denotes an integrated perspective as described in the second study in this thesis. In contrast, did they consider one dimension at a time without making any interconnections between them, or alternatively, did they explicitly express the view that they do not interconnect in any way? If so, their expression was coded as SEP, denoting a separated perspective as described in study II.

According to Cohen, Manion, & Morrison (2011, p. 554), there is a risk that researchers overemphasize confirmatory data and under-emphasize non-supporting data during analysis of qualitative data. Before the thematic analysis started, all interviews were transcribed into text and thereafter coded in order to avoid the risk of biased interpretations, since the interviews were based on the views identified and described in the previous study. When the thematic analysis was completed, the results were transformed into their associated beliefs.
Results

The overall aim of this research was to obtain new knowledge about how the diversity in students’ views on environmental, social and economic dimensions of SD and their interconnectedness takes shape. The reason for focusing on students’ views was to be able to contribute new information to discussions about learner-centered and pluralistic approaches in ESD and whether and how a holistic understanding of SD can be promoted through approaches that focus on the student perspective. The findings of this research demonstrate the pre-conditions for pluralism and holism in the upper secondary classroom. This section presents the results of the four studies in relation to the overall aim of the thesis. Detailed results can be found in each of the four sub-studies.

The results of the comparison of SC between students from ESD-profiled and regular schools (Study I) indicated a significant but small difference between the two groups. Students from regular schools displayed lower mean values in all three dimensions (environmental, social, and economic) of their SC. However, the difference was only significant in the economic dimension of their SC. Calculations of the effect size were performed in order to determine the magnitude of the effect in the economic dimension, and these indicated that it was small. The difference between the groups within the economic dimension mainly concerned the component of behavior, i.e. the difference mostly related to different ways of acting in relation to economic aspects of sustainability. Overall, the findings indicate that ESD students are somewhat more conscious of the economic dimension in relation to SD than students from regular schools. Taking a closer look at the mean values of the two groups for each of the three SD dimensions showed that the students emphasized social aspects in their SC, while economic aspects were the least acknowledged. The reliability analysis of each of the three dimensions in the SC construct indicated the lowest internal consistency for the economic dimension, which suggests that greater diversity in views could be at least part of the explanation.

Each one of the items in the SC questionnaire concerned only one dimension of SD, which made it possible to indicate strong agreement in
all dimensions; this was an appropriate approach for the purpose of study I. In the next phase, students were asked to prioritize between environmental, social and economic aspects when dealing with these in relation to each other within a number of everyday contexts (Study II). The results showed that the social dimension, which was emphasized mostly when the dimensions were dealt with one by one, was downgraded in the scenarios where the dimensions were considered in relation to each other. Economic factors were perceived as most important in decision-making in the grocery store, followed by environmental factors. In the context of global warming, environmental factors were prioritized as reasons for taking action, closely followed by social factors. Few considered economic factors to be reasons for taking action in relation to global warming. The third context concerned disposal of waste, and in this scenario, environmental factors were perceived as the most important reasons for acting. Neither social nor economic factors were perceived as particularly important. The results clearly indicate that the prioritization of SD dimensions varies with the context. Social reasons went from most emphasized when considered in isolation, to least important when considered in relation to environmental and economic reasons in the three sustainability-related scenarios. Moreover, there was different prioritization of economic aspects depending on whether they concerned the communal or the personal sphere: economic aspects were given the lowest priority when they were related to the communal level, but the highest priority when they related to the individual level.

The greater diversity within the economic dimension of students’ SC, and the ambiguous perceptions among the students concerning the role of the economy in SD led on to a more specific focus on the economic dimension in SD for the subsequent research (Studies III and IV). Economic objectives in terms of economic growth and economic development and their interconnectedness with SD are part of an ongoing debate in society. In the explorative cluster analysis, four groups of views on the interconnectedness of economic growth, economic development and SD were identified. The cluster analysis grouped individuals on the basis of a specific set of criteria, leading to groups with a distinct character that distinguished them from other groups. Hence,
the diversity in views among the students was clear. Four descriptive names were used to identify the groups according to their responses.

