Young People’s ‘Sustainability Consciousness’

Effects of ESD Implementation in Swedish Schools

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Abstract

The UN Decade of Education for Sustainable Development is approaching its end and it is important to investigate the effects of the efforts to implement *education for sustainable development* (ESD) nationally, before decisions on forthcoming efforts are made. There are few investigations of the effect of ESD implementation that take a broad approach. In order to measure the educational effects of ESD implementation broadly and inclusively, I introduce the concept of *sustainability consciousness* (SC), which will be operationalized into the research through a Likert scale questionnaire. This Licentiate thesis contributes new knowledge on the implementation of ESD in the Swedish school system as reflected in young people’s SC. Two studies have been conducted. In the first study, I investigated the effects of ESD implementation by a comparison of SC between students in schools with an explicit ESD approach and control schools without an explicit approach. In the second study, I investigated whether the perceptual dip among adolescents found in the field of environmental education was also present in the economic and social dimensions of their SC in addition to the environmental one. The total sample included 2,413 students in 6th, 9th, and 12th grades of the Swedish schools system. Results of the two studies indicate that the implementation of ESD in the Swedish compulsory school system does not seem to have been particularly successful as there are only small positive effects of an explicit ESD approach in 6th grade and even a small negative effect of an explicit ESD approach in the 9th grade. Furthermore, the dip in adolescent 9th graders’ SC is confirmed. This indicates that different age groups tackle the effects of the prevailing traditional sustainability teaching in different ways, which suggests that ESD in schools need to be adapted to different levels.
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Daniel Olsson, Niklas Gericke and Shu-Nu Chang Rundgren
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Paper 2
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Introduction

Over the last decades the concept of sustainable development (SD) has emerged as an inclusive concept involving environmental, economic and social dimensions. Increased globalization has raised awareness of the connections between environmental problems and socio-economic issues, such as poverty reduction and health. SD was introduced as the important concept to deal with the complex and interconnected problems of our globalized world (WCED, 1987). To facilitate and accentuate the implementation of SD issues throughout the educational system the UN declared the years 2005-2014 to be the decade of education for sustainable development (DESD) (UNESCO, 2006). The main idea of the DESD was to implement SD at all levels in the educational systems throughout the world. However, it was emphasized that the implementation should be based on the context and conditions of each country. The complexity and the challenges that the implementation of SD in education imply, has actuated a need for an approach in teaching that better prepares people for active citizenship and decision-making on complex issues. This approach in teaching is often called education for sustainable development (ESD).

During the DESD a great deal of research has been performed in the field of ESD. At the theoretical level the field has moved towards the notion of ESD as an approach to building capacities in young people rather than leading to behavioral change (Sandell, Öhman, Östman, Billingham, & Lindman, 2005; Breiting, 2009; Wals, 2011), but the idea of the behavioral and attitudinal goals of ESD is still substantial in research (Arbuthnott, 2008). During the DESD a wide range of empirical teaching practice and classroom studies have been conducted (e.g. Bursjöö, 2011; Stagell et al., 2014; Sund, 2013; Walshe, 2008; Öhman & Öhman, 2012).

To contribute to the field of teachers’ conceptual understanding of SD, Borg and colleagues performed a large scale quantitative study of upper secondary teachers in Sweden (Borg, Gericke, Bergman, & Höglund, 2012; 2013). They drew two main conclusions. First, there were subject-specific barriers among teachers, which highlighted the need to work collaboratively in teaching ESD and second, teachers were found not to have a holistic understanding of SD, including the three...
dimensions, environmental, economic and social. As a result, the teachers had difficulties in adopting a holistic approach when teaching ESD.

Against this background, it is not surprising that student-centered research has found that students throughout the educational system have difficulties to take in the full scope of SD (Manni, Sporre, & Ottander, 2013; Summers and Childs, 2007; Walshe, 2008). However, the results are not completely discouraging or unequivocal. Walshe (2008) found some attempts among students to link the dimensions together and Manni et al. (2012) found that the issues of the economic dimension were the easiest ones for students to relate to the other SD dimensions. The findings indicate the need for clarifying the educational outcome of ESD among students to ensure the success of further ESD implementation into the schools system.

In order to measure the effects of ESD implementation, a broad, inclusive approach is required, taking many aspects of teaching into account in relation to SD and its three dimensions. There are few investigations of the effect of ESD implementation on students that take a broad approach and those available have usually either focused on one aspect, e.g. attitudes, or on the relationship between different aspects. In Sweden, upper secondary students’ attitudes towards SD were investigated through an environmental attitude questionnaire supplemented with issues of solidarity and equality, in which the main aim was to examine how attitudes were distributed across sex, educational program and urban/rural living (Torbjörnsson, 2011). In Finland Uitto & Saloranta (2010) investigated the relationship between environmental and human values, attitudes interests and motivations among secondary school students. The Finnish researchers emphasized the importance of including both cognitive and affective factors when conducting research on the outcome of ESD among students.

Within the field of environmental education, a considerable number of large-scale studies that include different aspects of education have been carried out to investigate the effects of environmental education on students’ attitudes, knowledge, and behaviors regarding environmental issues. For example, several well-adjusted instruments for measuring environmental attitudes have been developed. In recent years, environmental education research in Flanders has compared students’ knowledge, attitudes and behaviors in schools with an explicit environmental approach and in regular schools (Boeve-de Pauw & Van Petegem,
They found very small differences between the two groups of students. These results contribute important knowledge to the field about the effects of environmental education in schools. However, there seems to be a lack of research that takes a broad approach to the effect of ESD implementation on students and to their broader consciousness of SD. This thesis aims to redress this lack.

In environmental education there has also been research revealing a decrease in young people’s attitudes, behavior and knowledge of the environment as they enter adolescence (Negev, Sagi, Garb, Salzberg, & Tal, 2008; Liefländer & Bogner, 2014). Investigating young people’s attitudes towards natural settings, Kaplan and Kaplan (2002) discovered the same decrease among adolescents in comparison to younger students. Furthermore, they found that the adolescents recovered from the decrease as they grew older, a phenomenon they call the adolescent time out in their preference of natural settings. So far, there is no research in the field of sustainability education that describes this phenomenon when it comes to young people’s broader consciousness of SD. The question therefore arises whether the same decrease and recovery is also present in young people’s broader consciousness of SD, including both the social and economic dimensions besides the environmental one. Knowledge of how age impacts on students’ SD consciousness is an important gap to fill in to ensure the success of further efforts to implement ESD in our school systems.

**Aim and research questions**

The DESD (decade of education for sustainable development) is now drawing to a close. In view of what has been discussed in the introduction, it is important to investigate the effects of implementing ESD nationally, before decisions for forthcoming efforts are made. Therefore, the overall aim of this thesis is to investigate the effects of the implementation of ESD in the Swedish school system in terms of young people’s broader consciousness of SD. The investigation of the effects of ESD implementation in Swedish schools will be conducted through two studies. In the first study the effects of ESD implementation will be investigated by comparing students’ broader consciousness of SD in schools with an explicit ESD approach (ESD-schools) and in control schools without such explicit approach (REF-schools). The second study aims to investigate whether there is a dip in the
degree of broader consciousness of SD among adolescents. The sample includes students in the 6th, 9th, and 12th grades of the Swedish schools system.

In order to satisfy the overall aim of investigating the effects of the ESD implementation in the Swedish school system, a wide range of SD items will be used in the studies. To be able to say something about students’ comprehension and broader consciousness of SD, the concept of sustainability consciousness (SC) is introduced and operationalized. Students’ SC can, because of its inclusive approach, be considered to represent a reflection of the effect of ESD implementation in the form of possible differences between groups of the studies. The concept of SC will be described more thoroughly in the background section.

The research questions in study 1 are:

1. Are there any differences in students’ SC between the ESD-school and REF-school groups?
   If so,

2. What are the differences?

The research questions in study 2 are:

1. Does students’ SC dip in adolescence?
   If so,

2. What are the differences between 6th, 9th and 12th grade students’ SC?
3. Is the dip among adolescents consistent across the dimensions (environmental, social and economic) of SD and SC constituents’ knowingness, attitude and behavior?

Theoretical background

Ever since SD was implemented in the educational system, it has been debated whether the approach needed in teaching should aim for attitudinal and behavioral change or should build capacities for the future, thus reducing the normativity claim that the concept of SD implies. The attention was directed towards the processes that form the basis for teaching and learning about SD. In literature this
teaching and learning process adapted for SD issues is often described as ESD. Internationally, the process of developing and implementing ESD resulted in the UN declaring the years 2005-2014 as the decade of ESD.

This section aims to describe SD and ESD, and the concept of SC, through which the effects of ESD implementation can be measured in terms of students' broader consciousness of sustainability.

**SD (sustainable development)**

Even though the term SD had been used earlier, it was not established as a commonly used concept until 1980 (IUCN, UNEP, WWF, 1980). Increased globalization had raised awareness of the connections between environmental problems and socio-economic issues, such as poverty reduction and health. In the Brundtland report (WCED, 1987), the important step was made to bring environmental, social and economic dimensions together into the concept of SD. The report includes a definition of SD, which has become widely known: ‘Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (WCED, 1987, pp. 43). The strength of the Brundtland report is the emphasis on interweaving environmental and socio-economic problems in a local, regional and global perspective today as well as for future generations. A critique of the definition is that it is based on the needs of humans, making it a strictly anthropocentric concept and thereby ignoring the intrinsic values of nature (Lee, 2000). Furthermore, a wide definition makes it easy for people, organizations, companies and governments to adapt the concept of SD to their own agendas, resulting in priority being given to the economy (Bonnett 1999; Giddings, Hopwood, and O’Brien 2002; Jabareen 2008). This may mean that SD becomes an ineffectual concept.

