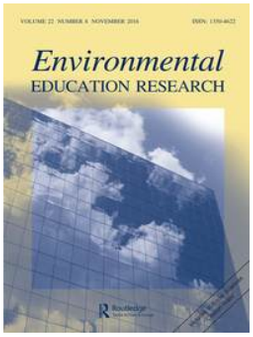

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Separated and integrated perspectives on environmental, economic, and social dimensions – an investigation of student views on sustainable development

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The sustainable development (SD) concept is based on the idea that economic and social development should be linked to the environment. However, controversies about various associated issues often arise due to the differences in protagonists' viewpoints, depending partly on whether they focus mainly on environmental, economic, or social dimensions and partly on ideological stances related (for instance) to the optimal ways of promoting economic growth and social justice. This study investigates views of 638 Swedish upper secondary students who responded to a questionnaire probing their views of SD from two perspectives. In the first, the dimensions were separately introduced, so the respondents only had to consider one dimension at a time. In the second, the dimensions were introduced in an integrated fashion, so the respondents had to consider effects related to all three dimensions. The results strongly indicate that the students' views and priorities concerning the dimensions depend on both the perspective and the context. Implications for teaching and learning are discussed.

Keywords: sustainable development; education for sustainable development; dimensions of sustainable development; holistic understanding; students' conceptions; decision-making

Introduction

Sustainable development (SD) is a complex concept, associated with diverse interpretations. Whatever the interpretation, there is, nonetheless, an implicit consensus embedded in the concept of SD. Still, there are frequently disagreements in real-life situations about specific environmental, economic, or social goals and frequently conflicts between environmental, economic, and social objectives. This is hardly surprising as sub-concepts such as 'environment', 'society', and 'economic development' are highly ideologically loaded. The complexity of SD and the diverging perspectives between people or groups in society can be resources in the process of learning (see e.g., Lundegård and Wickman 2009; Wals 2011). For example, the multidimensionality of the environmental, economic, and social aspects of SD can provide an opportunity to develop cross-disciplinary thinking. In everyday life, conflicts often arise due to differences in interpretation, value-judgment, and (hence) the view of the optimal solutions to environmental and developmental problems. Diverging opinions between people shed light on reasons for the difficulties to

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achieve SD. An important objective of *education for sustainable development* (ESD) is to highlight these differences in perspectives between different people and groups in society. Mogensen and Schnack (2010, 68) discuss the role of ESD in connection to an action competence approach as 'developing the students' ability, motivation, and desire to play an active role in finding democratic solutions to problems and issues connected to SD'. Highlighting different perspectives in the classroom can provide opportunities for students to learn how to deal with diverging opinions relating to the uncertainty of many SD issues in a democratic way. This study aimed to elucidate the divergence in student perspectives of the three SD dimensions, which can provide a starting point in ESD teaching and learning and be a way to support the development of action competence among students.

When working with SD issues in education, a holistic approach taking all three SD dimensions into account is often emphasized as important (e.g., Summers and Childs 2007; Warburton 2003). However, if the environmental, economic, and social dimensions of SD are dealt with separately in education, tensions between them might not be apparent to the students. They may then view SD from a visionary perspective, regarding environmental protection, economic prosperity, and social justice as complementary and harmonious goals. However, in many situations decisions have conflicting implications in the three dimensions, so one or two may have to be prioritized at the expense of the other(s). If such situations are addressed in education, other views may emerge that strengthen student understanding of the complexities involved. From an individual perspective, it is for instance not always easy to find products in the store that are most suitable for one's economy as well as for the environment and the workers producing the product. A number of studies have focused on conceptions of SD and/or its underlying dimensions (e.g., Borg et al. 2012, 2014; Manni, Sporre, and Ottander 2013; Öhman and Öhman 2012; Summers and Childs 2007; Torbjörnsson 2011; Walshe 2008, 2013). The studies all address the holistic perspective of SD from different angles. Öhman and Öhman (2012) specifically address the importance of including both a harmony- and a conflict-based perspective on SD and its underlying dimensions in education. This article contributes to this body of work by quantitatively investigating student views on the SD dimensions when these are introduced from both separated and integrated perspectives. The students are invited to consider aspects of the SD dimensions when these are introduced separated from one another but also when these are introduced in relation to one another. Comparisons are then made between these two perspectives.