Of the students, 57 per cent were designated **un-differentiating positive**. This group considered economic growth and economic development necessary for SD and the students in this group seemingly did not differentiate between the two concepts. During the group interviews, students representing this belief reasoned that economic resources are needed if SD is to be accomplished. They expressed the understanding that SD includes economic perspectives, however, the impact of more money in the economic system on the environment was considered either non-existent, or positive in general. The arguments mainly concerned better opportunities for development and better research. Moreover, the students considered that increased sustainability awareness among the citizens in a society is a result of living in a developed economy. Thirty per cent of the students were designated **nuanced ambivalent**, and this grouping indicated less polarized responses. They generally considered economic development necessary for SD, in contrast to their view on economic growth. Thus, they seemed to assign different meanings into the two concepts. During the group interviews, the students in this group stressed that the impact of the economic objectives depends on how the money is used. According to the students, economic growth has negative environmental consequences; when production increases, the environment is affected negatively. From a social viewpoint, economic growth can lead to increased gaps between people in society. Concerning economic development, they were more positive and this was for social reasons: economic development may turn developing countries into developed, and it may drive welfare, better infrastructure and gender equality. A smaller group (5%) was designated **two-way convinced**. This group considered economic growth and economic development both necessary for and threatening SD at the same time. Most students in this group seemed not to differentiate between the two concepts as shown by the similar pattern of responses to the two items. During the group interviews, the students emphasized how economy-related actions may have either positive or negative environmental and social consequences. They considered that economic growth affects the environment positively by enabling investments in
environmentally friendly solutions; however, it also promotes a consumer society, which affects the environment negatively. From a social perspective, they considered that economic growth encourages corruption and human greed. Economic development was regarded as socially positive in the sense that it may provide better living conditions for people; however, this development is only sustainable if based on the ideas of a circular economy. The group of critical students represented 8 per cent of the sample, and this group viewed neither economic growth nor economic development necessary for SD, disagreeing most strongly with the necessity for economic growth. Instead, most students in this group considered both processes to threaten SD. During group interviews, students representing the critical belief reasoned that both economic growth and economic development increases consumption and thereby production, which has consequences in terms of natural resource depletion. From a social perspective, consumption in developed countries was thought to affect people in developing countries negatively. According to these students, economic development has different meanings in developed and developing countries. In the latter, it may mean the possibility of living on more than just a minimum amount of money. However, development per se is not generally positive from either an environmental or a social perspective; living life as in past times could be preferable both from a health and from an environmental perspective. A difference was found between some of the groups in their environmental consciousness, measured as knowingness, attitudes and behaviors in relation to the environmental dimension. The un-differentiating positive and the two-way convinced groups responded significantly lower on the environmental attitudes-scale in comparison to the critical group.

To summarize, the main findings in relation to the overall aim of this thesis are as follows:

- Students in ESD-profiled schools display stronger consciousness of the economic dimension of SD than other students do;

- The environmental, social and economic dimensions of SD are perceived differently depending on
a) whether students encounter them in isolation or integrated
with each other, and
b) the context in which sustainability decisions are made;

- The economic dimension is associated with the clearest division
between personal and communal interests;

- There are four distinctly different views on the interconnected-
ness of economic objectives in society and SD, and representa-
tives of some of these differ in their environmental conscious-
ness;

- When discussing the role of the economy in SD, all students raise
the issue of consumption and production;

- Students raise a multitude of different perspectives on the inter-
connections between environmental, social and economic di-
mensions in SD.
Discussion

The findings of this research project have shed light on the diversity in students’ views of SD and its associated dimensions in relation to different sustainability contexts. The overall aim of this thesis was to study students’ views of SD and obtain new knowledge concerning the pre-conditions for learner centered and pluralistic approaches in ESD, and to discover whether and how a holistic understanding of SD can be promoted through such approaches. The following questions, therefore, guide the discussion that follows: What are the pre-conditions for perspective-shifting and holistic understanding through pluralistic approaches in the upper secondary classroom? Can pluralistic approaches that deal with students’ views as resources promote transformative learning? How can interconnectedness among dimensions of SD be promoted in education?

