Student ’sustainability consciousness’ and decision-making on sustainability dilemmas

Investigating effects of implementing education for sustainable development in Swedish upper secondary schools

Teresa Berglund
Student ’sustainability consciousness’ and decision-making on sustainability dilemmas

Investigating effects of implementing education for sustainable development in Swedish upper secondary schools

Teresa Berglund
Student 'sustainability consciousness' and decision-making on sustainability dilemmas - Investigating effects of implementing education for sustainable development in Swedish upper secondary schools

Teresa Berglund

LICENTIATE THESIS

Karlstad University Studies | 2014:59

urn:nbn:se:kau:diva-34196

This thesis is also part of the series Studies in Science and Technology Education ISSN 1652-5051 at Linköping University

ISSN 1403-8099

ISBN 978-91-7063-599-1

© The author

Distribution:
Karlstad University
Faculty of Health, Science and Technology
Department of Environmental and Life Sciences
SE-651 88 Karlstad, Sweden
+46 54 700 10 00

Print: Universitetstryckeriet, Karlstad 2014
Abstract

The central role of education for sustainable development (SD) has been emphasized since the 1990s. SD involves the three areas of environment, economy and society, with a focus on the relationships between environmental protection and human development. Education for sustainable development (ESD) takes a holistic view on the environmental, economic and social dimensions of SD and aims to empower students to engage in the democratic development of society in a more sustainable direction. Policy-level and research community discussions have addressed the ways in which ESD has been implemented internationally. This study focuses on upper secondary students, and investigates their views on sustainability and the ways they make decisions related to SD. The study aims to address the interdisciplinary and multidimensional content embraced in the concept of SD and the development of competences often associated with ESD. A survey investigating students’ (n=638) sustainability consciousness (SC) and their decision-making in a number of SD related contexts was conducted in 15 Swedish upper secondary schools. The results show that students attending schools with an ESD profile are characterized by stronger SC than students attending regular schools; however the difference is small and mostly related to the economic dimension of SD. Furthermore, students who prioritize environmental decisions in SD dilemmas show stronger SC than students giving priority to economic reasons. When environmental, economic and social dimensions are introduced separately, social aspects are given the highest priority by the students. In contrast, environmental aspects are up-graded when the dimensions are introduced in an integrated manner. However, different dimensions are prioritized in different contexts. The study provides empirical support for using multiple contexts and including both harmonious and conflict-based perspectives on SD in education. It also contributes knowledge to the discussion about the implementation of ESD in Sweden in terms of outcomes among students.
Tack

Det finns ett antal personer som jag vill tacka som på olika sätt har bidragit till den här licentiatuppsatsen.

Jag vill börja med mina handledare, Niklas Gericke och Shu-Nu Chang Rundgren; stort tack för ett osvikliga engagemang under hela forskningsprojektet! Niklas, tack för ditt tålmodiga arbete med mina texter, din noggrannhet och ditt sätt att ge både frihet och guïdning. Shu-Nu, tack för din alltid snabba respons då jag behövt hjälp, ditt arbete med mina texter och all stödning och uppmuntran du gett under tidens gång.

Jag vill också rikta ett stort tack till Jari Appelgren som har gett mig möjlighet att få insikt i statistikens komplexa värld. Du har visat på de möjligheter som finns och på ett begripligt sätt lyckats förklara idén bakom dem.

A big thanks to Søren Breiting, Aarhus University, and Maria Ojala, Uppsala University, for valuable input and comments on my work, and to the International Institute for Sustainable Development (IISD) for providing foundations for the survey instrument that part of this research is based on.

Karin Thörne, Anna Mogren, Torodd Lunde, Nina Christenson, Annika Pettersson och Elisabet Mellroth samt övriga deltagare i SMEER vid Karlstads universitet; tack för att ni bidragit med värdefulla synpunkter och idéer kring mitt arbete och mina texter. Tack också alla kollegor på biologiavdelningen för alla skratt och trevliga diskussioner som skett över lunch- och fikabordet. John Piccolo och Elisabeth Wennö har gett värdefull språklig input och Eva Erixon gav ett viktigt bidrag i datainsamlingsprocessen.

Ett stort tack vill jag rikta till dig, Daniel Olsson, licentiand-kollega och parhäst inom forskningsprojektet. Utan dig hade den här tiden som forskarstuderande tett sig helt annorlunda. Du har bidragit på så många olika sätt, både med vetenskapliga synpunkter, uppmuntrande tillrop, trevligt sällskap och med praktisk hjälp när jag till exempel bråkat med min dator, vilket har hänt från och till!

Jag vill också rikta ett tack till gymnasieförvaltningen i Karlstads kommun för att jag fick möjlighet att genomföra detta forskningsprojekt och ett särskilt tack till rektor Susanna Rydahl för all support under min forskningstid.

Nationella forskarskolan i naturvetenskapernas, teknikens och matematikens didaktik (FontD) har bidragit med en värdefull introduktion i didaktikforskningens värld. Tack till Lena Tibell, Konrad Schönborn samt alla
forskarstuderande kollegor för synpunkter och kommentarer samt den trevliga
samvaro vi haft tillsammans under alla FontD-träffar.

Och så till alla skolor och alla elever som deltagit i den här studien; jag är så
tacksmässig över att ni ställde upp och lät mig komma och besöka er trots den
intensiva period som alltid infaller i slutet av ett läsår.

Avslutningsvis vill jag tacka min familj för all support under de här 2,5 åren.
Kenneth, Ritva, mamma och pappa; tack för att ni alltid ställer upp när vi
behöver hjälp! Och så till de viktigaste personerna i mitt liv; Anders, Alva och
Alice. Till Anders för att du alltid tar tid för mina funderingar. Tack för att
jag får ha er vid min sida!
List of papers

Paper I

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


Paper II

Student views on the dimensions of sustainable development – a matter of context, congruence and conflict

Teresa Berglund and Niklas Gericke
Submitted to Environmental Education Research.
Contents

Introduction ................................................................................................................. 9
Aim of the thesis .......................................................................................................10
Theoretical background ...........................................................................................10
  Sustainable development ......................................................................................11
    The complexity of the concept ...........................................................................11
    The rise of the political concept ..........................................................................13
    A contentious concept .........................................................................................14
  Education for sustainable development ..............................................................14
    A holistic and interdisciplinary approach .........................................................17
      Two approaches to holism ...............................................................................18
    Pluralism and democracy ....................................................................................19
    Integration of cognitive and affective aspects ...................................................20
    The concept ‘sustainability consciousness’ .......................................................20
      Knowingness, attitudes and behaviors .............................................................21
    Situated learning .................................................................................................24
  Implementation of ESD in Sweden .........................................................................24
    The curriculum ....................................................................................................25
    School-supporting initiatives .............................................................................25
Method .....................................................................................................................27
  The survey instrument ...........................................................................................28
    The KAB sections ...............................................................................................29
    The scenario section ............................................................................................31
Participants ...............................................................................................................32
Collection of data ....................................................................................................33
Data analysis ............................................................................................................34
  Validity ..................................................................................................................34
  Reliability ..............................................................................................................38
  Comparative analysis ............................................................................................38
Main results ...............................................................................................................39
  Sustainability consciousness among ESD and REF students .............................39
  The dimensions of SC ..........................................................................................40
  Separated versus integrated perspectives on the SD dimensions .........................41
  Comparing the perspectives ..................................................................................42
Discussion and implications .....................................................................................44
  Validity and reliability of the instrument ................................................................44
  The sustainability consciousness among ESD and REF students .........................46
Introduction

The central role of education for sustainable development (SD) has been recognized ever since the UN Conference on Environment and Development in Rio de Janeiro, Brazil in 1992. Going back to the 1960s and early ‘70s, environmental education (EE) emerged in response to the environmental problems at the time (McKeown and Hopkins 2003). The main goal of EE was to protect the environment and to reduce human impact on nature. In the 1990s, the extensive Agenda21 document addressed the three areas of environment, economy and society with a focus on the relationships between environmental protection and human development. Education for sustainable development (ESD) is concerned with holistic perspectives on the environmental, economic and social dimensions of SD and with the empowerment of students to engage in a democratic development of society in a more sustainable direction.

The Decade of ESD (2005-2014), proclaimed by UN in 2002, is now ending and a new decade of ESD is upcoming. Many discussions both on policy level (e.g. by organizations such as UNESCO) and in the research community have addressed the ways in which ESD has been implemented internationally. ESD is a concept based on features such as holistic learning, integration of disciplines and integration of cognitive and affective domains. ESD has been implemented in many schools worldwide in a variety of ways. In Sweden, several external initiatives have been undertaken in order to support schools in their ESD implementation. These endeavors include concrete plans to work with these issues in schools, certification, and in-service training for teachers and school leaders.

This study centers on students and investigates student views on sustainability and decision making related to SD issues. The study aims to address the interdisciplinary and multidimensional content embedded in the concept of SD and the transformative perspective concerned with the development of competences often associated with ESD. The results are based on a survey conducted among students in Swedish upper secondary schools, which was designed to investigate their ‘sustainability consciousness’ and their decision-making in a number of SD related contexts from everyday life. The study is part of a larger research project investigating the implementation of ESD in the Swedish school system, focusing on 6th, 9th and 12th graders. This study reports the results of 12th graders (see also Olsson, Gericke, and Chang Rundgren
Aim of the thesis

This study is essentially about student views of the complex concept of SD. The diversity of views that might emerge is used as a basis for discussing the implementation of ESD in Swedish upper secondary schools as well as the foundations of ESD teaching in terms of differences in perspectives among students, which are often regarded as good starting points for ESD teaching. The aim of the two studies that form the basis of this thesis was to investigate effects of the implementation of ESD in Swedish upper secondary schools and to illuminate the complexity of the SD concept in an educational context. The two studies address upper secondary students’ views on SD from different perspectives. Furthermore, in order to study effects of the implementation of ESD in upper secondary school, a comparison is made between students from schools with an ESD approach and students from regular schools without an explicit ESD approach concerning their sustainability consciousness (SC). The concept of SC was developed in order to combine the multidimensional contents of SD and the cognitive and affective learning outcomes, which relate to the transformative intentions of ESD. The overall research questions addressed in this thesis are:

• Are there differences between students from schools using an ESD approach and students from regular schools in terms of their sustainability consciousness and if so, what is the nature of the differences?

• What views on the SD dimensions emerge when these are introduced separately or integrated (reflecting harmonious and conflict-based perspectives of SD)?

• Is there a relationship between students’ environmental, economic and social considerations and their decisions made in specific SD contexts?

Theoretical background

In order to provide a framework for the study, the concepts of SD and ESD will be presented in depth in the following sections. Thereafter, the concept of SC and its relationship to SD and ESD will be elucidated. Finally, the
implementation of ESD in Swedish schools is described from the perspective of existing supporting initiatives for schools in Sweden and the Swedish curriculum for upper secondary school.

**Sustainable development**

*The complexity of the concept*

The concept of SD has been debated and discussed extensively in recent years. Broadly depicted, the concept of SD attempts to combine concerns with environmental issues with socio-economic issues. However, from the SD debate, it is evident that there is no consensus of the concept; rather it is associated with a variety of interpretations and meanings (Giddings, Hopwood, and O’Brien 2002). The discussion has centered on definitions of SD and on the usefulness of the concept. Critique has also been leveled against the concept, mainly regarding its meaning and how to enforce it and translate it into practice.

Most people agree that sustainability is good, but what it actually stands for remains unclear. A review of multidisciplinary literature on SD by Jabareen (2008) showed that a) the concept is based on vague definitions, b) there is a lack of operative definitions and c) there is disagreement on what should in fact be sustained. In the review, interpretations of SD were categorized into independent concepts, each of them having a distinctive meaning. Seven concepts were identified in the conceptual analysis. In order to provide an introduction to the concept and its complexity, these will be shortly described.