Sustainable development

SD is a contentious concept. It has been promoted as a valuable concept for capturing holistic perspectives of the environment and human development, thus acknowledging that they are inextricably interconnected. However, it has also been criticized on several grounds. Firstly, it unifies two often conflicting principles: continuous economic growth and sustainable utilization of natural resources (Jabareen 2008). Secondly, it embraces many processes and sub-concepts that are the concern of everyone. SD could then easily become the responsibility of no-one since no-one would feel personally responsible for its implementation. Against this background, education has an important role in developing basic knowledge of SD and making SD perspectives visible in everyday life and public debate (Sandell, Öhman, and

Östman 2005). Thirdly, the implicit conceptual consensus might cause problems as numerous interest groups may cite SD as a common goal in their rhetoric, despite supporting radically opposing policies (see Jickling and Wals 2008, for a detailed discussion of this issue). Rauch (2002) argues that although the idea of SD is consensus-based, the actual meaning of SD needs to be established in specific situations, and the meanings applied by different groups must be distinguished. Nevertheless, due to its holistic nature the concept provides a valuable tool for discussions about possible ways to progress toward a more sustainable future, despite (and partly *because of*) the variations in views of goals and ways to achieve them.

Despite the diversity in interpretations of the SD concept there are some generally accepted core elements. A common way of structuring SD is to divide it into environmental, economic, and social dimensions (Giddings, Hopwood, and O'Brien 2002; Gough 2002; Herremans and Reid 2002; Rauch 2002; Summers and Childs 2007). The terminology might differ between different contexts. In some definitions, the environmental dimension is referred to as the ecological dimension. In this study, we use the term environment to include the ecological aspects of SD. In a similar way, we consider cultural aspects to be part of the social dimension.

Organizations such as UNESCO have raised the importance of education for SD. In the document *Framework for the UNDESD* (United Nations Decade of Education for Sustainable Development) *International Implementation Scheme* (2006), a number of sub-themes to the three dimensions of SD are outlined. Those underlying the social dimension are *human rights*, *peace and human security*, *gender equality*, *cultural diversity and intercultural understanding*, *health*, *HIV/AIDS and governance.* Sub-themes of the environmental dimension are *natural resources* (*water*, *energy*, *agriculture and biodiversity*), *climate change*, *rural development*, *sustainable urbanization*, *disaster prevention and mitigation.* Underlying the economic dimension are *poverty reduction, corporate responsibility and accountability*, *and market economy* (UNESCO 2006, 18–21). The definition of ESD in Swedish curricula is closely connected to these definitions (Borg et al. 2014). Therefore, these sub-themes have formed the basis of the questionnaire used in this study. In the questionnaire, each item relates to one of the sub-themes as defined by UNESCO (2006).

SD in education

A holistic approach in ESD encourages students to consider aspects related to all three dimensions and aims to enhance their understanding of environmental, societal, and economic consequences of actions. The holistic perspective is closely connected to a pluralistic approach to teaching that highlights different standpoints and opinions concerning SD problems and their solutions. The perspectives and values of all people are treated as equally relevant when considering optimal ways to tackle environmental and developmental problems (Rudsberg and Öhman 2010). Using a pluralistic approach to teaching is a way to deal with the holistic perspective, thus allowing for different perspectives and priorities to be discussed. However, there are different ways to deal with the holistic perspective. To integrate the SD dimensions can nurture students' understanding of SD as a complex concept with complex solutions in different situations. Treating each dimension separately might also develop students' understanding of SD as a complex and multidimensional concept. However, there is a risk that fewer opportunities are provided to experience

roots to the difficulties to find ways forward, arising from different perspectives, priorities, and interests among different people and groups of people. Several studies have indicated that tensions between the dimensions of SD can be stimulants rather than barriers in the learning process (Gough 2002; Herremans and Reid 2002; Jickling and Wals 2008; Rauch 2002; Sund 2015; Warburton 2003).

Ways to approach the relationships between environmental, economic, and social dimensions of SD in education have been widely discussed. The current debate on SD highlights two opposing perspectives. One is a 'visionary' perspective of SD, with congruent or harmonious relationships between the dimensions. The other focuses on the conflicts between the dimensions and associated controversies, thus addressing the dilemmas embedded in the comprehensive concept of SD. However, students' understanding of the nature of SD can be fostered by explicitly using both a congruence perspective and a conflict perspective regarding the three dimensions of SD (see e.g., Herremans and Reid 2002; Öhman and Öhman 2012). Öhman and Öhman (2012) further argue that the concept of SD invites to harmonious interpretations, which has been confirmed empirically also in other studies (Summers and Childs 2007). The separated and integrated perspectives on SD used in this study relate to this discussion on how to deal with the holistic perspective on SD in education.

A separated or integrated perspective on dimensions of SD

Applying a holistic perspective on SD from a *separated* point of view implies that the three dimensions are not being considered in relation to each other. Rather, the separated perspective means that some aspect relating to one of the dimensions is considered in isolation from other aspects. Thus, it means to deal with environmental, social, and economic issues separately and sequentially. The consequence is that the contradictions embedded in the concept of SD are not being exposed and thus not taken into account although all of the dimensions are dealt with. On the other hand, applying the holistic perspective on SD from an *integrated* point of view implies to expose and highlight some of the contradictions inherited in the SD concept. An issue is viewed from more than one perspective and considered in relation to other circumstances. When SD is investigated from this perspective, it implies to consider the issue from different standpoints and to decide what is more and less important and sometimes even to give priority to one aspect in favor of others. A focus of this study is to elucidate in what way separated and integrated perspectives on the three SD dimensions influences students' views. Interesting but underexplored issues in this context are the degrees to which students hold integrated views of the environmental, economic, and social dimensions of SD and if their decisions are influenced by environmental, economic, and social considerations. This article addresses this lacuna by investigating the views and decision-making of Swedish upper secondary students from these perspectives.