An alternative definition based on five equity principles was made by Haughton (1999). The idea was to move away from the focus of economic growth that was the result of the Brundtland definition, and think of SD as a process along the core principles of SD. First, the principle of ‘intergenerational equity, or the principle of futurity’; Second, the principle of ‘intra-generational equity, or more generally contemporary social equity or social justice’; Third, the principle of ‘geographical equity, or transfrontier responsibility’; Fourth, the principle of ‘procedural equity… to ensure that all people are treated openly and fairly’, and finally the fifth principle of ‘inter-species equity, which places the survival of other species on an equal basis to the survival of humans’ (Haughton, 1999, pp.
These equity principles put further focus on the interdependency of the issues and the importance of not separating the environmental, social and economic dimension, since inequity is considered to be alien to SD.

Even though there are several different definitions of SD, Jabareen (2008) pointed to the lack of a theoretical framework for understanding the complex concept of SD and proceeded to develop a new conceptual framework. At the very center of this framework (Jabareen, 2008) lies the ethical paradox of SD. The paradox is based on the word sustainable and its history in the field of ecology (an environmental label), while development has its roots in the economic field of society (economic and social label) and thus, the concept has a built-in tension. At the same time as the paradox is often seen as the major problem with the concept, the aim of SD will still be to mitigate between the two parts: sustainable and development (Jabareen, 2008). There are several ways to view the environmental and socio-economic interconnections of SD, as the concept implies. In the next section different views of SD will be elaborated on.

**Different views of SD**

In recent years, the integrated nature of the concept of SD has been emphasized. The most common way to acknowledge this has been to incorporate the environmental, economic and social dimensions that underpin SD. There are several different approaches to how these dimensions are interconnected and interdependent. Giddings and colleagues (2002) presented three different models that summarize three different views of SD.

The first model that Giddings and his colleagues describe is the three ring sector. The environmental, economic social and dimensions of SD are presented as interconnected rings with a common, overlapping area. The model is often used because of its simplicity and applicability in analysis. The three different sectors also imply that the dimensions can be viewed separately and priority can be given any of the dimensions, which also can be a weakness. The separation of the SD dimensions into three different sectors has been used to justify concentrating on one of the parts rather the concept as a whole. Governments and companies prioritize the economic dimensions and economic growth at the expense of the other two. Hopwood and colleagues (2005) characterize this kind of view as ‘status quo’, implying that problems can be solved without any major changes in society and technical progress is seen as the main component of the development.
In a second model SD dimensions are described as nested. Giddings and colleagues (2002) consider this as a more appropriate presentation of SD. The economy is nested within the society, which in turn is nested within the environment. The economy cannot exist without society and society cannot exist without the environment. The model of nested SD, deals with the interdependency of the SD dimensions in a better way than the earlier described three ring sector. As a consequence of bridging the barriers between disciplines, the model of nested SD facilitates taking a holistic view. A holistic view has been considered a key issue for SD (Giddings et al., 2002; Hopwood et al., 2005) although; the model of nested SD has its limitations. The complex relationships between the economy and society are at risk of being lost in a simplified model divided into the three dimensions and does not contribute to an intertwined principle-based view of SD. Giddings and colleagues (2002) therefore developed a new model that breaks up the boundaries between SD dimensions.

The third model suggested by Giddings and colleagues (2002) is that merging the social and economic dimensions would improve the model of nested SD. In the real world human activities, health and wellbeing are merged together within the environment. The boundary to the environment becomes blurry as an indication of the constant interaction with the environment. This model, which reflects the reality of the interaction between SD dimensions, puts the focus on human wellbeing and equity, which is in line with Haughton’s (1999) definition of the five SD principles described earlier, and moves away from prioritizing the economy. This also implies a transformation of the view of SD, away from the ‘top down’ status quo described by Hopwood and colleagues (2005). A transformation of SD implies that a ‘bottom up’ perspective is needed. Therefore the progress towards SD has to be a learning process (Vare & Scott, 2007). This puts education in the frontline of the process towards SD.

**SD in education**

At the international level, the importance of including SD in education emerged from a process that started at the Intergovernmental conference on environmental education in Tbilisi, 1977 (UNESCO, 1978), through the Brundtland commission report (WCED, 1987), the Rio conference in 1992 (UN, 1992) to the UN resolution establishing the United Nation DESD), (UN, 2002). The international collaboration resulted in an implementation scheme of SD into the educational
system (UNESCO, 2006). A fundamental idea in the policy process was the importance of maintaining connections between the different dimensions of SD, so that individuals have the chance to apply the principles of SD throughout their lives (UNESCO, 2006; 2009). To define SD in an educational context, the environmental, economic and social dimensions of SD were divided into fifteen strategic perspectives, or sub-themes (UNESCO, 2006). A short summary of what should constitute the three dimensions according to the UNESCO (2006) benchmarks is as follows:

**Sub-themes of the environmental dimension**
The sub-themes of the environmental dimension relate to raising the awareness of humans’ environmental, social and economic activities and their effect on resources and nature’s fragility (UNESCO, 2006). The sub-themes of the environmental dimension are: 1) Natural resources (water, energy, agriculture, biodiversity); 2) Climate change; 3) Rural development; 4) Sustainable urbanization; and 5) Disaster prevention and mitigation (UNESCO, 2006).

**Sub-themes of the economic dimension**
The sub-themes of the economic dimension concern consumption and sensitivity to the potential for and limits of economic growth, with a commitment to social justice and the environment (UNESCO, 2006). The sub-themes of the economic dimension are: 6) Poverty reduction; 7) Corporate responsibility and accountability; and 8) Market economy (UNESCO, 2006).

**Sub-themes of the social dimension**
The sub-themes of the social dimension focus on the resolution of differences and on understanding social institutions, democratic and participatory systems (UNESCO, 2006). The sub-themes of the social dimension are: 9) Human rights; 10) Peace and human security; 11) Gender equality; 12) Cultural diversity and intercultural understanding; 13) Health; 14) HIV/AIDS; and 15) Governance (UNESCO, 2006).

There is criticism of the view of the SD channeled through UN policy documents. One part of the criticism is based on countries’ diverse circumstances for implementing and that the policy documents are written from the perspective of rich countries. The documents are characterized by the idea of economic growth, so that the transformation process towards SD considered necessary will never be
reached (Hopwood et al., 2005; Jickling & Wals, 2008). Furthermore, by presupposing SD as a policy concept, we also set the framework for how we want the pupils to think and act. To succeed with such an approach in teaching SD, Bonnett (1999) describes the importance of having sustainability as a state of mind (Bonnett 1999; Bonnett 2002), which points to the need for an approach in teaching that engages young people in a natural way in a sustainable future.

Despite the criticism, the UNESCO document has become the benchmark for the development of both Swedish curricula and thereby also for organizations working with support to schools in the implementation process (Swedish National Agency for Education, 2011; 2014; Keep Sweden Tidy Foundation, 2014). Therefore, it is important to take these benchmarks as a point of departure in the studies that aim to answer the research questions of this thesis.

**ESD (education for sustainable development)**

The approach to facilitate implementing and dealing with SD in the educational systems is called ESD. A great deal of research has been aimed at finding relationships between attitudes and behavior to find ways in teaching that lead to behavioral change (see Arbuthnott, 2009). Still, there is no consensus and the purpose of the teaching that leads to behavioral change is questioned. In the field of ESD another approach in education is more directed towards building capacities than changing behavior. Vare and Scott (2007) describe these two different approaches in ESD as ESD 1 and ESD 2.

ESD 1 is considered to be synonymous with learning for sustainable development (Vare & Scott, 2007, pp. 193). This implies that learning should promote attitudes and behavior among individuals in a certain direction. This is a common and traditional approach in environmental education research, where i.e. pro environmental attitudes and behavior are frequently measured in order to determine the impact of education. Öhman (2004) derived this approach in teaching and learning from the fact-based and normative environmental teaching tradition. The fact-based and normative teaching approaches constituting ESD 1 are characterized by the view that science can provide solutions to environmental problems along with great confidence in technological progress and the possibility to re-set people’s minds to predetermined goals. Similarly, in addition to the fact-based and normative environmental teaching traditions defined by Öhman (2004), Scott and Gough (2003) also identified approaches in teaching regarding SD. The approach they
describe as Type 1 corresponds to the fact-based tradition and Type 2 corresponds to the normative tradition. ‘In both Type 1 and Type 2 approaches, learners, broadly speaking, learn to value what others tell them is important’ (Vare & Scott, 2007, pp. 192). Voices have been raised against the view of ESD 1 that there is a direct connection between an increase in knowledge and changes in attitudes and behavior (e.g. Wals, 2011; Jickling & Wals, 2008).

The second path of ESD rests on a different basis. Vare and Scott call this approach ESD 2 and consider it to be synonymous with learning as sustainable development (Vare & Scott, 2007, pp. 194). ESD 2 is characterized by two features. Firstly, ESD 2 is characterized by conflicting perspectives and by exploring various contradictions inherent in sustainability issues. The second main feature involves the development of critical thinking and building capacities for dealing with problem issues and dilemmas concerning SD. There are several different descriptions of ESD in the literature that fit into the Vare and Scott characteristics of ESD 2, all describing a similar approach to sustainability education, but in slightly different words (Sandell et al., 2005; Mogensen & Schnack, 2010; Breiting, 2009; Wals, 2011). Three different descriptions of ESD will here be presented as a summary of ESD 2.