Teachers are the ones who are supposed to deal with the teaching of the complex and dynamic field of sustainability in practice. So, in relation to the research presented in this thesis; what recommendations could be made for teaching? At the end of the Discussion, implications for ESD practice are discussed.

Students’ views – A resource for perspective shifts?

The results in terms of differences within the economic dimension of students’ SC drew attention towards the economic dimension of SD in ESD, and what this dimension in teaching and learning may be constituted of. Further investigation indicated that students prioritize differently depending on whether economic consequences affect them personally or not. This result is in line with previous research showing that economic factors have a strong influence on an individual’s behaviors and decisions, making economic factors an important part of strategies designed to influence people’s behavior (Kollmuss & Agyeman, 2002). When the students considered economic reasons for different actions on a collective societal level in relation to social and environmental reasons, they no longer perceived the economic reasons as important. Several studies have identified conflicts in students’ perceptions between a perceived need for collective action and their perception of their own potential to contribute (Wilks & Harris, 2016; Kramming, 2017).
Clearly, the context in which decisions are made has great significance. The results showed that students perceived the relative importance of environmental, social and economic dimensions differently in different contexts, which indicates that SD is not a static but rather a dynamic concept. This highlights the importance of an education that creates opportunities for students to encounter SD as a perspective in a variety of contexts rather than as an isolated theme over a short period.

The students view the interconnectedness between economic objectives such as economic growth and economic development and SD in different ways, and some even view them as unrelated. Thus, the results clearly show that there is a diversity of perspectives that can be discussed through inclusion of these interconnections. While some students acknowledge tensions between environmental protection and economic growth as in the conceptualization of the ethical paradox (Jabareen, 2008), others see them as reconcilable as in the integrative management approach (Ibid.). Some students who display critical positions towards economic growth and economic development also display higher levels of environmental consciousness. This finding suggests that the positive and the critical views relate to the perspectives of strong and weak sustainability respectively (e.g. Neumayer, 2003), where proponents of strong sustainability see different forms of capital as non-substitutable, and consider that loss in one form cannot be justified by gain in another. Depletion of natural capital stock, another conceptualization by Jabareen (2008), was talked about among the students when discussing negative impact on the environment, further indicating a strong sustainability perspective in the views of those students. While representatives of the largest of the identified groups, the un-differentiating positive, consider that change will occur inevitably in a developed society, through more knowledge, awareness, new technologies and research, others consider a profound change in norms and structures in society to be needed if transformation towards SD is to come about. Arguments that relate to the status quo, reform and transformation views as described by Hopwood et al. (2005) prevail in the reasoning of the students, although most groups use arguments for change that can be related to more than one of these positions. Representatives of the second largest group argue for making sustainable actions and choices cheaper and their counterpart more costly. A shift in
perspectives among individuals in society is considered necessary, and incentives should be created at political and institutional level, arguments that could be associated with the reform view (Hopwood et al., 2005). Representatives of the two-sided convinced group consider it difficult to unify environmental and socio-economic sustainability, which are arguments that could be associated with the ethical paradox perspective (Jabareen, 2008). Representatives of the critical group consider that society can be sustainable without being developed, arguments in line with the transformation view that a return to a simpler life is a way to achieve SD (Hopwood et al., 2005). During the interviews, students were asked to provide arguments for the position they reported in the questionnaire concerning possible interconnections between economic objectives and SD. It is possible that students would be able to present arguments for more than one position. However, as they responded in a certain way in the questionnaire preceding the focus group interview, they have presumably responded according to the dominant view that they held at the time.