*The concept of ethical paradox:* This concept addresses the tensions built into the concept of SD, by the concurrent usage of the words “sustain” and “develop”. The word sustainability is often seen as an environmental logo whereas development often has an economic logo. From this perspective, SD aims to moderate and mitigate between the goals of environmental protection and economic growth.

*The concept of natural capital stock:* This concept deals with the natural material assets of development, i.e. assets that cannot be created by humans. In the SD discourse, keeping natural capital at a constant level is often regarded as a criterion for sustainability, in order not to jeopardize future generations’ chances to achieve wealth and well-being.

*The concept of equity:* This concept addresses the social aspects of SD. In the SD discourse, equity refers to both intergenerational and intragenerational equity.
Relationships between disparities of power and environmental degradation (see a discussion in Jabareen [2008]) suggest that SD in this discourse can be seen as a criterion for environmental justice.

The concept of eco-form: Here, focus is on the ecological design of human habitats, thus enabling buildings and other environments to function in more sustainable ways. Since the ‘80s, ideas and technologies have emerged that focus on alternative building materials, recycling, renewable energy, organic foods, etc.

The concept of integrative management: This concept represents the integration of economic, environmental and social concerns in planning and management. Holistic management approaches are regarded as necessary in order to preserve the natural capital stock and to achieve sustainability and ecological stability. Aspects of environmental protection, social development and economic growth are considered together but not regarded as conflicting. Rather, they are conceived as a challenge to find ways of integrating ‘environment’ and ‘development’ to achieve SD.

The concept of utopianism: This concept is based on the idea of a perfect society where humans live in harmony with nature and justice prevails. In this vision, human habitats are based on the SD concept from a local to a global perspective.

The concept of political global agenda: The Earth is regarded as one unified globe. One aim is to provide the developing world with tools for dealing with environmental problems in addition to social and economic issues, such as population growth and poverty. This discourse is associated with disputes, mainly related to the northern and southern parts of the world, where the South insists on “no sustainability without development” and the North demands “no development without sustainability” (Jabareen 2008).

According to Giddings et al. (2002), the economic perspective is often dominant in relation to environmental and social perspectives in the political agenda. However, the material reality implies that economy is dependent on society and that all human action is placed in the environment, i.e. human life depends on it. The main argument proposed by Giddings et al. (2002) is that there is a need for a shift in how we as humans see the world; the division into separate entities must be replaced with a more trans-disciplinary view. SD is only possible if our view is based on an integrated outlook on human life and the surrounding world. Hopwood, Mellor, and O’Brien (2005) point to the global responsibilities that arise from environmental problems and state that actions have to be considered on an international level in order to avoid
displacing problems between different areas. Environmental problems are closely connected to human well-being and are a threat to people’s health, livelihoods and the quality of life for future generations. In addition to the tensions between economic growth and the use of resources and production of waste, another area of debate is between weak and strong sustainability (Hopwood et al. 2005). From the perspective of the weak sustainability supporters, technology is regarded as a solution for the loss of natural resources or environmental damage. Supporters of the strong sustainability perspective claim that capital made by humans cannot replace processes such as photosynthesis, which is crucial to human existence. The area of weak and strong sustainability is mostly concerned with environmental issues and thus, not with socio-economic consequences.

The rise of the political concept

SD emerged in the 1980s in response to increasing awareness about the need to link environmental concerns with social and economic development. At policy level, the concept of SD received worldwide recognition through the report *Our Common Future*, by the World Commission on Environment and Development (WCED 1987). In the report, SD was defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (p. 43). Hence, human needs were in focus although it was emphasized that they should be met with responsibility for generations to come. Another definition of SD is found in the publication *Caring for the Earth: A Strategy for Sustainable Living* by the UN Environment Programme, the World Conservation Union and the World Wide Fund that emerged a few years later (IUCN/UNEP/WWF 1991). SD was defined as “improving the quality of human life while living within the carrying capacity of supporting ecosystems” (p. 10). This definition complements the WCED (1987) definition by emphasizing the protection of the Earth’s regenerative capacity (UNESCO 2006). In 1992, the UN Conference on Environment and Development (UNCED) was held in Rio de Janeiro, Brazil. Emerging from this conference was the extensive *Agenda21*-document, which emphasized the role of education as essential for promoting SD and enhancing people’s capacities to address issues concerning development and environment (UNESCO 2006). In 2002, the Johannesburg Summit further emphasized the role of education and proposed a Decade of Education for Sustainable Development (DESD), which was later proclaimed to be the period 2005-2014 by the UN General Assembly.
A contentious concept

Critique has been raised against the concept of SD for a number of reasons. Some objections concern the broad spectrum of SD issues. It is pointed out that since SD is of general concern to the world, there is a risk that nobody feels a personal responsibility to act (Sandell, Öhman, and Östman 2005). Another objection is that the many actors in society embracing it, such as governments, large companies and reformers in the environmental and social sphere, all impose their own meaning on what SD means (Giddings et al. 2002). Many major companies in the world, e.g., in oil and gas, banking and finance, biotechnology and electricity generation, and car industry, are members of the World Business Council for Sustainable Development. However, they have been involved in conflict with human rights activists and trade unions (Giddings et al. 2002), which is an illustrative example of how different actors in society might use the term of SD while supporting radically opposed ideas (see a discussion in Jickling and Wals 2008 on this topic). A consequence might then be that SD runs the risk of losing its meaning as a concept since it encompasses such many varied meanings and interpretations that it might mean almost anything. To sum up, it is important to be aware of the investigators viewpoint on the meaning of SD when investigating interpretations of SD.

Although the concept of SD is associated with difficulties and a lack of clear consensus about its meaning, there are also obvious benefits connected to it. As Hopwood et al. (2005) argue, it provides a useful framework for discussions about the choices and challenges facing humanity in the future. The wideness of the concept and the lack of a precise definition enable creative discussions that are still orientated towards the same direction (De Haan and Harenberg 1999, in Rauch 2002).

The next section describes how SD is defined in an educational context.

Education for sustainable development

Previous sections have described SD as a controversial and debated concept. There is an implied consensus embedded in the term in the sense that no serious person would explicitly favor unsustainable development. However, views on how to reach sustainability differ from person to person. From an educational point of view, a common definition of SD is based on the integration of the three dimensions of environment, society and economy (see e.g., Gough 2002; Rauch 2002; Walshe 2008; Herremans and Reid 2002;
The dimensions of SD have been described in educational literature. *Environmental SD* is described by Rauch (2002) as safeguarding the natural bases of living in the long run by organizing society so that resultant material cycles fit into global cycles as well as local eco-systems. According to Herremans and Reid (2002), environmental SD stands for preservation, integrity, functioning and productivity of ecosystems, but also for the intrinsic value of flora and fauna. *Economic SD* is described as creating an economic system that assures a long-term quality of living, not only in terms of material wealth but also in terms of self-determination and self-development for individuals and societies (Rauch 2002). Herremans and Reid (2002) describe the economy as a system of production, distribution and consumption as a means to satisfy the material needs of people through for example money and possessions. *Social SD* is internal and external solidarisation with communities and regions and the responsibility for a global SD where also disadvantaged regions can take part (Rauch 2002). According to Herremans and Reid (2002), the emphasis is shifted from individual rights and economic wealth to community rights and welfare of human beings: fair treatment of humans regardless of gender and ethnic belonging, basic health care, safety issues, food standards, cultural and recreational accessibleness and lack of human exploitation.

UNESCO is the United Nations organization that is responsible for the sectors of education, science and culture. In the policy document *Framework for the UNDESD International Implementation Scheme* (UNESCO 2006), overall guidance is provided for the implementation of ESD, addressing the educational challenge for the decade 2005-2014. According to UNESCO (2006, 17), ESD should aim to demonstrate the following: *Interdisciplinarity and holism, values-driven, critical thinking and problem-solving, multi-method pedagogies, participatory decision-making, applicability and local relevance*. UNESCO (2006) outlined the three dimensions of SD as a long-term process of change. The three dimensions are described as follows:

*Environment:* an awareness of the resources and fragility of the physical environment and the affects on it of human activity and decisions, with a commitment to factoring environmental concerns into social and economic policy development.
Economy: a sensitivity to the limits and potential of economic growth and their impact on society and on the environment, with a commitment to assess personal and societal levels of consumption out of concern for the environment and for social justice.

Society: an understanding of social institutions and their role in change and development, as well as the democratic and participatory systems which give opportunity for the expression of opinion, the selection of governments, the forging of consensus and the resolution of differences.” (UNESCO 2006, 14).

Underlying each of these three dimensions is a number of sub-themes, which give further direction for SD education. The sub-themes underlying each dimension are:

Environmental perspectives: Natural resources (water, energy, agriculture, biodiversity), climate change, rural development, sustainable urbanization, disaster prevention and mitigation.

Economic perspectives: Poverty reduction, corporate responsibility and accountability, market economy.


Critique has been directed against the idea presented by UNESCO, of ESD being a carrier of globalizing forces, warning of the risk of reducing conceptual space and alternative ways of thinking (Jickling and Wals 2008).

This study draws on the UNESCO (2006) definitions of SD. The concept of SD is operationalized into a survey instrument based on the sub-themes underlying the environmental, economic and social dimensions. The reason for operationalizing SD in this way is that Swedish curricula and syllabuses derive from and are therefore closely connected to the UNESCO definitions (Borg, Gericke, Höglund, and Bergman 2014). The UNESCO definitions are also linked to how SD is described in literature.

In the following sections, some features of ESD that are central to this study are presented.
**A holistic and interdisciplinary approach**

It is often suggested that SD should be dealt with from an integrated perspective, applied to the existing content in all subjects (Sandell et al. 2005). Teachers can contribute their specific subject knowledge in relation to other teachers' expertise in other subjects, thus providing a basis for exchange of perspectives and fruitful debates on issues of complexity related to SD. Discussions about the broad range of existing viewpoints in relation to SD issues are important features of ESD (Sandell et al. 2005). A holistic approach to the wide range of SD contents implies an attempt to consider effects related to all three SD dimensions in discussing environmental and developmental problems and issues. The holistic perspective implies that aspects or effects related to all three dimensions are considered, although the dimensions need not be given equal weight in the solutions proposed to a particular environmental or developmental problem. The importance of the holistic and interdisciplinary approach has been emphasized in literature. Warburton (2003) has outlined a number of principles for encouraging students to move across disciplines, in line with the aim of systems-level thinking. By providing a broad scope of material and conceptual content, illustrating interconnections and interdependence and stressing dynamic processes and structures students are encouraged to develop cross-disciplinary thinking. Herremans and Reid (2002) argue that using the three dimensions of SD as a basis for student discussions promotes understanding of why disagreements exist and why it is difficult to solve environmental conflicts. Students can also develop awareness of their own values by considering all three dimensions and by reflecting on their own priorities in relation to the dimensions. Manni, Sporre, and Ottander (2013) argue for enhanced awareness of the importance of systems thinking and understanding of relationships between the SD dimensions among teachers.

Holistic perspectives have been investigated both from a teacher and student perspective. Several studies indicate a lack of holistic understanding of SD, both among teachers and students. In the study by Manni et al. (2013), it was shown that students aged 10-12 years generally understood SD and its dimensions at a level of low complexity and demonstrated difficulties in describing relationships between the dimensions. Walshe (2008) found similar results when investigating one class of students aged 12-13 years. When Summers and Childs (2007) investigated student science teachers' conceptions of SD, they found that only a small fraction (15%) acknowledged all three dimensions. Borg et al. (2014) investigated Swedish upper secondary teachers' conceptual understanding of
SD and found subject and discipline-bound differences between teachers. However, in general the teachers did not understand the concept of SD holistically. Another study by Borg et al. (2012) showed that 24% of the upper secondary teachers in the study did not include SD at all in their teaching. However, a difference was found between teachers in different disciplines.

Critique has been leveled against the integrated and cross-disciplinary nature of ESD. Stables and Scott (2002) argue that human-nature relationships can be examined from the perspective of each discipline instead of presupposing a false consensus regarding SD.