First, Sandell and colleagues (2005) compiled the approach that equates ESD with the pluralistic environmental teaching tradition. Increasing complexity in environmental problems meant that the fact-based and normative environmental teaching traditions no longer were considered sufficient to solve the problems facing society. The pluralistic environment teaching tradition was seen as a response to learning how to manage the complexity of the interaction between environmental and social problems. According to Sandell and colleagues (2005), pluralism is the keyword in ESD, implying that many perspectives (i.e. environmental, economic and social) and opinions should be discussed, studied and critically viewed in a democratic approach in education. The past, present and the future as well as local, regional and global perspectives are important components in education. Further, students’ responsibility and participation in planning activities under the supervision of the teacher is important for the ESD approach in teaching (Sandell et al., 2005).

Secondly, Mogensen and Schnack (2010) and Breiting (2009) describe ESD in a similar way. They consider ESD as an action competence approach.
The action competence approach points to democratic, participatory and action-oriented teaching-learning that can help students develop their ability, motivation and desire to play an active role in finding democratic solutions to problems and issues connected to sustainable development’ (Mogensen & Schnack, 2010, pp. 62).

The action competence approach is more of an educational ideal than an approach designed for a specific competence. Empowering students with capacities to address conflicting perspectives of SD issues is a key element of the action competence approach in education. An approach to teaching that truly seeks to empower students with action competence for future decisions cannot simultaneously focus on behavioral change (ESD 1) towards predetermined goals because the future may contain other than those we see today (Breiting, 2009). However, it is a complex issue, because short-term SD goals of attitudinal and behavioral change can promote benefits apparent to society and individuals and put sustainability issues on the political agenda.

Finally, the notion of ESD as transmitting values and behaviors to accomplish SD (as in ESD 1) has been criticized by, for example, Jackson (2011), Wals (2011) and Jickling and Wals (2008). They argue that ESD is a transformative process, where building capacities through social learning is key elements in the transformation process of the society towards SD (in line with the description of ESD 2). Social learning is not just learning in general. Social learning is that kind of learning that leads to a transformation in the way of thinking, valuing and acting, and where people together create new creative solutions to complex problems in society. The transformation process towards SD through social learning is an ongoing process without an end, and are in many ways similar to the process of building capacities and empowering people with action competence, described earlier (Mogensen & Schnack, 2010; Breiting, 2009).

Which ESD path is then the right one to take? Have ESD 2 phased out ESD 1, or are both approaches needed in ESD? On the one hand, if we are to empower people for future decisions, ESD 2 is the only way. On the other hand, according to Vare and Scott (2007) also ESD 1 serves a function. Acting on the basis of predetermined goals can help people do the obvious in order to contribute to SD by changing attitudes and behaviors. Short-term goals can promote the benefits of SD to society and individuals. Furthermore, it is possible to avoid an either-or-debate if attention is paid to both approaches. It could also be true that the two
different ESD approaches work in different ways in various age groups. Previous research has shown that there is less interest in environmental issues in the period of transition from adolescence into adulthood (see introduction), which means that there may be a need of an approach in teaching that is adapted to the needs of adolescents.

**Combining different approaches: UNESCO and curricula**

The UNESCO DESD (Decade of Education for Sustainable Development) is often categorized as Vare’s and Scott’s (2007) ESD 1:

‘The overall goal for the DESD is to integrate the values inherent in sustainable development into all aspects of learning to encourage changes in behavior that allow for a more sustainable and just society for all.’ (UNESCO, 2006, pp. 4)

The UNESCO document shows many connections to the transmissive view of ESD (ESD 1), but also stipulates that ESD should be viewed in the perspective of lifelong learning and that a transformative approach (ESD 2) is needed:

‘Education is the primary agent of transformation towards sustainable development, increasing people’s capacities to transform their visions for society into reality.’

(UNESCO, 2006, pp. 16)

In the DESD implementation scheme (UNESCO, 2006), there are many more examples of the mix of the two ESD approaches. In 2009 The DESD review of contents and structures of education for sustainable development was published (UNESCO, 2009). In this document UNESCO tries to redirect the course from an emphasis on ESD as a transmissive approach to being more imbued with the transformative approach that involves building capacities for future decision-making.

The DESD documentation has served as the basis for steering documents and implementation nationally, including the Swedish curricula. As in the UNESCO documents, the two different approaches to ESD can also be found in the Swedish curricula. For example:

‘The school should actively and consciously influence and stimulate students into embracing the common values of our society, and their expression in common daily action’ and ‘The school should take responsibility for ensuring that pupils acquire and develop the knowledge that is necessary for each individual and member of

‘Democratic working forms should also be applied in practice and prepare pupils for active participation of the life in society’ and ‘By taking part in planning and evaluation of their daily teaching and being able to choose courses, subjects, themes and activities, pupils will develop their ability to exercise, influence and take responsibility’ (The Swedish National Agency for Education, 2011, pp.10, 11).

The same text is also found in the curriculum for upper secondary school (Swedish National Agency for Education, 2013).

At the same time as the new curriculum was introduced in 2011, the structure and content of syllabuses were renewed, and each subject came to involve content related to SD issues. All subjects are structured on a number of capacities to be developed, very much in line with the ideas of ESD as a transformative process of empowering students for future decision-making.

**Implementing ESD in Swedish schools**

Except for the specifications in curricula and syllabuses, there have not been any major political initiatives to support schools with ESD implementation during the DESD. Schools that strived towards an explicit ESD profile have instead turned to organizations and authorities outside the school for support. There are several organizations whose purpose is to support schools, teachers and school leadership on issues of sustainability and ESD on the basis of the Swedish curricula and the benchmarks of international DESD documents (Keep Sweden Tidy Foundation, 2014; National Agency for Education, 2014; WWF 2014; The Swedish Council for Higher Education 2014). These organizations and networks are well known by schools in Sweden as supporting partners in ESD. As mentioned earlier in this section, it is important to take these benchmarks as a point of departure when aiming to answer the research questions of this thesis. Furthermore, this underlines the need to incorporate a concept in investigations that can reflect the effects of ESD implementation in terms of these benchmarks.

**SC (sustainability consciousness)**

The importance of integrating cognitive and affective aspects to enhance students’ interest and engagement in education has been addressed in research (e.g.
Littledyke, 2008). This means that more than cognitive factors alone influence views related to environmental, economic and social issues of everyday life; affective factors are also important to empower decision-making in everyday life. Therefore, in ESD it is important to incorporate both cognitive and affective aspects of learning (see Littledyke 2008; Sandell et al. 2005) to accomplish the goal of sustainability education and to prepare students for sustainable decision-making in their future lives. In the *Review of Contexts and Structures for Education for Sustainable Development* (UNESCO, 2009) four key principles relevant to all cultures covering the scope, purpose and practice of ESD are presented:

- ‘a transformative and reflective process that seeks to integrate values and perceptions of sustainability into not only education systems but one’s everyday personal and professional life;
- a means of empowering people with new knowledge and skills to help resolve common issues that challenge global society’s collective life now and in the future;
- a holistic approach to achieve economic and social justice and respect for all life;
- a means to improve the quality of basic education, to reorient existing educational programmes and to raise awareness.’ (UNESCO 2009, 26).

These key principles indicate that pure knowledge alone cannot fulfill the goals of ESD. Also in the Swedish curricula the importance of both cognitive and affective aspects in education is emphasize, as shown in a previous section of this chapter.

What cognitive and affective aspects should then be included in a study whose purpose is to investigate young people’s consciousness of SD? For practical reasons everything cannot be included. If some aspects are included, others will automatically be excluded. There are two main reasons for why knowingness, attitudes and behavior aspects were used to represent important cognitive and affective aspects of education in this thesis. First and most important, the definition of action competence, show a close relationship to the aspects of knowingness, attitudes and behavior (Breiting & Mogensen, 1999), see ‘The concept of SC’ section later in this chapter. Secondly, there are also practical reasons related to the selection of survey instrument. In order to get as broad and inclusive view as possible of the effects of ESD, an instrument based on the aspects of knowingness, attitudes and behavior was selected to constitute the tool for
investigating students’ SC. The meaning of what constitutes these cognitive and affective aspects of importance to education is described below.

**Knowingness, attitudes and behavior aspects**

Knowing what factual knowledge to learn today for sustainable decisions in the future is not easy to establish. When cognitive and affective aspects are incorporated in education the kind of knowledge associated with truth will not be completely meaningful. Furthermore, the complex structures behind human reasoning (incorporating cognitive and affective aspects) this type of truth can never be claimed for SD issues. Von Glasersfeld (1990) therefore argues for a theory of knowing instead of a theory of knowledge, where knowingness has both a cognitive, knowledge-based component and an affective-based component. In view of this, sustainability knowingness in this licentiate thesis is defined as the knowingness about the fundamentals on which SD is based.

Eagly and Chaiken (1993, pp. 1) define attitudes as follows: ‘*Attitude is a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor.*’ They consider an attitude to be the product of cognitive, affective and behavioral processes. The cognitive part of an attitude is often regarded as thoughts and ideas conceptualized as beliefs, whilst the affective part of an attitude most often is described as emotions and feelings in relation to attitude objects. The behavior part of an attitude consists of people’s actions exposed in relation to attitude objects. The cognitive, affective and behavioral processes preceding an attitude is expressed in the cognitive, affective and behavioral responses resulting from the attitude (Jagers, 2009). The scope of a measured attitude is often broader than the measure of a behavior. Therefore, the link between attitudes and behaviors is not always clear (Kollmuss and Agyeman 2002). By the responses of behavior (self-reported) important information of people’s actions is added to the attitudes in a particular area, like SD.