Previous research shows that students often put responsibility at governmental level to force actions and impose regulations that promote the necessary changes (Kagawa, 2007; Wilks & Harris, 2016). In Kagawa’s study, consumer change was identified as an essential action. However, most students pointed to a conscious selection of products rather than reducing the amount of things bought. The results presented in this thesis indicate an increased awareness of the effects of unsustainable consumption on the environment, but also on people in other parts of the world. Another perspective in the discussion of consumption is its strong connection to identity-construction, status and norms (Isenhour, 2010; Kramming, 2017). Arguments against this dominant discourse in society were mainly raised among the students representing the critical belief, for which the quantitative data indicated the strongest environmental consciousness, suggesting that there are environmental reasons behind the critique.

**Pluralistic teaching and transformative learning**

Anchoring the discussion in economic perspectives in the interviews turned out to be a fruitful way to stimulate consideration of different perspectives on SD issues, and to explore the ways these interconnect.
In line with data from the fields of both sustainability science (Schoolman et al., 2012) and sustainability education research (Manni et al., 2013), the results indicate that inclusion of the economic dimension is a way to facilitate teaching and learning that deals with the interconnections between dimensions of SD, something that is advocated by various scholars (Öhman, 2014; Knutsson, 2013). The findings show that there is great potential in the inclusion of students’ perspectives on environmental, social and economic interconnections to encourage perspective shifts in ESD (see e.g. Wals, 2011; 2015). Using the different perspectives among students, which were identified in this study, in the classroom as a resource to address tensions can affect student engagement in a positive way, especially since research shows that students are hesitant to respond in opposing ways to the perceived perspective of the teacher (Lundholm et al., 2013). More specifically, competencies such as systems and critical thinking and understanding complexity can be stimulated through such an approach. Clearly, students think differently about whether SD is something that costs or whether more money actually leads to less sustainability, whether technical development is a solution or not, whether society, structures and/or norms need to change or not, about who has the responsibility for change, and about whether there are environmental, social or both arguments for these views. Including these perspectives in teaching and learning may help reduce the cognitive dissonance that Kramming (2017) identified among upper secondary students. Since research in ESD shows that teachers feel uncertain about the economic dimension in SD (Borg et al., 2012) and that economic perspectives that have potential to challenge the status quo are missing in education (Dyment et al., 2015), there is great potential for development in this respect. The findings shed light on students’ views of environmental, social and economic interconnectedness in SD and help to illuminate how students’ perspectives can be included as a resource in ESD teaching and learning.

The results clearly indicate that most upper secondary students are aware of the role of the economy in SD, despite viewing it in different ways and from different perspectives. It seems the economic dimension is essential for what students consider necessary to change in order to accomplish a sustainable future. Hence, if economic perspectives are
excluded from teaching, there is a risk that students perceive their education to be distant from the reality they experience outside the walls of the school. If so, students may experience their education as irrelevant and meaningless in an area that is of great significance for their present and future life.

When encountering alternative ways of perceiving SD and the sustainability challenge, the opportunity to explain the arguments behind the views arises. By listening to others’ arguments, opportunities are provided for perspective shifts and development of critical thinking skills, which may stimulate education that has transformative potential (e.g. Wals, 2011; Wals, 2015; Boström et al., 2018). According to Wals (2011), teaching that takes place on the edge of people’s comfort zones offers great potential for learning; however, space for alternative views to emerge has to be created and treated as a resource. Not only do the possibilities to find solutions to complex issues increase through such an approach, but teaching that focuses not only on consensus (Wals, 2011) and harmonious perspectives (Öhman & Öhman, 2012) can also stimulate learning. A teacher who knows her/his students and who is able to create conditions in which different perspectives are treated as resources in the sustainability context, who encourages students to contribute their perspective, and who has the ability to create situations where social cohesion is strong (see Wals, 2011), may be able to explore different views together with the students in a fruitful way.