This study is based on a holistic perspective of the subject contents related to ESD. The three dimensions of environment, economy and society are used as foundation for investigating student views on SD. By including aspects of the sub-themes underlying the three SD dimensions as described previously, a broad approach to the investigation is taken in order to study the ways in which students acknowledge and relate to the three dimensions in different contexts.

Two approaches to holism

The holistic perspective can be dealt with in different ways. In national steering documents as well as UNESCO policy documents, the dimensions and their interrelations are often considered and treated in a way that emphasizes harmonious relationships between them and thus, conflicts and controversies are not made visible (Öhman and Öhman 2012). This is sometimes referred to as a harmony/congruence perspective versus a conflict/controversy perspective of SD (Öhman and Öhman 2012; Herremans and Reid 2002).

By using a harmony perspective alone, students might not get to the core of SD. If a harmony perspective was a true reflection of reality, then SD would already be happening. However, tensions between different interests are often roots of the difficulties in finding solutions to environmental and developmental problems (Sandell et al. 2005). To identify and discuss both congruencies and conflicts can facilitate the process of finding solutions and promoting understanding of the multidimensional nature of SD. Student opinions often differ concerning the actions that could best reach the goal of sustainability. As a result, students might develop better understanding of their own values (Herremans and Reid 2002).
Öhman and Öhman (2012) studied two classes of upper secondary students when working with a thematic assignment on sustainable urban planning. Their results show that the students mainly developed a harmony perspective in their meaning-making of SD. As a consequence, the basic modern society principles of progression, i.e. increased material welfare through technology development and economic growth, were not challenged. Summers and Childs (2007) investigated student science teacher conceptions of SD, and their results showed that even though the participants were aware of the three dimensions to various extent, there was almost no recognition of controversy in relation to the concept of SD. Öhman and Öhman (2012) emphasize the importance of giving students opportunities to encounter both harmony and conflict perspectives in their education.

**Pluralism and democracy**

Several authors have discussed the complexity of the SD concept from an educational perspective, e.g., Björneloo (2007); Sund (2013); Wals (2011). Studies have shown that the complexity can be treated as a resource in the process of learning (Sund 2013; Jickling and Wals 2008) but also that the roles of conflict and diverging perspectives need further study since dissonance can block learning (Wals 2011). Sund (2013) argues that teachers often tend to simplify issues of SD in order to make them more understandable and easy to deal with. Sund (2013) interviewed experienced ESD school teachers and the results show that the teachers regarded the complexity of SD as a resource rather than as an obstacle. A pluralistic approach in teaching is often emphasized as essential in ESD, in order to deal with the complexity in a constructive way. Using a pluralistic approach in teaching involves highlighting the diversity of opinions and understandings among students in discussions and debates in the classroom (Sandell et al. 2005). Different perspectives and their implications are treated as equally important. In discussions and debates, they are valued and reviewed critically. This indicates that students gain experiences of situations when other people have differing opinions. The benefits are several: students can develop abilities to deal with diverging opinions in a constructive way and they do not only learn about democracy, but actually experience democracy (Sandell et al. 2005). According to Wals (2011), a pluralistic approach is essential for new ways of being and seeing, which is the transformative nature of ESD. This is fruitful from a learning perspective but also in regard to the bigger picture including future citizenship. According to
Wals (2011), heterogeneity and pluralism create possibilities for more creative solutions to difficult issues than homogeneity and singularism.

**Integration of cognitive and affective aspects**

The process of learning embraces more than cognitive aspects. The close intertwining of subject matter, personal values and emotions in relation to learning has been described by several authors. Experiences of learning can cause emotional reactions, and personal values and emotions can mediate responses to the specific learning experience (Rickinson, Lundholm, and Hopwood 2009). Research has shown that when students make decisions on socio-scientific issues, arguments are more often based on values and ethical considerations than on scientific knowledge (Rickinson et al. 2009; Christenson, Chang Rundgren, and Höglund 2012). Cognitive and affective aspects are indispensable elements in ESD teaching and learning due to the holistic nature and the pluralistic approach. Sandell et al. (2005) found that in textbooks and curricula the process of acquiring knowledge on one hand and attitudes and values on the other is often separated. This differentiation is not reasonable according to Sandell et al. (2005) since when knowledge is learnt, specific ways of viewing that constitute important components of the view of the world automatically follow. Littledyke (2008) argues that integration of affective and cognitive domains in science and environmental education can increase student engagement. Thus, there is strong support for including both affective and cognitive aspects in an investigation of student views on sustainable development.

**The concept ‘sustainability consciousness’**

In the paper *Learning for a change: Exploring the Relationship Between Education and Sustainable Development*, Vare and Scott (2007) describe two approaches to ESD. The ESD1 approach involves 1) promoting or facilitating changes in what we do, 2) promoting (informed, skilled) behaviors and ways of thinking with a clear identified and agreed need, 3) learning for SD. The ESD2 approach involves 1) building capacities to think in a critical way about what experts say and to test the ideas behind SD, 2) exploring the contradictions embedded in SD, and 3) learning as SD. ESD1 represents a view of SD as expert-knowledge-driven, whereas ESD2 comprises a view of SD as being a learning process. Vare and Scott (2007) note that there are two reasons for why ESD1 is important, namely a) clear benefits to individuals, families and organizations but also social and environmental gains, and b) the advantages of simplicity; simple measures
that benefit the environment. Vare and Scott (2007) further note a focus on ESD1 in policy documents and the work of NGOs, and advocate the need to adjust the balance between ESD 1 and 2. The authors oppose the either-or debate; instead, they regard ESD1 and ESD2 approaches as complementary. In the next paragraph, the two approaches will be discussed in relation to the concept of sustainability consciousness (SC).

One aim of this thesis is to investigate effects of the implementation of ESD in Swedish upper secondary schools. The effects are measured in terms of student SC. SC is a comprehensive concept, aiming to combine multidimensional SD contents and cognitive and affective domains of learning, related to some of the competences included in the goals of ESD. SC is based on the conflation of knowingness (K), attitudes (A) and behaviors (B) with the environmental, economic and social dimensions of SD. The aspects of KAB together constitute consciousness and sustainability refers to the three SD dimensions. The framework for the holistic approach was provided by the SEE-SEP model developed by Chang Rundgren and Rundgren (2010), in which six subject areas (Sociology/culture, Environment, Economy, Science, Ethics/morality and Policy) are connected to the aspects of knowledge, value and personal experience in reasoning on socio-scientific issues. Transformative approaches to ESD would likely influence students KAB. However, some of the goals, particularly those related to ESD2, are difficult or perhaps even impossible to measure in this way (see Mogensen and Schnack 2010 on action competence in relation to ESD). Aspects related to the goal of action competence in EE are described by Breiting and Mogensen (1999) as knowledge of action possibilities, confidence in one’s own influence and the wish to act. These aspects are, to some extent, reflected in this investigation. In addition, another section of the survey instrument examines students’ decision-making in a number of SD related contexts. In that section of the instrument, students are exposed to some of the contradictions and conflicts of interest that are embedded in the concept of SD, another ESD2 related aspect. Therefore, the survey instrument can be regarded as reflecting elements of both the ESD1- and ESD2-approach, using ESD 1 and 2 as complementary, as recommended by Vare and Scott (2007).

Knowingness, attitudes and behaviors

In the survey instrument, the term knowingness is used in place of the more familiar term knowledge. The reason for using knowingness is that for the items
in this section of the questionnaire, the respondents need to consider which features they regard as necessary for SD. This implies that the K items reflect awareness about components of SD. Knowledge is a term associated with more formal meanings. Knowledge can exist on many levels (e.g., Bloom’s taxonomy) such as factual, conceptual, procedural and metacognitive (Krathwohl 2002). In this context, it would be problematic to determine levels of knowledge and this was not part of the investigation. The term knowledge is often associated with the notion of truth and is in the SD context problematic for at least two reasons: 1) What we know today might not hold entirely in the future, and 2) What is regarded as ‘true’ depends on the perspective of a particular person (see a discussion in Stables and Scott 2002). In the study by Sund (2013), this view was articulated among experienced ESD teachers and truth was seen as something negotiable in the context of ESD. Negotiable truth was a perspective widely held by the teachers in terms of both the complexity of SD and the uncertainty of the future. That is one of the reasons why ESD2 is focused on life-long learning, as it is the capacity to analyze, to question different options and to negotiate decisions that is to be developed (Vare and Scott 2007). Vare and Scott (2007) further point out that there is a difference between the question ‘has it been learned?’ and the question ‘what has been learned?’.

As mentioned in previous sections, this study investigates views of SD among young people on the basis of the integration of cognitive and affective domains. As we have seen, relationships between cognitive and affective aspects are complex. Knowledge acquisition is intertwined with the simultaneous adopting of specific views connected to, for example, values and attitudes (Sandell et al. 2005). To be able to capture affective domains, a section based on attitudes to certain components of SD was included. Attitudes embrace aspects such as emotions, but also cognitive and behavioral components (Eagly and Chaiken 1993; Jagers, Martinsson, and Nilsson 2009; Kollmuss and Agyeman 2002). As the explicit aim was to conflate cognitive and affective domains in order to take a holistic approach to the investigation, it was not necessary to find components that were regarded as either cognitive or affective.

The nature of attitudes has been examined and described (Eagly and Chaiken 1993). In the field of social psychology, attitude objects are defined as entities that are being evaluated. Some attitude objects are abstract and others are concrete. Anything that in some sense becomes an object of thought can serve as an attitude object. Attitudes are intimately connected to values; however, the
term value usually refers to attitudes towards more abstract goals or end states of human existence (e.g. freedom, equality etc.), in contrast to more concrete attitude objects (Eagly and Chaiken 1993).

Kollmuss and Agyeman (2002) define an attitude as the enduring positive or negative feeling about some object, person or issue. According to Eagly and Chaiken (1993), an attitude is an inferred state, accounting for co-variation between stimuli and evaluative responses to these stimuli. The observable evaluative responses can be divided into three categories; cognitive, affective and behavioral responses (see also Jagers et al. 2009). The cognitive responses are thoughts or ideas about the attitude object, often termed beliefs, through which the attitude object can be associated with a positive or negative attribute. Evaluative responses of the cognitive type can also be labeled as opinions, knowledge and cognitions. The affective responses are composed of e.g. emotions, moods or feelings that may vary from strongly positive to strongly negative. Responses of the behavioral type are overt actions exhibited in relation to the attitude object. In a similar sense as affective responses, these can range from strongly positive to strongly negative. Generally it can be said that those who evaluate an attitude object in a favorable manner tend to engage in behaviors that support it, in contrast to people who evaluate the object unfavorably, who tend to engage in behaviors that oppose it (Eagly and Chaiken 1993). In conclusion, cognitive and affective components are intertwined in the aspects in this study (knowingness, attitudes and behaviors, hereafter denoted KAB).

By including the three aspects of KAB in the investigation, a holistic approach is taken to the investigation of students’ views of SD. The K section embraces what students acknowledge as necessary features of SD. The A section reflects feelings or beliefs towards the SD issues and the B section indicates what the students do in relation to the SD issues in focus. Even though there are difficulties in defining what is included in the concept of SD in the perspective of ‘what is true?’, there is still a core of features that can be regarded as being more sustainable than their alternatives. This might change over time; however, the items are of such a kind that their relationship to SD is unlikely to change drastically in the near future.
Situated learning

A number of studies focusing on ‘situated learning’ have demonstrated that learning is context-specific. By varying the contexts, space is created for different kinds of learning to emerge. As argued by Sandell et al. (2005), learning takes place in the encounter. What is learned by an individual is related to what others do and say in the present situation and to the activity the individuals participate in. Vare and Scott (2007) emphasize ‘learning as participation’ where engagement in a process leads to deeper understanding. Lundegård and Wickman (2009) analyzed the constitution of identity during a situated discourse in a conversation concerning SD. Their results showed that the room, the artefacts and the sharing of personal experiences were important aspects of how the discussion developed and of the type of identities that were constituted. Thus, different circumstances and contexts enabled different identity positions. From this viewpoint, the authors argue that a good starting point for teaching SD is the lack of agreement on the understanding of future problems and the solution to them. They further highlight the importance of contexts including controversial questions in order for students to be able to adopt different identities. In summary, the studies point to the significance of contexts in terms of human encounters and other circumstances.