**The concept of SC**

To investigate students' consciousness in a particular area of education requires a broad range of questions to ensure full access to cognitive, affective and behavioral aspects. Moreover, the ESD principles presented earlier require an inclusive and holistic approach to SD, including the environmental, economic and social dimensions. SC is the concept that integrates the environmental, social and economic dimensions of SD. Furthermore, there are aspects that elucidate
sustainability knowingness, attitudes and behaviors in each of these three dimensions (see Figure 1). The notion of SC is retrieved from the field of environmental education, where environmental consciousness has been introduced by researchers (see Sánchez & Lafuente, 2010; Kollmuss & Agyeman, 2002). Breiting and Mogensen (1999) have described students’ action competence as closely related to co-variations between knowledge of action possibilities (knowingness), confidence in own influence (attitudes) and a wish to act (behavior). Words in parenthesis are my own interpretations. The concept of SC was developed to reflect students’ action competence according to the subthemes connected to SD dimensions as described by UNESCO (2006), and consequently the effect of an ESD approach can be reflected in students’ SC.

![Figure 1: The concept of SC (sustainability consciousness), consisting of the aspects knowingness (K), attitudes (A) and behavior (B) in the environmental, economic and social dimension of SD.](image-url)

To summarize, the concept of SC constitutes the link between the two approaches ESD 1 and ESD 2, described by Vare and Scott (2007), connecting the content part of ESD to the theory of ESD as a teaching model for building capacities. The strength of the SC concept is that it makes it possible to say something about the effect of ESD implementation in terms of what comes out among students regarding their consciousness of SD, through a broad range of aspects considered to be important for learning.
Method

The overall aim of this thesis is to investigate the effects of the implementation of ESD in the Swedish school system as reflected in young people's SC. This was done in two parts. First, the effect of an explicit ESD-approach on students' SC was investigated followed by an investigation to detect if there was dip in SC among adolescents compared with two other age groups. This aim reflects a need of a quantitative large-scale study with many participants rather than a qualitative study with few participants. In the following section the methods used to complete this thesis are described. The concept of SC together with the methodology are designed to be the bridge that connects the learning theories of ESD with the student outcome, i.e. the effects of the implementation of ESD will be measured as a reflection of their action competence through students’ SC.

The participants

The objective of this thesis implies that two important preconditions must be fulfilled in the sample process of participants for the two studies included. Students in schools with an explicit ESD approach have to be equally represented and compared to students in schools without such a profile, and additionally, the sampling must be done in three different grades to make it possible to identify any dip in the adolescents' SC. Therefore it is not possible to make a random sample. Instead, a non-probability purposive sample has to be used (Robson, 2011, p. 274-275). The following paragraphs are a description of the sample process taking the two important preconditions into account.

The age range in which the adolescent waning interest in environmental issues has been identified in previous studies, i.e. among 15-16 year-old students, was the starting point for the sampling process. This age group is found in the 9th grade, which is the last year of the Swedish compulsory school system. For the purpose of comparison, one younger age group and one older age group just outside the age range of the 9th grade group were included in the sample. Primary school students, 12-13 years old (6th grade) and upper secondary school students, 18-19 years old (12th grade) constitute good representatives of these two control groups. Grade 6 students are in the final year of primary school and grade 12 students are in the final year of the upper secondary school.

To meet the overall aim, the sample should also include schools of which one half consists of students in schools with an explicit ESD approach and the other half
consists of students in regular schools without such an approach. Records linked to three different organizations and one network were used to find schools with an explicit ESD approach. The organizations and the network are well known by schools in Sweden as supporting partners in ESD. First, eco-school (FEE 2014) is an international program which aims to raise student awareness of issues associated with SD. In Sweden, the *Keep Sweden Tidy Foundation* (2014) administers the eco-school green flag certificate and develops programs attuned to the Swedish school system. Second, the National Agency for Education provided a register of schools connected to their award *School for sustainable development* (Swedish National Agency for Education, 2014). Third, in autumn 2007, The World Wide Fund for Nature (WWF) initiated a three-year school development project called *School on sustainable way* (WWF 2014). Even though the WWF-project is now closed several of the schools have kept on working in the spirit of that project. Finally, I used a register which shows schools’ participation in activities related to *The Global School*. They offer programs and activities for teachers, school leaders and policy makers with a focus on globalization and ESD (The Swedish Council for Higher Education 2014).

With the two preconditions of taking grades and explicit ESD-approach into account, the sample process described more thoroughly in article 1 and article 2 of this thesis followed. In Figure 2 the sample process is summarized. The selection of schools with an ESD approach (ESD-schools) formed the basis for the selection of control schools (REF-schools). The REF-schools were selected to be fully comparable to ESD-schools in all respects, except for the explicit ESD approach, that is, factors such as geographic location, size of the school, grades and socio-economic factors should be fully comparable. To establish that schools in the two groups were fully comparable, databases from the national agency of education were used. To further validate the sample, telephone interviews with principals and school leaders in the municipalities were conducted (see Figure 2). To summarize the sample process, schools from all over Sweden were represented in the sample, from the north to the very south of the oblong country. The number of participating students was 1775 in study 1 and 2413 students in study 2 (see Table 1 in page 33). The participants represented a good selection of the three grades 6, 9 and 12 in Sweden, as well as for the schools with an explicit ESD approach and the schools without such an approach.
Figure 2: Sampling process for the selection of participants for the two studies. Numbers without brackets is for study 1 and numbers in brackets is for study 2.

Survey instrument
In 2012 the process of finding a survey instrument, or a combination of survey instruments with the capacity of measuring young people’s consciousness of SD was started. Finding an instrument that could capture the breadth of what comes out of ESD among young people was considered to be important in the process. In the field of environmental education there are several well-known questionnaires described in the literature that capture different aspects of young people’s perceptions of the environment.

One of the most frequently used instruments for investigating environmental attitudes is the 2-MEV instrument developed by Bogner and Wiseman (Bogner & Wiseman, 1999; 2006). It is a two dimensional Model of Ecological Values, 2-MEV, where Utilization and Preservation constitute the two dimensions. The major advantage of 2-MEV is that it is a well-developed and well-validated instrument for investigation of peoples’ environmental attitudes. Similarly, the New Environmental Paradigm, NEP-scale, has been frequently used to measure environmental attitudes (Dunlap, Van Liere, Mertig, & Jones, 2002). Children’s Environmental Attitude and Knowledge scale, CHEAK (Leeming, Dwyer, & Bracken, 1995) and The Environmental Attitudes Inventory (Milfont & Duckitt, 2010), are also a well-known survey instrument in the field of environmental education research. However, they all share the same quality. They are survey
instruments well-adjusted and very useful for research on the environmental dimension, but lack adjustment to the economic and social dimensions of SD. Furthermore, none of the survey instruments cover the wide range of aspects of education in a way that is needed to reflect young people’s SC.

A combination of the 2-MEV and the NEP-scale and complementary statements, covering solidarity and equality, has recently been used in Sweden to investigate upper secondary students’ attitudes toward SD (Torbjörnsson, 2011). Still, there is a lack of research investigating effects of ESD implementation in schools and a survey instrument which takes a comprehensive and inclusive approach to students’ consciousness of sustainability.

In Finland, a questionnaire was developed to investigate teachers’ and students’ sustainability actions at their schools (Uitto & Saloranta, 2010). The questionnaire is called SEED (Sustainable Food Education for Self-Efficacy). The SEED questionnaire includes many parts intended to measure values, attitudes and motivations. The survey also has a section that covers fact-based questions (multiple-choice) related to SD issues. Their survey study aimed to examine the relationship between various aspects such as between values and behavior and motivations. The focus of this thesis was to investigate students’ SC as an inclusive concept, and not to investigate the relations between different aspects. Therefore, the focus was directed in a different direction to find a questionnaire more adapted to that aim.

In 2010, a research team in Canada started to develop a survey instrument designed to measure people’s knowledge, attitudes and behaviors in terms of SD. Their intention was to capture the core of SD with respect to the UN DESD (Michalos, Creech, McDonald, & Kalke, 2011). In a second round they refined the questionnaire and made it more adapted to young people (Michalos et al., 2012).

The Canadian survey instrument was found to be most suitable for the purposes of the two studies in this thesis. However, since the knowledge items of the questionnaire were found to involve the knowingness of what is needed to accomplish SD (compare with my previous discussion of knowingness) rather than pure factual knowledge of SD issues, I preferred to use the term knowingness was used for this group of items.
The questionnaire was further developed and adapted to a Swedish context and to different age groups (ages 12-19). To avoid the policy language that could be traced in some of the items and to be more consistent in language, the questionnaire was stylistically edited to be more adapted to young people. Two lower secondary teachers gave suggestions on language suited for the 12-13 year-old 6\textsuperscript{th} graders.

The knowingness, attitudes and behavior items were categorized into the environmental, economic and social dimensions of SD by me and a research colleague, according to the definition of SD dimensions specified in the framework of the UN DESD (UNESCO, 2006).

To strengthen the face validity of the questionnaire design, a group of researchers from the Centre of SMEER\textsuperscript{1} at Karlstad University confirmed the categorization of the items. Where there were different opinions, a joint decision on the categorization of the item was reached after discussion. A few general items in the original Canadian questionnaire were not possible to categorize into any of the SD dimensions and were therefore removed. A few items were added to the economic dimension to ensure that there were enough items for statistical analysis. One example of an item added in the economic dimension is ‘I often purchase second-hand goods over the internet or in a shop’. See Appendix 2 for the final categorization of items.