**Separated and integrated approaches to holism in ESD**

The findings indicated that the type of approach to holism matters for the outcome at student level (study II). Using a separated perspective of the environmental, social and economic dimensions results in a different view among students compared to the views originating from contexts in which an integrated perspective is applied. However, both the separated and the integrated approaches to the three dimensions could be argued for as holistic, should holism be defined as including environmental, social and economic aspects on SD issues in education. Should holism be defined as the additional inclusion of interconnectedness between environmental, social and economic aspects of SD in education (see e.g. Öhman, 2014; Ignell et al., 2013; Knutsson, 2013), then the three dimensions must be dealt with in an integrated way.
The findings can be considered in light of multidisciplinary and interdisciplinary approaches in education as discussed by Feng (2012). The former is associated with the study of more than one field of knowledge, without making any connections between them. Interdisciplinarity originates from the perspective that “one single way of knowing is insufficient for understanding the complexity of the world” and focuses on integrated synthesis of different fields of knowledge (Feng, 2012, p. 32). Thus, interdisciplinary approaches are concerned with supporting the students in their learning of complexity and interconnectedness. The alternative to this approach leaves learners alone in establishing connections, without any opportunity to argue for their view, and hence, for their view to be explored, discussed and challenged. In the context of ESD, Wals (2015, p. 18) argues:

This does not mean abandoning the classic school subjects, which tend to be of a disciplinary nature but rather making them relevant in our common quest to address these issues. When taught separately, natural sciences, arts and humanities and sustainability education give a disjointed answer to society’s demand for a more sustainable world. This way of teaching and learning inevitably calls for a different way of designing spaces for learning or learning arenas that allow for boundary crossing between different disciplines, perspectives, interests and values.

Considering the ways the students reasoned about aspects of the different dimensions in relation to each other during the interviews, it is clear that subject knowledge is necessary if the reasoning about SD is to scratch more than the surface of the issues, as argued by Gericke, Hudson, Olin-Scheller, and Stolare (2018). Therefore, subject knowledge and interdisciplinary knowledge respectively provide favorable prerequisites for the quality of the other in the context of sustainability, in line with the argument of Wals above. Learner centered ESD accounts for the perspectives and views of the students. Hence, using a pluralistic approach that highlights the diversity of views that exist among students is a way to teach the complexity of sustainability issues and thus, contribute to a holistic understanding of SD. Together with the students, complex interconnections can be made visible, thus providing suitable conditions for critical exploration of current ways of addressing environmental and developmental issues in society. To look beyond the well-known and to question dominant assumptions and
norms may add a dimension of creativity to the educational experience. Research has shown that teachers feel hesitant to include actions regarding students as consumers and actions on a structural level in their teaching (Stagell et al., 2014; Aarnio-Linnanvuori, 2019), and feel uncertain about how to incorporate the economic dimension into their teaching (Borg et al., 2014). Hopefully, this research helps to show that teachers do not have to hold all the answers to the sort of complex issues encountered in the context of SD. Clearly, there is a multitude of perspectives among students to utilize as a resource. The role of the teacher is perhaps more that of a facilitator who enables different perspectives to meet, who encourages shifting of perspectives, and who structures the process of learning in such a way that students can explore and deepen their understanding of the complexity and interconnectedness of environmental, social and economic aspects in a variety of different contexts. This way to approach SD issues in ESD has great potential for the work towards SD and for the quality of education in general.

Implications

The findings of the research presented in this thesis shed light on the diversity of students’ perspectives on SD and associated environmental, social and economic dimensions. In addition, the findings indicate the importance of context in relation to SD, and the interconnectedness of economic perspectives to environmental and social perspectives. The research presented in this thesis provides new knowledge and empirical support concerning the pre-conditions for pluralistic approaches to teaching and their potential to promote a holistic understanding of SD. The implications of this research can contribute to the process of developing teaching strategies that promote holistic understanding through learner-centered approaches:

- Approach SD in an interdisciplinary way, in order to promote integrated synthesis of different perspectives;
- Apply a pluralistic approach that creates space for and promotes perspective shifts among the students;
- Use a variety of contexts in which students encounter sustainability issues to promote understanding of the complexity and dynamic nature of SD;

- Include the economic dimension in discussions of SD to enable
  a) the core of students’ ideas about how SD could be realized to be addressed, and
  b) exploration of interconnections between dimensions of SD.