In this study, different contexts are provided for the students. First, the SD dimensions are introduced as separated from each other and second, the SD dimensions are introduced integrated with each other. The latter is referred to as sustainability dilemmas and is based on three everyday life scenarios (consumption, global warming, and waste disposal). One concern of the study is whether the perspectives (separated or integrated dimensions) and the contexts used (consumption, global warming, and disposal of waste) have an impact on student views of SD.

The implementation of ESD in Sweden

In 2011, new curricula were launched in the Swedish school system, from primary to upper secondary school. Schools are working with the implementation of the new curriculum, both generally and in each subject area. The new curriculum clearly specifies that schools are expected to include aspects of SD as well as ESD in teaching and learning. Several perspectives investigated in this study are also addressed in the curriculum, e.g., the complexity of SD, the importance of seeing interconnections, multiple
perspectives, environmental perspectives and SD (see citations in the following paragraph).

**The curriculum**

The curriculum for upper secondary school (The Swedish National Agency for Education, 2013a) emphasizes the perspective of life-long learning with reference to a rapidly changing world:

“Students should also be able to orient themselves in a complex reality with its enormous flows of information and a rapidly changing world. The ability of students to find, acquire and apply new knowledge thus becomes important. Students should develop their ability to think critically, examine facts and relationships, and appreciate the consequences of different alternatives.” (The Swedish National Agency for Education, 2013a, 5)

The holistic perspective is also highlighted in the curriculum:

“Students acquisition of knowledge is dependent on developing the ability to see interconnections. The school should enable students to gain a general and coherent view. Students should get the opportunity to reflect over their experiences and apply their knowledge.” (The Swedish National Agency for Education, 2013a, 6)

SD is identified among the fundamental values and tasks for the school, as in the following paragraph:

“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, 2013a, 6)

**School-supporting initiatives**

In Sweden, a number of organizations support schools in their work with SD issues and ESD. The organizations are both governmental and non-governmental. Some of them have developed certifications that schools can apply for in order to give further directions concerning the school’s work and development. These initiatives have been used as a basis to find schools
working actively with implementation of ESD. The supporting structures are the following:

- The certification ‘School for sustainable development’, administered by the Swedish National Agency for Education (2013b). The purpose of the certification is to support, to provide guidance and to inspire schools in their pedagogical work with SD. To achieve the certificate, a school has to fulfil a number of criteria and apply for the certificate. The criteria are directed towards management and staff at the school but also include student influence as an important aspect. A complete evaluation is made every three years, which is submitted to the Swedish National Agency for Education in order to prolong the certificate for a new period of three years.

- The certification ‘Green Flag’, coordinated by the Keep Sweden Tidy foundation. The ‘Green Flag’ is the Swedish part of Eco-schools, an international programme of the Foundation for Environmental Education (FEE). The school’s work is performed in cycles in periods of one to two years. During that time, the school works with three areas of sustainability that the school wants to develop. These areas are the foundation of the school’s action plan, based on a clear connection to the curriculum. After each cycle, the documented work is reported to the Keep Sweden Tidy foundation, where it is reviewed and then feedback is provided to the school (Keep Sweden Tidy 2014).

- The ‘School on sustainable way’ project, coordinated by the World Wildlife Fund. The aim of the project, which started in autumn 2007, was a whole-school involvement in the work of learning for SD. The project has been ongoing for three years, and during that period, the schools were supported in their developmental efforts by tutors, who inspired and took part in the work of the school, by lecturing and participating in work team meetings etc. (World Wildlife Fund 2014).

- The Global School, a part of the Swedish Council for Higher Education. The Global School offers activities and programs for teachers, school leaders and policy makers with a focus on globalization and ESD (The Swedish Council for Higher Education 2014).
Schools committed to working with SD issues and ESD can use the supporting structures to facilitate the implementation of ESD. However, there is not much research on the effects of the implementation from a broader quantitative perspective in terms of student outcomes. The effects of eco-schools have been investigated in Flanders (Pauw and Van Petegem 2013) but only with a focus on the impact on the environmental dimension. In their study, younger students’ (aged 10 to 12) environmental values and behaviors were investigated. Another Swedish project studies the implementation of ESD from the perspective of norm supporting structures at the organizational level and teaching and learning processes in the classroom (see SMED 2014). Within the research project, Sund (2013), for example, studied experienced ESD schoolteachers’ teaching, and Öhman and Öhman (2012) conducted a case study of the conceptual meaning of ESD. The SMED research project also focused on upper secondary schools with an explicit ESD profile.

This study focuses on similar issues regarding the implementation of ESD in Swedish upper secondary schools but has a quantitative approach. By taking a holistic approach to SD/ESD, this research study contributes knowledge of effects of the implementation in terms of student outcomes.

**Method**

In this project, student views of SD are investigated by using a survey instrument that captures both cognitive and affective features of SD. In addition, a section including dilemmas related to SD investigates student decision-making in a number of scenarios that students are familiar with. By using a large number of students, it would be possible to draw conclusions about the implementation of ESD in Swedish upper secondary schools. A large survey population generally provides possibilities to make statistical comparisons between different groups of students. The strengths of a quantitative study are the possibilities of including larger number of respondents, and to be able to statistically analyze differences between groups and study relationships between different variables. In studies like these, generalizability of the findings is often sought in order to broaden the results to a wider population. However, the design of this study makes generalizability to wider populations more difficult since the groups of students were not chosen with random sampling methods and are therefore not representative of a wider population. Rather, the aim was to find a group of students from schools considered to be highly active with their ESD work and therefore, this group
cannot be considered representative of the wider population of students in Sweden. The other group was chosen on the basis of a number of criteria that correspond to the first group of students. Similarly, the selection of this group was not made on the basis of random sampling. Rather, the study takes a comparative approach by including two groups of students selected on the basis of a number of criteria.

Another method to capture perceptions of SD could have been to collect written texts about SD or include more open-ended questions in order to collect written responses. However, those kinds of designs are associated with specific difficulties; large numbers of participants would automatically result in a time consuming analysis process. There is also a risk that students might engage less in a task that is demanding in nature, especially if it is not an obligatory school task. In addition, studies on younger students (aged 10 to 12) have shown that students have difficulties in explaining complexity in written text (Manni et al. 2013). Interviews would have been an option in order to avoid these problems; however, the number of participants would then have been limited.

To meet the aim of the study, an instrument capable of capturing a wide range of viewpoints on SD was developed. In terms of the different interpretations and definitions of SD, e.g., Jabareen (2008), it can be concluded that the instrument does embrace broad perspectives with components of different interpretations of the concept. This study can answer questions of the type ‘What?’, but questions of the types ‘How?’ or ‘Why?’ would require another approach. To answer the latter types of questions, the investigation would have to be supplemented with other methods, such as interviews. Time constraints make this difficult in the time period provided for a licentiate project; however answers to those questions would without doubt add a dimension to the investigation.

The survey instrument

It is generally considered favorable to use instruments that have been tested and validated in earlier studies. A number of instruments commonly used in studies of this kind were considered at an early stage of the research process. A number of instruments focusing on the environmental dimension were found, e.g., the Second Order Model of Environmental Values (Bogner and Wiseman 2006), the Children’s Environmental Attitudes and Knowledge Scale (Leeming,
Dwyer, and Bracken 1995), the Environmental Attitudes Inventory (Milfont and Duckitt 2010), the New Ecological Paradigm (Dunlap, Van Liere, Mertig, and Jones 2002), the Environmental Perception Scale (Bogner and Wiseman 1999) and Yavetz, Goldman and Pe’er’s (2009) questionnaire measuring environmental knowledge, attitudes and self-reported behaviors. It became clear that few instruments measured the broader concept of SD with its underlying environmental, economic and social dimensions. Two instruments were found which, in addition to the environmental dimension, also included social and economic components: the SEED questionnaire (Uitto and Saloranta 2010) and a questionnaire developed in Canada measuring knowledge, attitudes and behaviors concerning SD (Michalos, Creech, McDonald, and Kahlke 2011; Michalos, Creech, Swayze, Kahlke, Buckler, and Rempel 2012). The Canadian survey instrument suited the purpose well since the instrument embodied cognitive and affective components with a focus on SD, and the items were based on the definition of SD made by UNESCO (2006). This was considered important since Swedish curricula and syllabuses have a connection to these guidelines and the work of school supporting NGOs (e.g. Keep Sweden Tidy) is based on close connections to the curriculum.

The KAB sections

In the first step of developing the instrument, each item from the questionnaire of Michalos et al. (2011; 2012) were categorized into one of the sub-themes underlying the three SD dimensions (UNESCO 2006, 18-21). To validate the categorization, four research colleagues from the Centre of SMEER1 at Karlstad University were asked to categorize the items based on the definitions and sub-themes in the UNESCO (2006) document. After this process, some of the items were excluded, some added, and some rewritten, in order to adapt the contents to Swedish curricula and culture. Based on the categorization, each item in the KAB sections measures an aspect of a sub-theme underlying one of the three SD dimensions. A sufficient number of KAB items for each dimension were included in order to perform valid statistical analysis at a later stage.

A pilot-study was conducted using two groups of grade 12 students (in total, n=45). The students were asked to mark items that they had some kind of trouble with when completing the survey. A focus group discussion was then

---

1 The Centre of Science, Mathematics, and Engineering Education Research at Karlstad University, Sweden.
held to identify problematic items and discuss interpretations and suggestions by the students on how to improve the items. The pilot-study resulted in adjustments of a number of items, mostly concerned with concretization and language simplifications. An online version of the questionnaire was developed using the software Survey & Report\(^2\) and for the cases where computers were not accessible in the classrooms, a paper version was developed.

The first three sections of the questionnaire are the K, A, and B sections (see Appendix, part 1, 2, and 3). These sections are based on a number of statements for which the respondents mark their level of agreement or disagreement on a five-point Likert scale, ranging from *Strongly disagree* (1) to *Strongly agree* (5). The scale is a summated rating construction and is widely used (Robson 2011). In some cases, this kind of scale is used based on an even number of response options, thus forcing the respondent to choose either agreement or disagreement. Since the scale needed to comprise the existing opinions about the objects among the respondents, a neutral option was included since neutral opinions might exist on these statements among the participants. In addition to the scale, a *Don’t know* option was available for each item. The environmental, economic and social items were mixed in each section. Some of the items were reversed to establish reliability of the responses. The number of items for each dimension as well as for the whole construct of sustainability consciousness (SC) is presented in Table 1.

<table>
<thead>
<tr>
<th></th>
<th>K</th>
<th>A</th>
<th>B</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Env</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>Eco</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Soc</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>EnvEcoSoc</td>
<td>19</td>
<td>14</td>
<td>17</td>
<td>50</td>
</tr>
</tbody>
</table>

The items in the K section are concerned with what the students know or acknowledge to be necessary components of SD. Items in the A section are generally stated as ‘I think that…’ or ‘I think it is important that…’. The B section examines to what extent students perform a number of SD related actions. The strengths associated with the KAB sections are that they can provide a picture of the knowingness, attitudes and self-reported behaviors that students report.

\(^2\) Artologik software on the web: www.artologik.com
in relation to the sub-themes underlying the SD dimensions. It is also possible to see to what extent students recognize or acknowledge each dimension, by forming clusters of items in the analysis. The sections can also probe the SC among the students, by merging the environmental KAB, economic KAB and social KAB items.