Late in the autumn of 2012, two pilot studies were performed with a total of 150 participants in the 6\textsuperscript{th}, 9\textsuperscript{th} and 12\textsuperscript{th} grades. In addition to the pilot studies, group interviews were made with students in the different target grades for the studies to ensure that they understood the language and the items. After each pilot study, minor language editing was made to improve the understanding of the questionnaire items. The questionnaire was also supplemented with background questions on gender, whether the students have heard of SD before, where they have heard of SD, and their choice of school.

Since the studies cover 6\textsuperscript{th}, 9\textsuperscript{th} and 12\textsuperscript{th} grades in the Swedish school system, the final version of the questionnaire resulted in three grade adapted versions, still fully comparable with each other. The 6\textsuperscript{th} grade version has a slightly simplified

\textsuperscript{1} SMEER is the abbreviation for the Centre of Science, Mathematics, and Engineering Education Research at Karlstad University, Sweden.
language and the 9th and 12th grade versions only differ in the grade specific background questions. The questionnaires are found in the Appendix 1.

**Data collection process**

In the two studies that are part of this thesis the participating schools were geographically located across the whole country. In previous large-scale studies with a focus on education and SD on teachers (Borg et al., 2012; Borg et al., 2013) and on students in upper secondary (Torbjörnsson, 2011), questionnaires were sent via email to the participants. It is a common procedure for reaching many respondents quickly. Though, there is a risk of losing reliability in the data collection process. Who responds? Do the students answer the questionnaire in a regular lesson or do they have to respond in their free time? Is the mode of procedure in the same way in all schools? In order to eliminate as many of these questions as possible in the data collection process, it was decided that a researcher should be present in the classroom to give the same information to all students before their participation. This was a time-consuming, but important part of the process of ensuring the reliability of the collected data.

There are ethical considerations associated with this type of research, and it must be conducted according to Swedish regulations (Hermerén et al. 2011). A week before the visit, the participating schools received an information letter and informed consent forms to distribute to all the students and for the 6th graders also to their parents. Students from the age of 15 may decide for themselves whether they want to participate in a questionnaire survey, without the consent of a parent. If a questionnaire concerns matters that are a natural part of school education (e.g. SD) also younger students can be expected to decide on their participation in this type of study. However, it is good ethical practice also to give the parents information about the research, so they can discuss possible participation or not with their children in advance.

From the beginning of March to the end of May 2013, data were collected from students in the participating schools. In total, 2 413 students from the 6th, 9th and 12th grades participated by answering the questionnaire. Approximately one half of the participants were from ESD-schools and the other half from REF-schools. Response rates were generally high, probably because of all the work invested in the data collection process, see Table 1.
Table 1. Number of participants in each of the grades 6, 9 and 12 in ESD-schools and REF-schools respectively and the response rates of each grade.

<table>
<thead>
<tr>
<th></th>
<th>Grade 6</th>
<th>Grade 9</th>
<th>Grade 12</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESD-schools</td>
<td>505</td>
<td>407</td>
<td>400</td>
<td>1312</td>
</tr>
<tr>
<td>REF-schools</td>
<td>429</td>
<td>434</td>
<td>238</td>
<td>1101</td>
</tr>
<tr>
<td>Total</td>
<td>934</td>
<td>841</td>
<td>638</td>
<td>2413</td>
</tr>
<tr>
<td>Response rates</td>
<td>86.6%</td>
<td>89.7%</td>
<td>65.7%</td>
<td>80.7%</td>
</tr>
</tbody>
</table>

Validity and reliability of the questionnaire and data analysis

In the questionnaire development process some changes in the Canadian version were made. The items of the questionnaire were categorized into the environmental, economic and social dimensions of SD according to the UNESCO (2006) definition of SD. The questionnaire was also adapted to three different grades in the Swedish school system. Therefore, the important starting point in the data analysis process to get to know the data material is described below.

Construct validity of the questionnaire

This thesis is based on investigations of young people's consciousness of SD including the environmental, economic and social dimensions. It is therefore important that the survey instrument has the ability to measure these variables. The construct validity of the questionnaire design was established by factor analysis based on student responses. Two different methods of exploratory factor analysis were used: principal component analysis (PCA) and principal axis factoring (PAF). Both methods are based on the factorization of data received from the respondents’ responses, but with some important differences.

PCA endeavours to explain the maximum amount of total variance and with successive factoring until there is no meaningful variance left. PCA assumes no correlation between the factors. To facilitate factoring a technique called rotation can be used to discriminate between factors. There are several rotation models that can be used. For the PCA, the rotation varimax was used to identify factor components.

The PAF, often called common factor analysis, works in a slightly different way. The PAF attempts to explain the maximum amount of common variance by
seeking the smallest number of exploratory factors. To establish the validity of the questionnaire and its construct, PAF (oblique rotation) seemed to be the most suitable exploratory factor analysis model, since it allows free correlation and a maximum of common variance of the SD dimension variables.

However, similar result was obtained with both PCA and PAF. Calculations were made for K, A and B aspects separately; otherwise the factor analysis would probably find these factors first. For the knowingness and behavior items the social and environmental dimensions constituted clear factors, while the attitude items showed a more unclear pattern. The factors corresponding to the economic dimension items were slightly more blurry, see Table 2. Both social and environmental items were also present in that factor, maybe as a consequence of the interconnectivity of SD dimensions (see the description of the UNESCO definition of the subthemes in page 18). Nevertheless, it is still satisfying that the three SD dimensions were displayed fairly well in the exploratory factor analysis, confirming the construct of the questionnaire. Exploratory factor analysis made for each grade separately shows a similar pattern as for the total group of students, but for the 6th graders the economic dimension was slightly more blurred than in the other two grades investigated.

The correlation between the exploratory factors and the SD dimension items of K, A and B aspects respectively is high, which also confirms the construct of the questionnaire. The following Pearson’s correlation values are absolute values for the whole sample since it is the magnitude of the correlation that is of interest. Thus, if the correlation is negative due to reversed items it is not reported here. The Pearson’s correlations between the social dimension items and the corresponding factors are $0.730 \leq r \leq 0.964$, $p<.001$ (the dark grey columns in Table 2). The Pearson’s correlations between the environmental dimension items and the corresponding factors are $0.869 \leq r \leq 0.946$, $p<.001$ (the white factor columns in Table 2) and the Pearson’s correlations between the economic dimension items and the corresponding factors are $0.824 \leq r \leq 0.845$, $p<.001$ (the light grey columns in Table 2). These significant correlations are generally high and student responses reflect the theoretical framework underlying the survey. It is worth noting that the social and the economic attitude items correlated highly with both factor 1 and factor 3 (Table 2). This indicates the interconnectivity between these dimensions in the theoretical design and as mentioned in a previous section, the economic
dimension is more easily linked to other SD dimensions by students (Manni et al., 2013). A more detailed discussion of the consequences of the factor analysis is discussed in the section 'Measuring SC' on page 43.

All in all, the factor analysis and the correlations between exploratory factors and the three SD dimensions (defined by the theoretical formwork of UNESCO) indicate a questionnaire with high validity. The dimensions have strong interconnections to one another, which is also palpable in the UNESCO definition (UNESCO, 2006).

Table 2: Summary of exploratory factor analysis for the questionnaire, divided into knowingness attitude and behavior aspects. Each item has the same number as in Appendix 1. Rotation method: Oblimin with Kaiser normalization and number of factors are set to 3.

<table>
<thead>
<tr>
<th>Item</th>
<th>Knowingness</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Attitude</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Behavior</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
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<tbody>
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<td>25 (Eco)</td>
<td>-.703*</td>
<td>47 (Soc)</td>
<td>-.748</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 (Soc)</td>
<td>.720</td>
<td>12 (Soc)</td>
<td>.695</td>
<td>50 (Soc)</td>
<td>-.692</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>13 (Soc)</td>
<td>.613</td>
<td>26 (Eco)</td>
<td>-.479*</td>
<td>37 (Soc)</td>
<td>-.369</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 (Soc)</td>
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<td>21 (Soc)</td>
<td>-.475</td>
<td>36 (Env)</td>
<td>-.611</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>20 (Soc)</td>
<td>-.395</td>
<td>35 (Env)</td>
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</tr>
<tr>
<td>10 (Soc)</td>
<td>.443</td>
<td>23 (Env)</td>
<td>.726</td>
<td>45 (Env)</td>
<td>-.535</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>11 (Soc)</td>
<td>.393*</td>
<td>33 (Env)</td>
<td>.374</td>
<td>34 (Env)</td>
<td>-.450</td>
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<tr>
<td>16 (Env)</td>
<td>.632</td>
<td>24 (Env)</td>
<td>.635*</td>
<td>44 (Eco)</td>
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<td>.517*</td>
<td>48 (Soc)</td>
<td>.683*</td>
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<td>3 (Env)</td>
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<tr>
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<td>30 (Soc)</td>
<td>.311*</td>
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<td>Eigenvalues</td>
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<td>1.224</td>
<td>4.304</td>
<td>1.228</td>
<td>1.120</td>
<td>4.313</td>
<td>1.620</td>
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<td>% of variance</td>
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<td>7.225</td>
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<tr>
<td>Pearson's r</td>
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<td>0.910</td>
<td>0.841</td>
<td>0.831</td>
<td>0.869</td>
<td>0.844</td>
<td>0.824</td>
<td>0.730</td>
<td>0.946</td>
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</tbody>
</table>

Note: Pearson's correlation between Factors and the corresponding dimension according to the theoretical construct of the questionnaire. The dark grey column corresponds to the social dimension, the light grey corresponds to the economic dimension and the white column corresponds to the environmental dimension of the theoretical construct. Factor loadings less than 0.3 are omitted from the table.