My hope is that future research will continue to focus on how interconnectedness can be taught and learnt, in order to develop more knowledge in relation to the essential “how” question in ESD.

Notes

1SIRIS, Skolverkets internetbaserade resultat- och kvalitetsinformationssystem. [The National Agency for Education's online information system on results and quality]: http://siris.skolverket.se/siris/f?p=Siris:1:0

2Artologik software for the web, https://www.artologik.com/


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Appendix 1

SC questionnaire

Part 1

For each statement below, mark the alternative which ties in best with your understanding.

You can mark your response on a scale from Strongly disagree to Strongly agree. If you neither agree nor disagree then mark the middle alternative. If you don't know how to respond to the question, then mark the alternative, Don't know.

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<thead>
<tr>
<th></th>
<th></th>
<th>Strongly agree</th>
<th>Strongly disagree</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Economic development is necessary for sustainable development.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>Improving people’s chances for a long and healthy life contributes to sustainable development.</td>
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<td></td>
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<tr>
<td>3</td>
<td>Reducing water consumption is necessary for sustainable development.</td>
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<td></td>
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<tr>
<td>4</td>
<td>Preserving nature is not necessary for sustainable development.</td>
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<tr>
<td>5</td>
<td>A culture where conflicts are resolved peacefully through discussion is necessary for sustainable development.</td>
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<tr>
<td>6</td>
<td>Sustainable development demands that we humans reduce all sorts of waste.</td>
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<tr>
<td>7</td>
<td>People who exercise their democratic rights are necessary for sustainable development (for example, they vote in elections, involve themselves in social issues, express their opinions)</td>
<td></td>
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<tr>
<td>8</td>
<td>Reinforcing girls’ and women’s rights and increasing equality around the world is necessary for sustainable development.</td>
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<tr>
<td>9</td>
<td>Respecting human rights is necessary for sustainable development.</td>
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<tr>
<td>10</td>
<td>To achieve sustainable development, all the people in the world must have access to good education.</td>
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</tbody>
</table>
11 Sustainable development requires that companies act responsibly towards their employees, customers and suppliers.

12 Preserving the variety of living creatures is necessary for sustainable development (preserving biological diversity).

13 Having respect for other cultures is necessary for sustainable development.

14 Sustainable development requires fair distribution of goods and services among people in the world.

15 Wiping out poverty in the world is necessary for sustainable development.

16 Sustainable development requires a shift to renewable natural resources.

17 Sustainable development demands that people understand how the economy functions.

18 For sustainable development, big infectious diseases such as HIV/AIDS and malaria must be stopped.

19 For sustainable development, people need to be educated in how to protect themselves against natural disasters.

Part 2

For every statement below, mark the alternative which corresponds best with your understanding.

You can mark your response on a scale from Strongly disagree to Strongly agree. If you neither agree nor disagree then mark the middle alternative. If you don’t know how to respond to the question, then mark the alternative, Don’t know.