Each KAB item is designed to measure one aspect related to one of the sub-themes of SD. This implies that the respondent only has to consider effects related to one dimension when marking an answer. Hence, these sections in the questionnaire do not expose the respondent to a conflict of interests when answering the items. Therefore, the KAB sections can be regarded to reflect a harmony/congruence perspective on the SD dimensions. As discussed in previous paragraphs, tensions and sometimes conflicts between aspects of the dimensions are central elements of SD. This is not accounted for in the KAB sections of the questionnaire. However, some respondents might have a conflict-based perspective when responding to the items and some not.

**The scenario section**

In order to investigate student views on SD from a more conflict based perspective, a section on sustainability dilemmas was added to introduce the three dimensions of SD integrated with each other (see Appendix, part 4). In this section, three scenarios concerning people’s everyday life experiences were described. The three topics were: 1) Consumption, 2) Global warming, and 3) Waste disposal. Six reasons were provided for each scenario, two from each dimension of SD. The respondent had to decide what reason is the most important in the situation and then, which three reasons are the most important ones (In the paper version, the respondents were asked to rank the alternatives with 1, 2, and 3). Three reasons thus remained unmarked in each response. Hence, the students had to consider effects related to all three dimensions simultaneously when making a decision. A conflict of interest might then arise when the respondent had to select and de-select among the reasons and consequently, among the dimensions.

This section offers an opportunity to examine views on the dimensions from an integrated perspective. The significance of the context is also illuminated, since different contexts might allow for different perspectives to emerge. Other influential variables such as value structures are also actuated in this section. Literature has shown that divergence in opinions concerning SD issues can
serve as good starting points for discussions among students about core SD issues (Lundegård and Wickman 2009). By examining how these diverging opinions look like in relation to everyday contexts, information is provided about where conflicts might arise and which views exist among students in relation to these contexts.

To sum up, the KAB and the scenario section together shed light on student views on the SD dimensions when the dimensions are examined from both a separated and an integrated perspective. Differences between the views of SD emerging in both a harmony/congruence and a controversy/conflict approach are thus illuminated.

**Participants**

The first part of this study is based on a comparison between 12th grade students attending schools with an explicit ESD approach and students attending schools without explicit SD or ESD approach. The students were selected from two of the 17 national programs existing in the Swedish upper secondary school system; the science and the social science programs. These are both common programs and preparatory for studies at tertiary level. The procedure of selecting schools for the study aimed at finding the schools that had made the most progress in the implementation of ESD and comparable “regular” schools. As described in previous sections, a number of organizations support schools in their work with teaching and learning related to ESD (The Swedish National Agency for Education, Keep Sweden Tidy, World Wildlife Fund and The Global School). Schools with an ESD focus were selected based on registers from these organizations, which were used as indicators of the schools’ ESD activity. A ranking list was made based on the length of time the school had had a certification (School for Sustainable Development or Green Flag). In addition, schools that participated in the project ‘School on Sustainable Way’ were identified. The Global School register was then used to further distinguish and confirm the level of activity. The Global School register provided information about the schools’ participation in in-service ESD activities for teachers and school leaders. The register was used to determine the schools level of participation in activities organized by the Global School. The ranking list was further verified by investigation of the schools websites indicating their ESD activity. In the last step, principals and in some cases also teachers were interviewed.
In order to find comparable schools to the ESD active schools, a number of factors were considered: the school's geographical location, size, appropriate educational programs and socio-cultural background factors at group level. The schools in the group of regular schools were selected from the same region as far as possible. The total number of students and the socio-cultural background factors at group level were checked in public registers from The Swedish National Agency of Education (2013c). Since several factors were considered, the selection of these schools was based on an appraisal of the aforementioned factors rather than an inflexible process.

The group of students attending schools with an ESD approach is hereafter called the ESD-group of students, and the other group is called the reference group of students (REF-group).

**Collection of data**

Data were collected in the schools with the selected groups of students. A week before the visit, the selected groups of students were provided with information letters concerning the study. Since the participants were 18-19 years old, they could decide for themselves whether they wanted to participate in the study or not. The participating students completed an online version of the questionnaire and in cases where computers were not available in the classroom, a paper version (see Appendix) was used. The researcher or a colleague were present during collection of the data (with one exception) in order to ensure that the participants were given the same instructions and thus increase the reliability of the study. In the exceptional school, it was not possible to visit the selected groups of students on the same day and therefore, a teacher supervised the online survey with the students, with the help of detailed instructions. The intention was to include between 55 and 65 students from each school in order to have an equal representation of each school. However, since the data were collected during late spring, the schools were involved with a great deal of administrative work. As a consequence, the ability for them to participate in the study was limited. This resulted in a smaller group of REF-students and variation in the number of participants from each school (from 14 to 75). Two schools in the ESD-group do not have corresponding schools in the REF-group. The ESD-group consists of students from eight schools and the REF-group consists of students from seven schools. An overview of the participants is shown in Table 2.
Table 2. Different subsets of the data.

<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>

In total, 647 students from 15 schools completed the questionnaire. The overall response rate was 65.7%, corresponding to a response rate of 63.7% in the ESD-group and 69.3% in the REF-group of students. Nine questionnaires were removed due to invalid responses such as whole segments of questions remaining unanswered etc. Very few students chose not to participate when present in the classroom, and those being absent generally had other reasons for not being there, e.g., being ill or taking exams. Since the conditions described above were similar for both groups, the results are likely not biased between the groups.

**Data analysis**

This section includes a description of the methods used to check validity and reliability of the instrument, and the statistical analysis methods used to answer the research questions.

**Validity**

Validity refers to the accuracy of a result (Robson 2011). There are different types of validity, some concerned with participant or observer errors and some concerned with the tools or instruments used for gathering data. The process of selecting participants for the study has already been described in previous sections. The first action taken to establish validity was the categorization of KAB items into sub-themes of the SD dimensions. Four research colleagues were asked to categorize the items individually and subsequently, the categorization was discussed collegially. Another step to establish validity is by conducting a pilot-study to confirm that students interpret the items as intended and that the instrument has ability to capture the opinions that exist among the students on the issues at hand.

Construct validity refers to whether the instrument measures what it is intended to measure. After data collection, construct validity can be checked by factor analysis and principal components analysis techniques (PCA). Factor analysis is performed in order to measure things that cannot be measured directly; so called latent variables, and is a technique for identifying clusters of variables.
PCA is concerned with determining linear components that might exist within the data and the extent by which each variable contributes to that component (Field 2013). Both factor analysis and PCA aim to reduce a set of variables into a smaller set of dimensions, which are called “factors” in factor analysis and “components” in PCA (Field 2013). The purpose of this study was to measure the KAB related to the three SD dimensions (Environmental KAB, Economic KAB and Social KAB), thus forming the construct of sustainability consciousness (SC). Since a focus was the three SD dimensions, it was necessary to test if the three dimensions could be identified as explanatory constructs in the data by performing factor analysis on the responses to all KAB items. The analysis was performed within each one of the KAB aspects, otherwise the KAB aspects most likely would have been identified as constructs. Principal component analysis (PCA) and Principal axis factoring (PAF) are examples of exploratory factor analyses and another type is confirmatory factor analysis (CFA). The factor analysis is a multivariate technique for identifying whether correlations between a set of observed variables stem from their relationships to one or several latent variables in the data (Field 2013). In this study, exploratory techniques (PCA and PAF) were used to test whether the three SD dimensions could be identified in the data from the KAB sections. PCA assumes no correlation between factors whereas PAF allows for correlation between the factors. Other studies have shown that there is correlation between components of the SD dimensions (see Torbjörnsson 2011) and therefore, PAF is more suitable for the data obtained in this investigation. However, both techniques were used to explore the dataset.

Results of the PAF for the whole student sample are shown in Table 3. The analysis was conducted on the 19 items in the knowingness section (Appendix, part 1), on the 14 items in the attitudes section (Appendix, part 2) and finally, on the 17 items in the behavior section (Appendix, part 3). The rotation method was Oblimin with Kaiser normalization. Factor loadings less than 0.3 were omitted and the number of factors was set to 3.
Table 3. Results from principal axis factoring for the KAB sections in the questionnaire.

<table>
<thead>
<tr>
<th>Knowingness</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Attitudes</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Behaviors</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 (Soc)</td>
<td>0.49</td>
<td></td>
<td></td>
<td>22 (Eco)</td>
<td>0.53</td>
<td></td>
<td></td>
<td>39 (Eco)</td>
<td>0.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 (Soc)</td>
<td>0.39</td>
<td></td>
<td></td>
<td>23 (Env)</td>
<td>-0.45</td>
<td></td>
<td></td>
<td>40 (Env)</td>
<td>0.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 (Soc)</td>
<td>0.73</td>
<td></td>
<td></td>
<td>24 (Env)</td>
<td>0.31</td>
<td></td>
<td>0.51</td>
<td>42 (Eco)</td>
<td>0.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 (Soc)</td>
<td>0.94</td>
<td></td>
<td></td>
<td>27 (Env)</td>
<td>0.40</td>
<td>0.32</td>
<td>0.33</td>
<td>44 (Eco)</td>
<td>0.33</td>
<td>-0.34</td>
<td></td>
</tr>
<tr>
<td>10 (Soc)</td>
<td>0.30</td>
<td>0.37</td>
<td></td>
<td>31 (Env)</td>
<td>0.31</td>
<td></td>
<td></td>
<td>45 (Env)</td>
<td>0.35</td>
<td>-0.51</td>
<td></td>
</tr>
<tr>
<td>13 (Soc)</td>
<td>0.52</td>
<td></td>
<td></td>
<td>33 (Env)</td>
<td>-0.49</td>
<td></td>
<td></td>
<td>46 (Soc)</td>
<td>0.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 (Env)</td>
<td>0.44</td>
<td>20 (Soc)</td>
<td>0.40</td>
<td>21 (Soc)</td>
<td>0.53</td>
<td>49 (Eco)</td>
<td>0.34</td>
<td>25 (Eco)</td>
<td>0.74</td>
<td>37 (Soc)</td>
<td>0.32</td>
</tr>
<tr>
<td>4 (Env)</td>
<td>-0.38</td>
<td>22 (Soc)</td>
<td>0.53</td>
<td>21 (Soc)</td>
<td>0.53</td>
<td>49 (Eco)</td>
<td>0.34</td>
<td>25 (Eco)</td>
<td>0.74</td>
<td>37 (Soc)</td>
<td>0.32</td>
</tr>
<tr>
<td>6 (Env)</td>
<td>0.42</td>
<td></td>
<td></td>
<td>25 (Eco)</td>
<td>0.49</td>
<td></td>
<td></td>
<td>47 (Soc)</td>
<td>0.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 (Env)</td>
<td>0.44</td>
<td>26 (Eco)</td>
<td>0.40</td>
<td>21 (Soc)</td>
<td>0.53</td>
<td>49 (Eco)</td>
<td>0.34</td>
<td>25 (Eco)</td>
<td>0.74</td>
<td>37 (Soc)</td>
<td>0.32</td>
</tr>
<tr>
<td>14 (Eco)</td>
<td>0.40</td>
<td></td>
<td>0.70</td>
<td>32 (Soc)</td>
<td>0.70</td>
<td></td>
<td></td>
<td>50 (Soc)</td>
<td>0.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 (Env)</td>
<td>0.73</td>
<td>29 (Soc)</td>
<td>0.65</td>
<td>27 (Soc)</td>
<td>0.65</td>
<td>34 (Env)</td>
<td>-0.35</td>
<td>25 (Soc)</td>
<td>0.65</td>
<td>34 (Env)</td>
<td>-0.35</td>
</tr>
<tr>
<td>2 (Soc)</td>
<td>0.34</td>
<td>30 (Soc)</td>
<td>0.37</td>
<td>30 (Soc)</td>
<td>0.37</td>
<td>35 (Env)</td>
<td>-0.40</td>
<td>30 (Soc)</td>
<td>0.37</td>
<td>35 (Env)</td>
<td>-0.40</td>
</tr>
<tr>
<td>15 (Eco)</td>
<td>0.33</td>
<td></td>
<td></td>
<td>36 (Env)</td>
<td>0.33</td>
<td>30 (Soc)</td>
<td>-0.75</td>
<td>36 (Env)</td>
<td>0.33</td>
<td>30 (Soc)</td>
<td>-0.75</td>
</tr>
<tr>
<td>17 (Eco)</td>
<td>0.46</td>
<td></td>
<td></td>
<td>41 (Env)</td>
<td>0.46</td>
<td></td>
<td></td>
<td>41 (Env)</td>
<td>0.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 (Soc)</td>
<td>0.62</td>
<td></td>
<td></td>
<td>43 (Env)</td>
<td>0.62</td>
<td></td>
<td></td>
<td>43 (Env)</td>
<td>0.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 (Env)</td>
<td>0.67</td>
<td></td>
<td></td>
<td>35 (Soc)</td>
<td>0.67</td>
<td></td>
<td></td>
<td>35 (Soc)</td>
<td>0.67</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Eigenvalue  | 5.16     | 1.76     | 1.28     | 4.45      | 1.29     | 1.11     | 4.26      | 1.59      | 1.35     |          |
| % of variance| 27.17    | 9.26     | 6.71     | 31.8      | 9.18     | 7.91     | 25.1      | 9.37      | 7.96     |          |

To be able to investigate the relationships between the factors and the items connected to each dimension further, an analysis showing Pearson’s correlations between the identified factors and the items within each dimension was made. Pearson’s correlation coefficient ($r$) is a standardized measure of the strength of a relationship between two variables. Values range from -1 (as one variable changes, the other changes in the opposite direction by the same amount) to +1 (as one variable changes, the other changes in the same direction by the same amount). If Pearson’s $r$ is 0, it implies that as one variable changes, the other does not change at all.