*Items identified in another factor than the SD dimension of the theoretical framework.

**Reliability of the questionnaire**

A questionnaire is designed to measure different aspects of the same variables. To ensure that the construct of the questionnaire consistently reflect the measure of the three SD dimensions, reliability analysis was performed. The idea of statistical
reliability analysis is to measure the consistency of answers from two persons that are equal according to the design of the questionnaire. If this is the case, their answers should be very similar. The most common way of measuring scale reliability is with Cronbach’s Alpha. Field (2013) points out that it is not meaningful to place an exact Cronbach’s Alpha value on what is a good reliability. The alpha value is dependent on the number of items included and the type of test. This means that as the number of items included in the calculation increase, the alpha value will also increase. A very low Cronbach’s Alpha value indicates that the items have to low correlation in order to measure the same variable. Accordingly, an alpha value very close to 1.0 indicates that the items measure exactly the same thing for that variable in other words, if Cronbach’s Alpha is 1.0 one item could be enough in such a case. According to Nunnaly and Berstein (1994), the Cronbach’s Alpha value should not be less than 0.6 or more than 0.95. However, values somewhere around 0.7 to 0.9 seem to be suitable for this type of study, depending on the number of items. One can expect values below 0.7 if the items cover a wide range of meanings in the investigation (Field 2013). In Table 3, the reliability analysis of the whole questionnaire and the different subscales are presented. The SC variable of the whole questionnaire that includes knowingness, attitudes and behavior items in the environmental, economic and social dimension of SD is called \( \text{EnvEcoSoc KAB} \). The environmental, economic and social dimension variables are called \( \text{Env KAB} \), \( \text{Eco KAB} \) and \( \text{Soc KAB} \) respectively. Finally, there are variables of aspects knowingness, \( K \), attitudes, \( A \) and behavior, \( B \).

The numbers set out in Table 3 indicate a tool with good reliability and internal consistency. Slightly lower alpha values in the economic dimension may indicate that students had somewhat more difficulty in identifying the economic items as they are interpreted in the questionnaire. Further interpretation of the Cronbach’s Alpha values can be found in Article 1 and Article 2. A way to develop the questionnaire and reach higher internal consistency of the economic dimensions could be to perform confirmatory factor analysis followed by revision of items if these are found to be problematic.
Table 3: Cronbach's Alpha values for the questionnaire

<table>
<thead>
<tr>
<th></th>
<th>Grade 6</th>
<th>Grade 9</th>
<th>Grade 12</th>
<th>Number of items</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnvEcoSoc KAB</td>
<td>.883</td>
<td>.909</td>
<td>.902</td>
<td>50</td>
</tr>
<tr>
<td>Env KAB</td>
<td>.738</td>
<td>.759</td>
<td>.783</td>
<td>17</td>
</tr>
<tr>
<td>Eco KAB</td>
<td>.674</td>
<td>.720</td>
<td>.684</td>
<td>13</td>
</tr>
<tr>
<td>Soc KAB</td>
<td>.785</td>
<td>.840</td>
<td>.805</td>
<td>20</td>
</tr>
<tr>
<td>K</td>
<td>.834</td>
<td>.858</td>
<td>.835</td>
<td>19</td>
</tr>
<tr>
<td>A</td>
<td>.742</td>
<td>.833</td>
<td>.816</td>
<td>14</td>
</tr>
<tr>
<td>B</td>
<td>.802</td>
<td>.780</td>
<td>.797</td>
<td>17</td>
</tr>
</tbody>
</table>

Note: EnvEcoSoc KAB = all items of the questionnaire. Env KAB = items of environmental dimension, Eco KAB = items of the economic dimension and Soc KAB = items of the social dimension. K=knowingness items (within the three SD dimensions), A=attitude items (within the three SD dimensions) and B=behavior items (within the three SD dimensions).

**Data analysis process**

All the data collected during the data collection process were transferred from Survey and Report to IBM SPSS statistics version 20. All statistical analysis was carried out with SPSS and support from a statistician and Field (2013), except for the effect size (Cohen’s d) since SPSS does not provide that calculation. Therefore, the web-based effect size calculator provided by Dr. Lee A. Becker at the University of Colorado was used for effect size calculations (Becker, 2014).

Starting the process of analyzing with the already described validity and reliability analysis was a good way to get to know the data material before further analysis. Both Cronbach’s alpha values and the exploratory factor analysis confirmed that the survey instrument fit our purposes and the limitations could be kept in mind when results were to be interpreted.

Independent samples $t$-test was used to find if there were any significant mean value differences between students in ESD-school and in REF-schools. One-way ANOVA was used to explore the mean value differences between students in the three different grades, 6th, 9th and 12th grade. Both $t$-test and one-way ANOVA are well known tests for this kind of mean value analysis. However, they have some limitations that could have effect on the results. With independent samples $t$-test two groups are compared and only one factor at the time can be taken into account in the calculations, e.g. ESD-school or REF-school. Factors known to have big impact on students, e.g. gender (male or female) cannot be controlled for
at the same time in a $t$-test. One-way ANOVA is used when there are more than two groups in the calculation. Still, the case is exactly the same as with the $t$-test. Only one factor at the time can be controlled for in the calculation, which means that separate analysis has to be done for gender effects. Gender analysis using $t$-test and one-way ANOVA indicated that gender was a factor to take into account in the further analysis process.

In the two articles that are a part of this thesis, results of multivariate analysis of variance (MANOVA) followed by analysis of variance (ANOVA) are used. There are two main reasons for using these analysis tools instead of $t$-tests and one-way ANOVA. First, the concept of SC is an inclusive three dimensional concept that requires an analytical method with the capacity of taking more than one SD-dimension into account. Second MANOVA can control for factors that may have an effect on the results, e.g. gender effects. MANOVA also takes into account the correlations between the dependent variables (the three SD dimensions), which of course is a strength when analyzing an intertwined concept. Moreover, the MANOVA was followed by the univariate ANOVA results of the dependent variables (each SD dimension separately), which also are controlled for the factors that may have impact on the results, (i.e. gender effects in the case of this research project). Thereby the analysis will show if there are so-called interaction-effects to take into account when interpreting the results. To give an example: if a difference between the students in the ESD-school and the REF-school groups can be explained only by the type of group, results show a direct effect of that group type. An interaction-effect occurs if the difference between ESD-group and REF-group can be explained not only by the type of group, but also have to be explained by gender (Field, 2013).

This thesis is a part of larger research project where differences in upper secondary students’ SC is the focus of another researcher and presented elsewhere (Berglund, Gericke, & Chang-Rundgren, 2014; Berglund, Gericke, submitted).

A significant difference between groups is not always enough when results are to be interpreted. The $P$ value indicates if there is a significant difference, but the $P$ value will say nothing about the magnitude of the difference. If there are many participants in a study, it is likely that a significant difference between groups will be found even though the difference between groups is small. It is of course of interest to be able to say that a certain method has an effect (e.g. ESD approach),
but it is also of major interest to be able to say something about the magnitude of the method, i.e. to what degree it affects the participants involved. The effect size is a good way to describe the magnitude of a significant difference. A common way to describe the effect size is by using Cohen’s $d$ (Cohen, 2013). When calculating the effect size, Cohen’s $d$, the mean value difference between groups is divided by the standard deviation (Becker, 2014). Most researchers in the educational field use the guidelines of Cohen (2013) to interpret the effect size. According to Cohen, the effect size is small if Cohen’s $d$ is above 0.2; medium if Cohen’s $d$ is above 0.5 and big if Cohen’s $d$ is above 0.8. Cohen (2013) also uses the term *moderate effect* to describe effect sizes between 0.3 and 0.5. These categories provide a guiding point for effect sizes, but should also be informed by the research context. According to Cohen, a medium effect of 0.5 should be visible to the naked eye by an observer. Such an effect would probably seldom be the case when investigating effects of educational approaches and interventions. Therefore, in educational research, such as in the field of environmental education and sustainability education, it seems that effects above 0.2 should be reasonably “large” effects to detect through statistical analysis.

**Results**

**Main results of study 1**

In the first study, the effect of ESD implementation in Swedish compulsory school was investigated through students’ SC. The concept of SC consists of knowingness, attitudes and behavior within the environmental, economic and social dimensions of SD and must be analyzed as a whole entity. The aim was to compare the SC of one group of students who had been taught in schools with an explicit ESD-profile with students in schools without such a profile. In Sweden the goals of the curricula are described as goals to be reached after 6th grade and after 9th grade. Therefore, this study examined these two grades of the Swedish compulsory school system. Students’ SC was analyzed by MANOVA followed by ANOVA of the environmental, economic and social dimensions of SD separately. Significance level of all analysis was 0.05. Cohen’s $d$ was used to describe the effect of the discovered differences.

There was a significant difference in students’ SC between the ESD-and the REF-school groups both in the 6th (Figure 3) and 9th (Figure 4) grades separately, even
though differences were generally small. In the 6th grade students in the ESD-schools had stronger SC than the students in the REF-schools. In the 9th grade it was the other way around: students in the ESD-schools had lower SC than the students in the REF-schools. The ANOVA for each dimension shows that for students in the 6th grade there was a significant difference only in the environmental dimension between ESD-schools and REF-schools. Students in ESD-schools scored significantly higher mean values than students in REF-schools in the environmental dimension. The effect size of the difference between groups in 6th grade using Cohen’s $d$ was $d=0.25$. For students in the 9th grade, there was a significant difference between groups in the social dimension. Students in REF-schools scored significantly higher mean values than students in ESD-schools in the social dimension. The effect size of the difference between groups in 9th grade using Cohen’s $d$ was $d=-0.22$, i.e. a small negative effect.