20 I think that everyone ought to be given the opportunity to acquire the knowledge, values and skills that are necessary to live sustainably.
<table>
<thead>
<tr>
<th></th>
<th>I think that we who are living now should make sure that people in the future enjoy the same quality of life as we do today.</th>
</tr>
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<tbody>
<tr>
<td>21</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td></td>
<td>I think that companies have a responsibility to reduce the use of packaging and disposable articles.</td>
</tr>
<tr>
<td>22</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td></td>
<td>Using more natural resources than we need does not threaten the health and well-being of people in the future.</td>
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<tr>
<td>23</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
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<tr>
<td></td>
<td>I think that we need stricter laws and regulations to protect the environment.</td>
</tr>
<tr>
<td>24</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td></td>
<td>I think it is important to reduce poverty.</td>
</tr>
<tr>
<td>25</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td></td>
<td>I think that companies in rich countries should give employees in poor nations the same conditions as in rich countries.</td>
</tr>
<tr>
<td>26</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td></td>
<td>I think that it is important to take measures against problems which have to do with climate change.</td>
</tr>
<tr>
<td>27</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td></td>
<td>I think that the government should provide financial aid to encourage more people to make the shift to green cars.</td>
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<tr>
<td>28</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td></td>
<td>I think that the government should make all its decisions on the basis of sustainable development.</td>
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<tr>
<td>29</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td></td>
<td>I think that it is important that people in society exercise their democratic rights and become involved in important issues.</td>
</tr>
<tr>
<td>30</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td></td>
<td>I think that people who pollute land, air or water should pay for the damage they cause to the environment.</td>
</tr>
<tr>
<td>31</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td></td>
<td>I think that women and men throughout the world must be given the same opportunities for education and employment.</td>
</tr>
<tr>
<td>32</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td></td>
<td>I think it is okay that each one of us uses as much water as we want.</td>
</tr>
<tr>
<td>33</td>
<td>☐ ☐ ☐ ☐ ☐ ☐</td>
</tr>
</tbody>
</table>
### Part 3

For each statement below, mark the alternative which ties in best with your understanding.

You can mark your responses on a scale from **Strongly disagree** to **Strongly agree.** If you neither agree nor disagree then mark the **middle alternative.** If you don’t know how to respond to a question, then mark the alternative, **Don’t know.**

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<tbody>
<tr>
<td>34</td>
<td>Where possible, I choose to cycle or walk when I’m going somewhere, instead of travelling by motor vehicle.</td>
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<td>35</td>
<td>I never waste water.</td>
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<tr>
<td>36</td>
<td>I recycle as much as I can.</td>
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<tr>
<td>37</td>
<td>When I use a computer or mobile to chat, to text, to play games and so on, I always treat others as respectfully as I would in real life.</td>
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<tr>
<td>38</td>
<td>I often make lifestyle choices which are not good for my health.</td>
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<tr>
<td>39</td>
<td>I do things which help poor people.</td>
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<tr>
<td>40</td>
<td>I pick up rubbish when I see it out in the countryside or in public places.</td>
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<tr>
<td>41</td>
<td>I don’t think about how my actions may damage the natural environment.</td>
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<tr>
<td>42</td>
<td>I often purchase second-hand goods over the internet or in a shop.</td>
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<tr>
<td>43</td>
<td>I always separate food waste before putting out the rubbish when I have the chance.</td>
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<tr>
<td>44</td>
<td>I avoid buying goods from companies with a bad reputation for looking after their employees and the environment.</td>
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<tr>
<td>45</td>
<td>I have changed my personal lifestyle in order to reduce waste (e.g., throwing away less food or not wasting materials).</td>
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</tbody>
</table>
46. I work on committees (e.g. the student council, my class committee, the cafeteria committee) at my school.

47. I treat everyone with the same respect, even if they have another cultural background than mine.

48. I support an aid organisation or environmental group.

49. I watch news programs or read newspaper articles to do with the economy.

50. I show the same respect to men and women, boys and girls.
Appendix 2

The scenario questionnaire

1) Imagine that you are standing in a grocery store helping with the weekly grocery shopping. **What do you think is important to take into account when you're shopping?** Mark the **three** most important arguments for how you choose your groceries by putting 1 in front of the most important, 2 in front of the second most important and 3 in front of third most important argument.