The factor analysis of the knowingness items showed that the social dimension was found in factor 1, where 6 out of the 8 social items were identified (Table 3). Factor 1 also correlated mostly with the social knowingness items (Ksoc) by a Pearson’s $r$ of 0.94. The environmental dimension was identified in factor 2, where all but one of the environmental items were found. Pearson’s $r$ was also highest with the environmental knowingness items (Kenv) with a value of $r = 0.87$. Factor 3 was based on a mix of items. However, Pearson’s $r$ between factor 3 and the economic knowingness items (Keco) indicated that factor 3 correlated mostly with Keco items ($r = 0.77$), although the correlation with social knowingness items (Ksoc) was nearly as high. To conclude, the social and environmental dimensions were identified within the knowingness section of
the questionnaire, and the economic items were also identified but not as clearly as the other two dimensions.

In the analysis of the attitude items, the environmental dimension was identified in factor 1, where all environmental items were found (Table 3). The Pearson’s $r$ also indicated highest correlation between factor 1 and the environmental attitude items ($A_{env}, r = 0.90$). In factor 2, social items were mostly found (Table 3) and factor 2 also correlated mostly with social attitude items ($A_{soc}, r = 0.82$). Factor 3 included a mix of items (Table 3). The economic items were not distributed in factor 3 as would be expected; rather, economic items were distributed across the two first factors. To conclude, the environmental and social dimensions were found, but less clearly compared to the K section. The economic dimension was not identified within the A section.

Concerning the behavior section in the questionnaire, the social and environmental dimensions were identified in factors 2 and 3. All economic items were found in factor 1, but with some interference from items of other dimensions. However, factor 1 correlated mostly with economic behavior items, ($B_{eco}, r = 0.83$). Factor 2 correlated mostly with social behavior items ($B_{soc}, r = 0.64$) and factor 3 with environmental behavior items ($B_{env}, r = -0.94$). The negative correlation coefficient between factor 3 and $B_{env}$ are due to the fact that there are reversed items in factor 3. The negative coefficient is a result of the fact that if one variable changes the other changes in the opposite direction as described in previous paragraphs. Conclusively, the three SD dimensions are quite clearly distinguishable within the B section.

In summary, two of the three SD dimensions in the questionnaire seem more autonomous; the environmental and the social dimensions. Economic items are also identified but not as clear, particularly for the attitude section of the survey instrument. However, the three SD dimensions were identified, verifying the construct of the survey instrument. As discussed by many researchers, the SD dimensions are intimately interconnected. The factor analysis illuminates this interconnectedness, although the three dimensions are discernable. Recalling the 15 sub-themes outlined in previous sections that form the basis of the items in the survey instrument, it can be seen that from a theoretical perspective as well, the economic dimension is cross-border in nature, particularly towards the social dimension.
Merging the three SD dimensions in the comprehensive concept of SC provides an opportunity to investigate some of the complex relationships that underlie the SD concept. SC is based on multivariate analysis of the three SD dimensions, which implies starting from a holistic point of departure and then looking for differences related to the separate dimensions in order to investigate and interpret different elements. Therefore, all items were retained in the questionnaire in order to measure the big picture as well as the parts.

**Reliability**

Table 4 presents the results of the reliability tests for the whole student sample. Reliability means that the questionnaire consistently should reflect the construct that it is measuring (Field 2013). The Cronbach’s Alpha values (CA) indicate the overall reliability of the questionnaire. Values of 0.7 to 0.8 are generally regarded as acceptable; however the values depend on the construct being studied. For psychological constructs, values between 0.7 can be expected due to their diversity. The CA is also dependent on the number of items on the scale (Field 2013). Increasing the number of items for a scale generally increases the Cronbach’s Alpha for that scale. Table 4 indicates that the CA values seem to correlate with the number of items on each of the scales.

Table 4. Cronbach's Alpha values for the construct of SC (EnvEcoSocKAB) and for its underpinning subscales (EnvKAB, EcoKAB, SocKAB).

<table>
<thead>
<tr>
<th></th>
<th>Cronbach's Alpha</th>
<th>No. of items</th>
<th>K</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnvKAB</td>
<td>0.783</td>
<td>17</td>
<td>6</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>EcoKAB</td>
<td>0.684</td>
<td>13</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>SocKAB</td>
<td>0.805</td>
<td>20</td>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>EnvEcoSocKAB</td>
<td>0.902</td>
<td>50</td>
<td>19</td>
<td>14</td>
<td>17</td>
</tr>
</tbody>
</table>

In general, the reliability of the instrument is good and within an acceptable range, particularly considering the vast diversity of SD issues connected to each of the dimensions. The lower CA for the economic dimension indicates greater diversity of viewpoints connected to this dimension. This could be expected from the results of the factor analysis.

**Comparative analysis**

Multivariate analysis of variance (MANOVA) was used to test all three dimensions simultaneously for the comprehensive concept of SC. MANOVA is used in situations when more than one outcome variable has been measured.
For the concept of SC, it was necessary to test the three variables of environmental KAB, economic KAB and social KAB simultaneously. MANOVA controls for effects of variables that are not the focus of the investigation, in this case it was needed to control for effects of biases in gender and program distribution. The MANOVA can also give information about interactions between variables. MANOVA has the capacity to detect whether groups differ along a combination of dimensions, while analysis of variance (ANOVA) can tell whether groups differ along a single dimension (Field 2013). MANOVA is preferable in contrast to separate ANOVAs for each dependent variable when several outcome variables need to be tested since the risk of type 1 errors is reduced (Field 2013). The advantage of MANOVA is the power to detect significant differences between two groups that the ANOVAs might not find within the separate dimensions. There is a possibility that the ANOVAs indicate no significant differences between groups while the MANOVA indicates a difference between the groups when all three dimensions are analyzed simultaneously. Both MANOVA and ANOVA are used to test whether there is a significant difference between groups; however, they do not give information about the effect size. Even small differences can be statistically significant if the sample sizes are big. A good complement to the level of significance is therefore to measure the size of the effect. The effect size measurement provides an objective measure of the magnitude of the observed effect. In this study, effect size in terms of the Cohen’s $d$ was calculated, expressing the difference between the two means in standard deviation units. There are some widely used suggestions for what constitutes a small, medium and large effect and these are commonly regarded as small if Cohen’s $d = 0.2$, medium if Cohen’s $d = 0.5$ and large if Cohen’s $d = 0.8$ (Field 2013).

Main results

Sustainability consciousness among ESD and REF students

In the first part, student SC was investigated and thereafter, differences in the underlying dimensions. The results show that students from the ESD group differed in their SC from students in the REF group. Since SC is a three dimensional concept based on environmental, economic and social dimensions, it can be represented visually as a volume. The mean values for both groups of students are marked along an axis representing each dimension and then combined to form a tetrahedron for each of the two groups (Figure 1). From the MANOVA, a significant difference between the two groups of students was
found in terms of their SC (EnvEcoSocKAB, Wilks' Lambda=0.028). The ESD group of students was indicated by a greater volume of the tetrahedron in comparison to the REF group of students, thus indicating a stronger SC for the ESD group. The shape of the tetrahedrons was similar for both groups of students: elongated along the social axis and more compressed along the economic axis, indicating that responses were highest in the social dimension, lowest in the economic dimension and intermediate in the environmental dimension for both groups. In order to examine the nature of the difference between the two groups, results within the underlying dimensions provided by the ANOVAs were examined. Those results are presented in the next paragraph.

Figure 1. SC illustrated as two tetrahedrons, one representing the ESD-group of students and one representing the REF-group of students. The difference is significant at the $p < .05$ level.

**The dimensions of SC**

Examining the mean values for the three underlying dimensions showed that the mean values were higher for the ESD group for all three dimensions, however not significantly higher for the environmental and social dimensions, implying that those differences might be caused by chance (Table 5). The reliability analysis showed that the social dimension seemed associated with the most homogenous views as indicated by a higher value of Cronbach’s Alpha, whereas the economic dimension seemed connected to the most diverse viewpoints, indicated by a lower Cronbach’s Alpha, see Table 4. For the
underlying economic dimension, a significant difference was found between the two groups of students. The ESD group of students reported significantly higher mean values in the economic dimension than did the REF group of students. However, significance alone does not provide information about the importance of an effect, as discussed previously. The magnitude of the effect was calculated by the Cohen’s $d$-value, based on the mean value difference and the standard deviations. Cohen’s $d$ for the difference within the economic dimension was 0.2, which is generally regarded as a small effect (Field 2013).

Table 5. Results of the univariate analysis on the separate dimensions: means (rounded to two decimals) and $p$-values. *The difference is significant at the $p<.05$ level.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>ESD</th>
<th>REF</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Env KAB</td>
<td>3.87</td>
<td>3.83</td>
<td>0.396</td>
</tr>
<tr>
<td>Eco KAB</td>
<td>3.74</td>
<td>3.64</td>
<td>0.027*</td>
</tr>
<tr>
<td>Soc KAB</td>
<td>4.00</td>
<td>3.99</td>
<td>0.849</td>
</tr>
</tbody>
</table>

**Separated versus integrated perspectives on the SD dimensions**

To be able to investigate views on the environmental, economic and social dimensions from a more integrated perspective, a section was added to the questionnaire where the students had to make decisions and thus prioritize one dimension over the others (see Appendix, Part 4). Three everyday life scenarios were presented to the students and two reasons provided from each dimension, from which the respondents had to choose the most important one. This section can be regarded as reflecting a conflict perspective on the three SD dimensions, since for each scenario the respondent is exposed to a possible conflict of interests. In contrast, the KAB sections that constituted the foundation for SC can be regarded as investigating the SD dimensions from a harmony/congruence perspective. In the KAB sections, the respondent only has to consider one particular issue for each item when marking an answer.

The overall responses to the scenario section indicated that the rankings differed substantially from those obtained from the separate evaluations of the three dimensions in terms of their SC. From the integrated perspective it became clear that the social dimension was ranked less important when other dimensions had to be considered simultaneously, and the environmental dimension was up-graded (Table 6). The pattern of responses to the three scenarios differed, indicating that the context had significance. Scenario 1
concerned grocery shopping and for this scenario, economic reasons were ranked most highly followed by environmental reasons and least frequently, social reasons were selected. In scenario 2, concerned with the issue of global warming, environmental reasons were selected most frequently closely followed by social reasons. Economic reasons for mitigating effects of global warming were prioritized to a low extent by the students. For the issue of sustainable waste disposal in scenario 3, environmental reasons dominated strongly over social and economic reasons.