Figure 3: A representation of the multivariate results of SC among students in 6th grade. Students in ESD-schools had significantly higher SC than students in REF-schools. The scale is the same on all three axes.
Main results of study 2

The second study investigated whether the perceptual dip found among adolescents in the area of environmental education is also present when examining adolescents’ broader consciousness of SD, including knowingness, attitudes and behavioral aspects within the social and economic dimensions in addition to the environmental dimension, using the concept of SC. For this purpose, students in 6th grade (ages 12-13) and 12th grade (ages 18-19) were control groups to the experimental group of 9th graders (ages 15-16). As in study 1, students’ SC was analyzed by MANOVA followed by ANOVA of the environmental, economic and social dimensions of SD separately. Significance level of all analysis was 0.05. Cohen’s d was used to describe the effect of the discovered differences.

The results of the MANOVA analysis show that 9th graders report significantly lower SC than both 6th graders and 12th graders. The ANOVA results confirm that 9th graders report significantly lower mean values in all three SD dimensions in comparison to both 6th and 12th graders, see Figure 5 (p≤0.001 for all SD dimensions and the effect size is small to medium, using Cohen’s d, when
compared with 9\textsuperscript{th} graders). Figure 5 also illustrates the characteristic V-shaped dip found for the adolescent group. The results of investigating adolescents' SC thus confirm that the adolescent dip found in environmental education is also found in sustainability education, in the economic and social dimension in addition to the environmental dimension.

![Figure 5](image)

\textbf{Figure 5:} The 9\textsuperscript{th} graders mean values are significantly lower in all three SD dimensions than the mean values of 6\textsuperscript{th} and 12\textsuperscript{th} graders, thus causing the V shaped-dip.

\textbf{Summary of results}

The lasting impression from the results presented in the two studies is that there are small differences between students in ESD-schools and REF-schools. For the 6\textsuperscript{th} grade students the differences indicate that an ESD approach for a school is in fact an environmental approach. For 9\textsuperscript{th} grade students an explicit ESD approach even has a negative effect on students' SC. The biggest differences were found between grades, where the adolescent students in 9\textsuperscript{th} grade showed the lowest SC in comparison with both the 6\textsuperscript{th} and 12\textsuperscript{th} graders. The results accentuate the importance of an approach in teaching that emphasize different perspectives, includes all SD dimensions and responds to the adolescents' needs in education.
Furthermore, even though gender was not the focus in any of my two studies, the results in both reveal that there are differences between genders. These gender differences are worth considering in further research and ESD implementation.

Discussion
The overall purpose of this licentiate thesis was to investigate the effects of the implementation of ESD in the Swedish school system by students’ SC. This was done through two studies. Firstly, a comparison was made between students in the compulsory school system who attended schools with an explicit ESD approach, ESD-schools, and students who attended schools without such an approach, REF-schools. The two groups were represented by students in their last year at primary school level (6th grade) and the final year of the compulsory education (9th grade). Secondly, a comparative study between students in the three 6th, 9th and 12th grades was conducted in order to discover if there was a dip in adolescents’ SC, comparable to the dip found among adolescents’ in the field of environmental education. In this section I will first discuss SC and validity issues connected to the questionnaire. The results of the differences in students’ SC along with implications will be discussed.

Measuring SC (sustainability consciousness)
My purpose was to see effects of ESD implementation by measuring aspects of learning about SD among students. Mogensen and Schnack (2010) pointed to the difficulties of measuring action competence. Empowering students with action competence involves building capacities for the future, which is a teaching approach characterized by components of teaching and learning described as ESD 2 by Vare and Scott (2007). Since I have not studied students’ learning process, I concede that I cannot say anything about the direct effect of students' action competence as an effect of schools’ explicit ESD approach. However, something can be said about the indirect effect of students' action competence reflected by their SC. Students' action competence can be described as the co-variation between the knowingness (knowledge of action possibilities), attitudes (confidence in own influence) and behavior (a wish to act) (Breiting & Mogensen, 1999). In the background section, I described how SC can be seen as the theoretical link that joins the two prevailing approaches to ESD presented by Vare and Scott (2007), ESD 1 and ESD 2, and that the approaches combined serve a purpose. SC can
therefore be considered to reflect the students' action competence as a consequence of their educational outcome.

The validity and reliability of the questionnaire are of most importance when interpreting the results of the concept of SC through this study. As mentioned earlier, both the reliability and validity analyses show a functional questionnaire operationalized for measures of students' SC, allowing the research questions to be answered. The questionnaire has the capacity of measuring students' SC as an inclusive concept. Important aspects of SD in education are addressed and elements which are considered essential for the students' action competence are included (Breiting & Mogensen, 1999). Through factor analysis the interconnections of SD dimensions was highlighted. In particular, this was the case of the economic and social dimensions and of the attitude items. This is also reflected in the theoretical framework that formed the basis of the definitions of environmental, social and economic dimensions of SD (UNESCO, 2006). Also Giddings and colleagues (2002) stressed the difficulties of drawing boundaries between the SD dimensions. In a theoretical perspective, it is certainly a strength that the questionnaire reflects the theory behind its design clearly and that the items to some degree are interconnected.

In a technical perspective, there are some disadvantages worth considering. The exploratory factor analysis indicates that some items may be improved, especially in the economic dimension. The reason for the blurriness of the factors (see Table 2) may be that economic issues have the character of being easily connected to the other two dimensions of SD, as described by Manni and colleagues (2013). This is more evident in students’ responses to items in the attitude section of the questionnaire, where the interconnections between dimensions and the boundary between social and economic dimensions, in particular, become blurred and unclear for the students. Another explanation for the fuzziness in the factors corresponding to the economic dimension may also be that the economy items of the questionnaire were more imprecise and wider in design, which also could be the case for some items in the attitude section. Further research should consider continuing confirmatory factor analysis (CFA) to further validate and develop the questionnaire items and the construct. The CFA presupposes the theory behind the structure of the questionnaire and then confirm how well it corresponds to reality on the basis of the respondents' answers. Such analysis may confirm that
some items, for example in the economic dimension, need adjusting or replacing. However, despite small deficiencies identified by the validation process, the strengths of having an instrument anchored in a school context by a theoretical framework and policy and steering documents predominate. The questionnaire captures the very essence of students' consciousness of SD and thus it is possible to say something about the ESD implementation in the form of differences in SC between different groups of students.

**Differences in students’ SC**

Regarding differences between students at ESD-schools and REF-schools, the results show that there are significant differences between the groups in their SC. An ESD approach has a small positive effect in 6th grade, while the converse is true in the 9th grade. An ESD approach has little negative effect on that adolescent group. Previously I have described how SC can be considered to reflect the students' action competence (Breiting & Mogensen, 1999). Consequently, an ESD approach has a small positive effect on students' action competence among 6th graders, while there is something in 9th graders' SC that reflects negatively to an explicit ESD approach and hence affects their action competence.

The univariate results show the differences in SD dimensions separately. For the 6th grade it turned out that it was only in the environmental dimension that there was a significant difference. The awarding organizations, which largely form the basis of the selection of ESD-schools, have a tradition of being environmental awarding organizations, but changed focus at the start of the DESD in 2005 (Foundation Keep Sweden Tidy, 2014; Swedish National Agency for Education, 2014). One possibility is that teachers in ESD schools perceive the support of the certifying organizations as environmental support and rewards. Another possibility is that the certifying organizations still offer support to schools in the form of an environmental approach instead of an ESD approach, even though their intention is to support schools with an ESD approach. However, the results are in line with other researchers who investigated the effect of eco-schools in Flanders. They found that 10-12 year-old eco-school students scored higher on environmental knowledge and their attitudes were less centered on utilization of nature in comparison with students in control schools (Boeve-de Pauw & Van Petegem, 2011).
The negative effect of an ESD approach on 9th grade students are more difficult to interpret, but other studies of this age group have shown that this age group is not especially interested in environmental and human issues, a phenomenon that has also been noted in environmental education research (Kaplan & Kaplan 2002; Liefländer & Bogner 2014; Negev et al. 2008). Recently, 12th grade students' consciousness of SD has been investigated (Berglund et al., 2014), as part of the major project, which includes my two studies. The finding of this investigation was that a school with an explicit ESD approach showed a small positive effect on students' SC in the 12th grade again and consequently also on their action competence. These research indications prompted the focus that I decided on for the second study.

The results of the second study confirmed that there is a dip in adolescents SC in comparison with both younger and older students, comparable to the dip in adolescents' attitudes toward natural environment found by Kaplan and Kaplan (2002). The dip in adolescents’ SC was consistent also in the underlying SD dimensions and the aspects constituting each SD dimension. Kaplan and Kaplan (2002) base their explanation of adolescents’ dip in attitudes to, and concern for the environment, on three informational needs: the need to explore and seek information, the need for understanding and the need for taking action. Increases in the first two needs during adolescence appear to be associated with changes in the brain thus also increasing risk-taking attitudes and behaviors among adolescents. As a consequence their attitudes and behaviors tend to be more negative regarding environmental, social and perhaps economic issues in their surrounding world. Kaplan and Kaplan (2002) point to the importance of a teaching approach adapted to adolescent needs to counter the dip. To meet these needs of adolescents the Kaplans suggests a teaching approach that involves a high degree of participation and activities that are not adult generated. This implies that a normative teaching approach, in which the teachers implement actions intended to transfer attitudes and behaviors to students, is likely to have negative effects on adolescents. There are strong indications in research that teachers generally teach environmental issues (Boeve-de Pauw & Van Petegem 2011), and more recently sustainability development (Borg et al., 2012; Stagell et al., 2014) in this manner, which consequently could mean that the teaching have an adverse effect on students' SC.
To conclude, the ESD implementation of the UN DESD in the Swedish compulsory school system seems not to have been particularly successful with respect to the effect on students' SC and indirectly on their action competence for sustainability issues. The results question the usefulness of the current system of external organizations certifying schools as ‘ESD-schools’ (or similar). Even the top ranked ESD-schools in the sample within the certification system have a limited impact on students’ SC. Nevertheless, it is not only the certification system that seems to miss the mark; schools in the ESD-group also included teachers and school leaders with a high level of engagement in ESD in-service training. Further research in the next decade is needed as well as new ways of testing ESD implementation. The quantitative approach of my two studies needs to be complemented with further research close to the practice and processes in the classroom, and in collaboration with organizations that want to support schools with an ESD approach to develop what is already done today.