- [ ] That the product is locally produced, to reduce transport emissions
- [ ] That the product is produced under good working conditions for the workers, e.g., Fairtrade
- [ ] That the product is cheap so that my money stretches to other things
- [ ] That the product has an eco-label, e.g. KRAV or Ekologisk
- [ ] That the product is produced locally, creating jobs in Sweden
- [ ] That the product is of high quality and that the manufacturer is reliable

2) One of our big problems today is global warming, which our way of living contributes to. Global warming leads to climate change, which has various consequences around the world. **Which do you think are the most important arguments for why we must put the brakes on global warming?** Mark the **three** most important arguments by putting 1 in front of the most important, 2 in front of the second most important, and 3 in front of the third most important argument.

- [ ] People are exposed to great suffering from, for example, floods or drought
- [ ] Global warming means high reconstruction costs in connection with, for instance, storms and floods
- [ ] Global warming causes certain species to become extinct and ecosystems to be destroyed
People will be forced to flee their homes and become climate refugees

Poorer nations are hit hard economically by emissions from richer nations

Eco systems which are in danger of disappearing must be preserved, e.g. the Arctic and the Swedish alpine region

3) Today we are trying to organise society so that we can take better care of our waste. **Which do you think are the most important arguments for why we should take care of our waste?** Mark the **three** most important arguments by putting 1 in front of the most important, 2 in front of the next most important, and 3 in front of the third most important argument.

- Because it is often cheaper for us to recycle resources instead of extracting new ones, e.g. aluminium cans.
- Because we need to conserve nature’s resources
- So that poorer nations will not have to take care of our environmentally dangerous waste
- Because it is more expensive for us not to recycle, e.g., increased costs for garbage collection
- So that dangerous substances are not released into our environment
- In order not to leave our waste problem to future generations
Appendix 3

Interview questions

Part 1: Meaning/interpretation of the concept sustainable development

I: This interview involves your way of viewing and thinking about sustainable development in society, in the world today, and in the future.

Hand out their completed questionnaires

I: As a start, I would like you to write down some sentences in which you explain and give reasons for your answers to these questionnaire questions. You can write on the questionnaire sheets. Before you do this, please write down what the concepts economic growth and economic development are/mean/refer to. I am not interested in assessing you answers. Simply write what you think each might be.

I: What is sustainable development? What does it mean?

I: Tell us if you think there is sustainable development today (in society; in Sweden; in the world). Explain how you think.

I: What do you think the overall/major problems are?

I: What do you think the main causes of these problems are?

Part 3: Interpretation of the concepts economic growth, economic development, and their interconnectedness to sustainable development

I: So far, we have discussed your views on how issues involved in sustainable development are interrelated. Now I would like to know how you think about the two concepts sometimes referred to in the public debate: economic growth and economic development.

Ask them to focus on what they wrote on the first page of the questionnaire

I: Let us start with economic growth. What does it mean? Tell us how you interpret it.

I: What about economic development, then? What does it mean? Tell us how you interpret it.

I: Are the two the same or do they differ in any way?

I: Has economic growth anything to do with sustainable development? Tell us what you think about that.

I: Has economic development anything to do with sustainable development? Tell us what you think about that.
STUDENT VIEWS OF ENVIRONMENTAL, SOCIAL AND ECONOMIC DIMENSIONS OF SUSTAINABLE DEVELOPMENT AND THEIR INTERCONNECTEDNESS

Education for sustainable development (ESD) is described as a learner-centered teaching approach in which the perspectives of the learners constitute an important part. In line with the holistic aims of ESD, social and economic perspectives are considered alongside environmental perspectives when dealing with sustainability issues. This thesis is a compilation of four sub-studies, centering on the diversity of views among upper secondary students on sustainable development, its underlying environmental, social and economic dimensions and their interconnectedness. Both quantitative and qualitative methods were used to investigate the diversity in students' views in different contexts. The results reveal a diversity in views that specifically relates to the economic dimension of sustainable development. Four distinctly different beliefs were identified among the students on how the economy and sustainable development are connected. Moreover, students' views differed depending on whether they encountered environmental, social and economic dimensions in an integrated way or in isolation. The findings indicate the potential resource students' views and different contexts can represent in education that aims for learning about the complex and dynamic nature of sustainable development.