Table 6. Relative frequencies of responses to the scenario items. The reasons related to the specific dimension are indicated within parentheses. Bold numbers indicate percentage of students selecting one of the reasons as the most important one.

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Env (1 and 4) 32.3%</td>
<td>(3 and 6) 45%</td>
<td>(2 and 5) 74.3%</td>
</tr>
<tr>
<td>Eco (3 and 6) 54.1%</td>
<td>(2 and 5) 16.8%</td>
<td>(1 and 4) 11.1%</td>
</tr>
<tr>
<td>Soc (2 and 5) 13.6%</td>
<td>(1 and 4) 38.3%</td>
<td>(3 and 6) 14.6%</td>
</tr>
</tbody>
</table>

More than 50% of the students selected environmental reasons as most important at least twice for the three scenarios, thus indicating a dominance of the environmental perspective when all three dimensions have to be considered simultaneously. In contrast, only 12% chose social reasons at least twice for the three scenarios and nearly 17% selected economic reasons at least twice.

Comparing the perspectives

It is somewhat surprising that the perspectives differed to such an extent depending on whether a separated or integrated perspective on the three SD dimensions was used. In order to examine these differences in depth, an analysis was conducted to compare responses from the integrated perspective and responses from the separated perspective on the SD dimensions. In this analysis, student decisions were examined in relation to the environmental, economic and social dimensions of their SC. Results from MANOVA showed that the group of students who gave priority to economic reasons in their decisions reported significantly lower mean values in all three SD dimensions when they were separately investigated and thus, this group was defined by a lower SC than the group of students who prioritized other than economic reasons (Wilks’ Lambda<0.01), Figure 2. The size of the effect concerning differences in the three dimensions varied from small to medium (Cohen’s 𝑑: }
0.35 (Eco), 0.50 (Soc), 0.65 (Env)). Furthermore, the group of students who gave priority to environmental reasons in their decisions reported significantly higher mean values in all three SD dimensions when investigated separately (Wilks’ Lambda<0.01), Figure 3. Thus, these students were defined by a stronger SC than the group of students who gave priority to other than environmental reasons in the three scenarios. The effect sizes ranged between small and medium for the three dimensions (Cohen’s $d$: 0.22 (Eco), 0.27 (Soc), 0.50 (Env)).

Figure 2. Differences in SC dimensions (environmental, economic and social KAB) between students who selected economic reasons as most important at least twice (2 or 3 Eco) in responses to the three scenarios. All differences are significant at the $p < .05$ level.

Figure 3. Differences in SC dimensions (environmental, economic and social KAB) between students who selected environmental reasons as most important at least twice (2 or 3 Env) in responses to the three scenarios. All differences are significant at the $p < .05$ level.
The group of students who gave priority to social reasons in their decisions was the smallest group. No significant differences were found between them and those giving priority to other than social reasons.

**Discussion and implications**

In the first part of the discussion, the prerequisites for the research are discussed, in terms of validity and reliability. Then a discussion concerning the results of the study follows. In this section, effects of the implementation of ESD are discussed in terms of student SC, then followed by a discussion about the views of SD that emerge when separated and integrated perspectives on the three dimensions are used. Finally, the comparison between views from the separated and the integrated perspective is discussed and some general conclusions considering students’ views on the dimensions of SD are drawn.

**Validity and reliability of the instrument**

As mentioned in previous sections, the construct validity of the instrument can be checked by factor analysis. The results of the exploratory factor analysis showed that the social and environmental dimensions were identified within the knowingness section of the questionnaire. The economic dimension was also identified but was not as clear as the other two dimensions. For the attitude section of the questionnaire, the environmental and social dimensions were identified by the exploratory factor analysis, however less clearly compared to the knowingness section. The economic dimension was not identified within the attitude section. Results of the study by Manni et al. (2013) showed that younger students’ related the economic dimension more to the other two dimensions than the environmental or social dimensions. If economic items to a greater extent are being related to the other two dimensions, this might be an explanation for why the students seem to perceive the environmental and social dimensions more clearly. In general, the attitude section seems more one-dimensional compared to the knowingness section. The nature of the attitude items might result in high responses in general since the attitude statements might be extra easy to agree with. As a result, the three dimensions may be more difficult to identify within the attitude section. Concerning the behavior section, the three dimensions were found in the exploratory factor analysis. Only few items interfered with the general pattern constituted by the three dimensions.
To summarize the discussion, two of the three SD dimensions in the questionnaire seem more autonomous; the environmental and the social dimensions. Economic items are slightly more difficult to identify, particularly in the attitude section of the survey instrument. This implies that the categorization of items into the SD dimensions, which was made based on the UNESCO (2006) framework, is in some cases not consistent with the students’ perceptions. The survey instrument was designed based on a theoretical framework. As the literature shows (Giddings et al. 2002; Gough 2002), the dimensions are strongly interconnected, and the results of this study points in the same direction. Some sub-themes of the economic dimension, such as poverty reduction, might be areas that connect to aspects of the social dimension in students’ perceptions. The definitions of SD in Swedish policy and steering documents are largely based on the UNESCO definition (Borg et al. 2014) and therefore, it is important for the study to use a definition similar to those found in the steering documents. The framework is based on the broadness of the SD concept, but the factor analysis displayed the complexity and multidimensionality of SD issues. In line with previous research showing that the three SD dimensions should not be regarded as separate from each other, these results suggest similar interpretations. The instrument does capture SD from a holistic viewpoint as intended, but if it is to be used in future studies then the attitude section would need to be developed further if the intention is to discriminate on the basis of the SD dimensions.

The reliability analysis indicated satisfying levels of the Cronbach’s Alpha values, both related to the comprehensive construct of SC and to the underlying sub-scales. The lowest reliability was found within the economic dimension, indicating greater diversity of viewpoints connected to the economic dimension in comparison with the environmental and social dimensions. However, in addition to the fact that students seem to connect economic issues more to other dimensions than social and environmental issues, it should be noted that also teachers report the greatest uncertainty in the economic dimension of SD (Borg et al. 2014). Therefore, it would have been surprising if the results in this study had pointed in another direction. To conclude, the results of the reliability analysis show that the reliability of the instrument is good and within an acceptable range, especially considering the immense diversity of SD issues connected to the SD dimensions.
The sustainability consciousness among ESD and REF students

As shown from the results of the first part of this study, a significant difference in SC was found between students from schools with an ESD approach in comparison to students from schools without explicit ESD approach. It was shown that the ESD group of students had stronger SC than the REF group of students. An in depth investigation of the environmental, economic and social dimensions underlying the construct of SC disclosed that no differences were found between the two groups in the environmental and social dimensions. However, a significant difference was found in the economic dimension, indicated by a higher mean value in economic KAB for the ESD group of students, although the size of the effect was quite small. An explanation might be that the students are aware of the tensions between environmental stability, resource distribution and stable economic growth. Studies have shown that students tend to relate economic issues more often to other dimensions than environmental and social issues (Manni et al. 2013). A consequence can be that the economic issues are downgraded and environmental and/or social issues favored. The results for both groups of students showed that schools generally seem to deal with all three dimensions; however, they were recognized to a varying extent. The results of this study cannot tell whether schools deal with aspects underlying the SD dimensions in an integrated perspective, which is regarded as an important element of ESD teaching and learning.

Something seems to differ between ESD schools and REF schools concerning their approach to dealing with economic issues in their teaching. Differences might exist on many levels, e.g., the way that the role of the economy is made explicit in teaching or how it is being related to other dimensions in the teaching. Differences might also exist between schools within each of the two groups concerning their teaching approach to SD issues. However, the purpose of this study was to investigate effects of the ESD implementation on a larger scale by comparing two groups of students in schools with different approaches to those issues. The study of Borg et al. (2014) showed that upper secondary teachers generally were most uncertain concerning the economic dimension in comparison to the environmental and social dimensions. Perhaps less uncertainty exists among teachers in ESD schools on the economy and its role, in which case this is an important effect of the ESD implementation. Another possible explanation is that what people regard as sustainable economic development might point in different directions. Researchers have argued against the perspective that stable economic growth is incontrovertibly
sustainable (see a discussion in Hopwood et al. 2005). Even if the perspective of economic growth is not characteristic of the economic items in this investigation, some respondents might be critical of economy as a perspective to consider in relation to SD. Economic perspectives often dominate in decisions at a political level of society (Giddings et al. 2002). Increasing student understanding of the role of the economy in relation to social and environmental issues might provide a foundation for decisions based on more holistic perspectives in the future.

Separated versus integrated perspectives on the SD dimensions

*Harmony/congruence or conflict/controversy?*

Different views on SD emerged from the KAB sections (introducing the dimensions from a separated perspective) and from the scenario section (introducing the dimensions from an integrated perspective). The separated perspective on the SD dimensions was regarded as reflecting SD from a harmony/congruence perspective and the integrated perspective on the SD dimensions was regarded as reflecting SD from a conflict-based perspective. Several researchers have argued for the importance that students are given opportunities to encounter both harmony/congruence and conflict/controversy perspectives on SD in their education (e.g., Öhman and Öhman 2012; Herremans and Reid 2002). The pattern of responses relating to the two perspectives differed depending on whether the students were considering environmental, economic and social aspects of SD singly or in combination. The social dimension was ranked high when using a separated perspective. This is in sharp contrast to findings by Borg et al. (2014) and Summers and Childs (2007), which showed that upper secondary teachers and student teachers were least aware of social factors in relation to SD. Using an integrated perspective resulted in the downgrading of the social dimension and accentuation of the environmental dimension. Thus, it seemed that social issues were ranked important when no other aspects have to be considered. However, when aspects related to economic and environmental dimensions needed to be considered simultaneously, social aspects were ranked less importantly and environmental aspects were generally given higher priority.

*The significance of context*

The overall results of the three scenarios showed that the environmental reasons were generally favored more than economic and social reasons. The
reported preferences differed between the three scenarios (see Table 6), implying that students’ responses are influenced significantly by the context. Some reasons for selecting products (scenario 1) or taking action in connection to global warming (scenario 2) and sustainable waste disposal (scenario 3) could be related to the interests of the individual (see Appendix, part 4. For an elaborated discussion, see paper 2). Other reasons were more related to interests of nature or other people (see Appendix, part 4). The responses to the scenario items might be influenced by what Schwartz et al. (2001) describe as basic human values. These are defined as desirable and trans-situational goals in people’s lives, serving as guiding principles. Two orthogonal dimensions summarize the relationships between them. One of these dimensions is self-transcendence versus self-enhancement, reflecting values of universalism and benevolence connected to the wellbeing of people and nature on one side, versus values of achievement and power, more connected to the individual on the other side. As a consequence, a self-enhancement perspective could result in strong preferences for options related to the interests of the individual, here and elsewhere often linked to economic aspects. In a similar way, a self-transcendence perspective could result in strong preferences for options related to public interests and/or nature, self-evidently often related to the social and environmental dimensions. Although it is not possible in this study to determine whether the respondents had their own or broader interests in focus when selecting a reason, it is still important to recognize this distinction among the reasons.

There is also a distinction between intrinsic or instrumental values (Sandell et al. 2005) that might be part of an explanation for some of the responses in the scenarios. Instrumental value is ascribed to a thing that can be used to achieve something desirable, but has no value in itself. An example is money; money provides a means for obtaining material things or desirable experiences. Intrinsic value, on the other hand, is given to something that has a value in itself, e.g., good health. This distinction mostly relate to scenario 2 since the interests of the individual are not represented in the reasons for scenario 2. Few respondents chose economic reasons for taking actions to mitigate the effects of global warming. Hence, the students do not seem to think that a strong economy is a goal in itself, which might be interpreted that the economy has only instrumental value for many students. The students do not seem to link high economic costs and harmful consequences for people.
To conclude, student understanding of the SD dimensions and the relationships between them seem to be dependent on the context, illustrated by the response patterns for the three scenarios; the perspective, meaning congruence or conflict; and other variables that are influential such as value structures. A main conclusion of the two studies is that student meaning making concerning SD and its dimensions is strongly situated and thus not fixed, which is consistent with the results of Lundegård and Wickman (2009).