The second study contributes new information about the importance of a progression in ESD as young people grow up. The results strongly indicate that the 15-16 year-old age group needs special attention in education and research. So far, an educational approach for sustainability education that is universal for all ages has been proposed. The results of study 2 indicate that different ages respond differently to the prevailing tradition in teaching sustainability, which suggests that ESD in school needs to be adapted to different levels. Therefore further research is proposed to evaluate the potential of ESD as a teaching approach for tackling the adolescent dip in students’ SC.
References


Berglund, T., & Gericke, N. (Submitted). Student views on the dimensions of sustainable development: a matter of context, congruence and conflict.


Appendix 1
Questionnaire on Sustainable Development

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: (only upper secondary)
- Sex  Female  Science
  Male  Humanities
  Possible extension program:

- 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.
  - No active choice made.
  - The school has a good reputation.
  - Proximity to school
  - The school offers extra-curricular activities of interest, state which:

  ____________________________

- This school offers the program I want to do (only upper secondary)
Part 1, grade 6

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**.

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

56
To achieve sustainable development, companies must treat their employees, customers and suppliers in a fair way.

Preserving many different natural species is necessary for sustainable development.

Having respect for other cultures is necessary for sustainable development.

Sustainable development demands a fair distribution of, for example, food and medical care among people in the world.

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

Sustainable development demands that we switch to renewable resources (renewable resources include, for example, wind power, solar panels, ethanol, cardboard packaging.)

Sustainable development demands that people understand how the economy functions.

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

For sustainable development, people need to be educated in how to protect themselves against natural disasters.
Part 2, grade 6

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

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

20. I think that everyone ought to be educated in how to live sustainably.

21. I think that we who are alive now should make sure that people in the future will be as well off as we are today.

22. I think that companies have a responsibility to reduce the use of packaging and disposable articles.

23. Using more of nature’s resources than we need does not threaten people's health nor their chances for wellbeing in the future.

24. I think that we need stricter laws and regulations to protect the environment.

25. I think it is important to reduce poverty.

26. I think that companies in rich countries should give employees in poor nations the same conditions as in rich countries.

27. I think that it is important to do something about problems which have to do with climate change.

28. I think that the government should provide financial aid to encourage more people to make the shift to green cars.

29. I think that the government should make all its decisions on the basis of sustainable development.
I think it is important that people in society vote in elections and express their views on important issues.

I think that people who pollute land, air or water should pay for the damage they cause to the environment.

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, grade 6

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.

Where possible, I choose to cycle or walk when I’m going somewhere, instead of travelling by motor vehicle.

I never waste water.

I recycle as much as I can.

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.

I often do things which are not good for my health.

I do things which help poor people.
<p>| | | | | | |</p>
<table>
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<tbody>
<tr>
<td>40</td>
<td>I pick up rubbish when I see it out in the countryside or in public places.</td>
<td><img src="check" alt="Strongly disagree" /></td>
<td><img src="check" alt="Strongly disagree" /></td>
<td><img src="check" alt="Strongly disagree" /></td>
<td><img src="check" alt="Strongly disagree" /></td>
</tr>
<tr>
<td>41</td>
<td>I don't think about whether things I do might harm the natural environment.</td>
<td><img src="check" alt="Strongly disagree" /></td>
<td><img src="check" alt="Strongly disagree" /></td>
<td><img src="check" alt="Strongly disagree" /></td>
<td><img src="check" alt="Strongly disagree" /></td>
</tr>
<tr>
<td>42</td>
<td>I often purchase second-hand goods over the internet or in a shop.</td>
<td><img src="check" alt="Strongly disagree" /></td>
<td><img src="check" alt="Strongly disagree" /></td>
<td><img src="check" alt="Strongly disagree" /></td>
<td><img src="check" alt="Strongly disagree" /></td>
</tr>
<tr>
<td>43</td>
<td>I always separate food waste before putting out the rubbish when I have the chance.</td>
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<td>I avoid buying goods from companies with a bad reputation for looking after their employees and the environment.</td>
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<td>I do things to reduce waste (e.g., throwing away less food and not wasting paper).</td>
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<td>I work on committees (e.g. the student council, my class committee, the cafeteria committee) at my school.</td>
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<td>I treat everyone with the same respect, even if they have another cultural background than mine.</td>
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<td>I support an aid organization or environmental group.</td>
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<td>I watch news programs or read newspaper articles to do with the economy.</td>
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<td>I show the same respect to men and women, boys and girls.</td>
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Part 1, grade 9 and 12

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.
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<th></th>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Strongly agree</th>
<th>Don’t know</th>
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<tr>
<td>10</td>
<td>To achieve sustainable development, all the people in the world must have access to good education.</td>
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<td>11</td>
<td>Sustainable development requires that companies act responsibly towards their employees, customers and suppliers.</td>
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<td>Preserving the variety of living creatures is necessary for sustainable development (preserving biological diversity).</td>
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<td>Having respect for other cultures is necessary for sustainable development.</td>
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<td>14</td>
<td>Sustainable development requires fair distribution of goods and services among people in the world.</td>
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<td>15</td>
<td>Wiping out poverty in the world is necessary for sustainable development.</td>
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<td>16</td>
<td>Sustainable development requires a shift to renewable natural resources.</td>
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<td>17</td>
<td>Sustainable development demands that people understand how the economy functions.</td>
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<td>18</td>
<td>For sustainable development, big infectious diseases such as HIV/AIDS and malaria must be stopped.</td>
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<td>19</td>
<td>For sustainable development, people need to be educated in how to protect themselves against natural disasters.</td>
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</table>
Part 2, grade 9 and 12

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.

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Strongly agree</th>
<th>Don’t know</th>
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<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>
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<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>
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<td>22</td>
<td>I think that companies have a responsibility to reduce the use of packaging and disposable articles.</td>
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<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>
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<td>24</td>
<td>I think that we need stricter laws and regulations to protect the environment.</td>
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<td>25</td>
<td>I think it is important to reduce poverty.</td>
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<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>
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<td>27</td>
<td>I think that it is important to take measures against problems which have to do with climate change.</td>
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<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>
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</table>
29  I think that the government should make all its decisions on the basis of sustainable development.

30  I think that it is important that people in society exercise their democratic rights and become involved in important issues.

31  I think that people who pollute land, air or water should pay for the damage they cause to the environment.

32  I think that women and men throughout the world must be given the same opportunities for education and employment.

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

**Del 3, grade 9 and 12**

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, Don’t know. If you don’t know how to respond to a question, then mark the alternative, Don’t know.

34  Where possible, I choose to cycle or walk when I’m going somewhere, instead of travelling by motor vehicle.

35  I never waste water.

36  I recycle as much as I can.

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.
38 I often make lifestyle choices which are not good for my health.

39 I do things which help poor people.

40 I pick up rubbish when I see it out in the countryside or in public places.

41 I don’t think about how my actions may damage the natural environment.

42 I often purchase second-hand goods over the internet or in a shop.

43 I always separate food waste before putting out the rubbish when I have the chance.

44 I avoid buying goods from companies with a bad reputation for looking after their employees and the environment.

45 I have changed my personal lifestyle in order to reduce waste (e.g., throwing away less food or not wasting materials).

46 I work on committees (e.g. the student council, my class committee, the cafeteria committee) at my school.

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

48 I support an aid organization or environmental group.

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

50 I show the same respect to men and women, boys and girls.
Appendix 2
Categorization of knowingness, attitude and behavior items into the environmental, social and economic dimensions according to UNESCO (2006) definition of SD dimensions in an educational perspective.

<table>
<thead>
<tr>
<th>Item number</th>
<th>Environmental</th>
<th>Social</th>
<th>Economic</th>
<th>Knowingness</th>
<th>Attitude</th>
<th>Behavior</th>
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Young People’s
‘Sustainability Consciousness’

The UN Decade of Education for Sustainable Development is drawing to an end and it is important to investigate the effects of implementing education for sustainable development (ESD) nationally. This thesis contributes new knowledge on the implementation of ESD in the Swedish school system. The concept of sustainability consciousness (SC) is introduced and operationalized to measure the educational effects of ESD by taking a broad and inclusive approach in two studies with a total of 2,413 students in 6th, 9th, and 12th grades. The first study investigated differences in students’ SC by comparing students in schools with an explicit ESD approach and control schools without an explicit approach. The second study investigated if there is a dip in 9th graders’ SC in comparison with younger and older age groups. Results reveal that the implementation of ESD in the Swedish schools does not seem to have been particularly successful as there are only small effects of an explicit ESD approach. A dip in adolescent 9th graders’ SC is also confirmed. Different age groups respond to the prevailing traditional sustainability teaching in different ways, which suggest that ESD in schools need to be adapted to different levels.