Comparing separated and integrated perspectives

The combined analysis provided a clear picture of the sustainability consciousness among students from different groups, formed by their decisions in the scenario items. The students favoring environmental reasons in their response to the three scenarios formed one group. This group of students had stronger SC and reported higher mean values in all three SD dimensions than other students. Another group consisted of students who favored economic reasons most in the three scenarios. This group of students was indicated by lower SC, and reported lower mean values in all the three SD dimensions than others. The group of students prioritizing social reasons most in the three scenarios was the smallest group, and no significant difference was found between those students and others. These results suggest that enhanced consciousness concerning SD issues is associated with a change in decisions from an economic grounding towards a more environmental grounding. This implies that when students are facing conflicts of interests related to SD issues, the students that developed stronger SC, i.e. are more aware of SD cognitively and affectively, are more likely to favor environmental factors over economic concerns.

The results of the combined analysis suggest that developing the SC among students could influence their decision making in SD related contexts. However, the effects that the ESD schools had on student SC are small and thus, not likely to have effects on the decisions made by the students in the three scenarios. A central question to address is whether this is due to that it is difficult to influence students' SC by teaching approaches as recommended in the literature or, whether many of the schools implementing ESD at present are not working according to the recommended approaches? This study highlights the need to follow up this study with qualitative approaches related to practice in order to address these questions. SD content is present both in the overall goals of the national curriculum and in the syllabuses for specific subjects.
Thus, schools are addressing SD issues in their teaching; however, they might not use an ESD approach as a basis for their teaching. There is a risk that SD turns into activities rather than being a perspective on how to organize teaching collectively. The certifications were created to facilitate the implementation of ESD in the Swedish school system. However, there is room for a variety of interpretations, which might not lead to changes in how these perspectives are dealt with in teaching or in how teaching is organized.

The ambiguity of the economic dimension

Finally, the results shed light on the ambiguous views among students concerning the economy and its role in relation to SD. Previous research findings by Borg et al. (2014) highlighted upper secondary teachers’ uncertainty in regard to the economic dimension of SD. This study indicates that the most diverse views among students were found in relation to the economic dimension, although students from schools with an ESD approach were more aware of the economy and its role. In different contexts, the economic factors could be regarded as either communal (at local, regional, national or global level) or personal. Distinguishing between personal and communal finances and illuminating the relationships between them are therefore important in teaching, in order to clarify the complex connections between the wellbeing of the individual, the society and the global community. According to Giddings et al. (2002), the economy is often given priority at a political level and is often the dominant perspective in decisions that involve environmental and social aspects. It is therefore important that the next generation of decision makers in society is provided with opportunities to develop their understanding of economic issues and pre-conditions while being in a position of autonomy and independence. From this perspective, the school has an important role in providing a foundation for decisions based on more holistic considerations for the future.

The results of this study are consistent with earlier studies addressing the use of multiple perspectives, both in general education and in ESD (Björneloo 2007; Sund 2013; Warburton 2003). Holistic approaches and multiple perspectives in ESD embrace aspects of all three dimensions in education as argued by Warburton (2003) and can also involve both harmony/congruence and conflict/controversy perspectives as discussed by Herremans and Reid (2002), Öhman and Öhman (2012) and Wals (2011). To provide opportunities for students to develop their understanding of the multidimensional nature of SD
and to develop understanding of diverging views among people opens up for experiences of how conflicts can be dealt with and solved constructively and democratically. The results of this study illuminate some of the diverging views of SD, often regarded as fruitful starting points in ESD, that exist among students. The results also support previous studies emphasizing the importance that students are provided with opportunities to experience a diversity of issues and contexts related to SD in their education (Warburton 2003). Researchers have argued that different contexts generate different identities (Lundegård and Wickman 2009) and that the meaning of SD is not static; rather, it is something that changes from situation to situation and from group to group (Rauch 2002), which the findings of this study support.

This study has shown that schools working actively with an ESD approach have had an effect in terms of SC among their students, although the effect is small and mostly related to the economic dimension. A new decade of ESD is approaching and successful ways to implement ESD in schools will be discussed further. This study can contribute to this discussion by providing a quantitative study on student perspectives as a complement to studies of student perspectives with more qualitative approaches or perspectives on teachers and school organization. From the perspective of teaching and learning, this study can contribute to the discussion about student and teacher perspectives of SD and in what ways the interconnections of the dimensions are dealt with in education. This study can help illuminate the divergence between the views on SD that can emerge when SD is approached from a congruence/harmony and a conflict/controversy perspective. It can also provide a foundation for reflections among teachers on how they view the relationships between the dimensions and how these are communicated in their own teaching, but also from the perspective of education as a whole.
References


Appendix

Questionnaire on Sustainable Development – Upper secondary school

This questionnaire consists of a series of claims to which you respond to by putting a cross next to the choice you make. Go back carefully over the questionnaire before you hand it in to check that you have not left out any questions.

Thank you for your cooperation.

- The name of your school: Program:
- Sex
  - Female
  - Male
- Have you heard of the notion of Sustainable Development?
  - Yes
  - No
- If yes, in what connection have you heard of Sustainable Development? Several alternatives are possible here.
  - in school
  - on TV
  - in the newspapers
  - through an association
  - on radio
  - in your home
  - from friends
  - via the internet
  - Other, state which:_________
- Mark the alternative which decided your choice of school. Several alternatives are possible here.
  - Friends
  - The school has a good reputation.
  - Proximity to school
  - The school offers extra-curricular activities of interest, state which:____________________
  - Other
  - This school offers the program I want to do
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.

1 Economic development is necessary for sustainable development.

2 Improving people’s chances for a long and healthy life contributes to sustainable development.

3 Reducing water consumption is necessary for sustainable development.

4 Preserving nature is not necessary for sustainable development.

5 A culture where conflicts are resolved peacefully through discussion is necessary for sustainable development.

6 Sustainable development demands that we humans reduce all sorts of waste.

7 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)

8 Reinforcing girls’ and women’s rights and increasing equality around the world is necessary for sustainable development.

9 Respecting human rights is necessary for sustainable development.

10 To achieve sustainable development, all the people in the world must have access to good education.
<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Strongly agree</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Sustainable development requires that companies act responsibly towards their employees, customers and suppliers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Preserving the variety of living creatures is necessary for sustainable development (preserving biological diversity).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Having respect for other cultures is necessary for sustainable development.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Sustainable development requires fair distribution of goods and services among people in the world.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Wiping out poverty in the world is necessary for sustainable development.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Sustainable development requires a shift to renewable natural resources.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Sustainable development demands that people understand how the economy functions.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>For sustainable development, big infectious diseases such as HIV/AIDS and malaria must be stopped.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>For sustainable development, people need to be educated in how to protect themselves against natural disasters.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>I think that everyone ought to be given the opportunity to acquire the knowledge, values and skills that are necessary to live sustainably.</td>
</tr>
<tr>
<td>21</td>
<td>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.</td>
</tr>
<tr>
<td>22</td>
<td>I think that companies have a responsibility to reduce the use of packaging and disposable articles.</td>
</tr>
<tr>
<td>23</td>
<td>Using more natural resources than we need does not threaten the health and well-being of people in the future.</td>
</tr>
<tr>
<td>24</td>
<td>I think that we need stricter laws and regulations to protect the environment.</td>
</tr>
<tr>
<td>25</td>
<td>I think it is important to reduce poverty.</td>
</tr>
<tr>
<td>26</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>27</td>
<td>I think that it is important to take measures against problems which have to do with climate change.</td>
</tr>
<tr>
<td>28</td>
<td>I think that the government should provide financial aid to encourage more people to make the shift to green cars.</td>
</tr>
<tr>
<td>29</td>
<td>I think that the government should make all its decisions on the basis of sustainable development.</td>
</tr>
<tr>
<td>30</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>31</td>
<td>I think that people who pollute land, air or water should pay for the damage they cause to the environment.</td>
</tr>
</tbody>
</table>
I think that women and men throughout the world must be given the same opportunities for education and employment.

I think it is okay that each one of us uses as much water as we want.

**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**.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Strongly agree</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>34 Where possible, I choose to cycle or walk when I’m going somewhere, instead of travelling by motor vehicle.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 I never waste water.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36 I recycle as much as I can.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37 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>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38 I often make lifestyle choices which are not good for my health.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39 I do things which help poor people.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 I pick up rubbish when I see it out in the countryside or in public places.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41 I don’t think about how my actions may damage the natural environment.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42 I often purchase second-hand goods over the internet or in a shop.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Statement</td>
<td>Strongly disagree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>43</td>
<td>I always separate food waste before putting out the rubbish when I have the chance.</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>44</td>
<td>I avoid buying goods from companies with a bad reputation for looking after their employees and the environment.</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
</tr>
<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>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>46</td>
<td>I work on committees (e.g. the student council, my class committee, the cafeteria committee) at my school.</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>47</td>
<td>I treat everyone with the same respect, even if they have another cultural background than mine.</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>48</td>
<td>I support an aid organisation or environmental group.</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>49</td>
<td>I watch news programs or read newspaper articles to do with the economy.</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>50</td>
<td>I show the same respect to men and women, boys and girls.</td>
<td>☐ ☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐ ☐</td>
</tr>
</tbody>
</table>
Part 4 (Paper version)

1) Imagine that you are standing in a grocery store helping with the weekly grocery shopping. **What reasons do you think are important to consider when you are shopping?** Mark the three most important reasons 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 the third most important reason.

- [ ] 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 life contributes to. Global warming leads to climate change, which has various impacts around the world. **What do you think are the most important reasons for braking global warming?** Mark the three most important reasons 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 reason.

- [ ] 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
- [ ] Ecosystems which are in danger of disappearing must be preserved, e.g. the Arctic and Swedish alpine region
3) Today we are trying to organize society so that we can take better care of our waste. **What do you think are the most important reasons for taking care of our waste?** Mark the three most important reasons 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 reason.

- [ ] Because it is often cheaper for us to recycle resources instead of extracting new ones, e.g. for aluminium cans.
- [ ] Because we need to conserve natural 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. higher costs of garbage collection
- [ ] So that dangerous substances are not released into our environment
- [ ] To avoid leaving our waste problem to future generations


68. Konferensproceeding: 10-year Anniversary Meeting with the Scientific Committee


Doctoral and licentiate theses in Biology produced at the Department of Environmental and Life Sciences, Karlstad University


12. Linnea Lans. Relations between metabolic rate, migration and behaviour in Atlantic salmon (Salmo salar) and brown trout (Salmo trutta) Licentiate thesis, 3 June 2010.


22. Åsa Enefalk. Effects of fine woody debris on juvenile brown trout (Salmo trutta) and drifting invertebrates. Licentiate thesis, 29 April 2014.


Student ’sustainability consciousness’ and decision-making on sustainability dilemmas

This study addresses the interdisciplinary and multidimensional content embraced in the concept of sustainable development (SD) and the development of competences often associated with education for sustainable development (ESD). A survey was conducted among 638 students from 15 upper secondary schools, investigating their sustainability consciousness (SC) and their decision-making in relation to a number of sustainability dilemmas. The results showed that students attending schools with an ESD profile were characterized by stronger SC than students attending regular schools; however the difference between the groups was small and mostly related to the economic dimension of SD. Students who prioritized environmental decisions in SD dilemmas showed stronger SC than students who prioritized economic reasons. The SD dimensions were given varying importance depending on the context and whether a harmony-based or a conflict-based perspective on environmental, economic and social dimensions was used. The study provides support for using multiple perspectives and including both harmonious- and conflict-based perspectives on SD in education. It also contributes knowledge of the implementation of ESD in Sweden in terms of the student sustainability consciousness in the two groups.