Previous research on conceptions of SD

Many quantitative studies can be related to a separated perspective on the SD dimensions since the items in the survey instruments often probe respondent's attitudes to a single dimension, rather than multiple dimensions or their relative importance. A few Swedish studies investigated perceptions of SD and its

underlying dimensions in this way. Borg et al. (2012, 2014) found that upper secondary teachers did not generally have a holistic understanding of the concept of SD. Their results also indicated that the teachers generally had greatest uncertainties about economic aspects and greatest awareness of ecological aspects. The teachers were least aware of the social dimension (nearly 50% of the sample was unsure whether it was an essential element of SD). Torbjörnsson (2011) surveyed upper secondary students' attitudes to solidarity, equality, and the preservation (or utilization) of nature, respectively representing the social, economic, and ecological dimensions. A clear positive correlation was found between aspects of the ecological and social dimensions. The correlation between biocentric values and attitude toward equality was slightly positive, but views of solidarity and equality (aspects of social and economic dimensions) were the most strongly correlated investigated attitudes. The study by Torbjörnsson demonstrates the close interrelationships between the three dimensions of SD according to a separated perspective.

In an earlier study (Berglund, Gericke, and Chang Rundgren 2014) we also focused on SD and its dimensions. More specifically we investigated Swedish students 'sustainability consciousness'. Sustainability here refers to environmental, economic, and social dimensions of SD, while consciousness is a composite notion merging knowingness, attitudes, and behaviors. The focus of the study was to investigate effects of the ESD implementation in Sweden at a student level by comparing students from ESD certified schools to students from schools without explicit ESD certificates. We found only small positive effects on students' sustainability consciousness by the ESD certification system, mainly on their views toward economy. As the sustainability consciousness concept is addressed also in the present study, the concept is delineated more in detail further on in the study (see Methods section).

Few studies have addressed integrated perspectives on the three SD dimensions. However, Manni, Sporre, and Ottander (2013) investigated 10- to 12-year-old students' ($n = 209$) understandings of SD and associated values. The participants were first asked about aspects of one dimension at a time and subsequently about the relationships between them. Thus, the results provide indications of views from both separated and integrated perspectives of the dimensions. Main findings were that the students had difficulties in seeing relationships between the three dimensions, implying a lack of holistic understanding. The results also showed that the students related economic aspects to other aspects of SD more than ecological aspects and generally did not connect social aspects to either economic or ecological issues. The role of conflicts in the SD dialog was investigated by Lundegård and Wickman in a study from 2007. They found that conflicts between different human interests were central to ESD, since value judgments concerning human conflict of interest constituted the core of the dialog. In another study, Lundegård and Wickman (2009) concluded that different contexts situated different identities to emerge among the students.

The need for research concerning the diversity of perspectives on the three SD dimensions has been emphasized by several authors. Wals (2011) raises the role of conflict, dissonance, and diversity in the social learning process. Divergences in knowledge systems, perspectives, and values can initiate learning processes, although there seem to be barriers, e.g., if people are either too like-minded or there is too great dissonance within a group (Wals 2011). Öhman and Öhman (2012) emphasize the need to empirically investigate how teachers and students relate to the relationships between the SD dimensions in their educational practice. In conclusion, the importance of an integrated perspective in ESD, highlighting tensions

between the dimensions, is emphasized in previous literature. However, few quantitative studies have addressed views of the SD dimensions from an integrated perspective, and more research on this topic is needed. In this study, we use two different questionnaire instruments based on two different approaches to SD and its underpinning dimensions. In the first, students respond to items relating to one SD dimension at a time, and consequently, it is possible to indicate a high level of agreement in all three SD dimensions. We refer to this section as a separated perspective on SD and its underpinning dimensions. In the second approach, the three SD dimensions are introduced in an integrated manner, and the respondents need to select and deselect among reasons relating to the three dimensions, thus prioritizing one at the expense of the other two. We refer to this section as an integrated perspective on SD and its underpinning dimensions. The present study is based on empirical data acquired by surveying the views of students in 15 upper secondary schools across Sweden.

Aim and research questions

This study investigates Swedish upper secondary students' views on the environmental, economic, and social dimensions of SD from both separated and integrated perspectives and the interrelationships of these perspectives.

The specific research questions addressed are the following:

- In separated perspectives, to what extent are the environmental, economic, and social dimensions of SD adopted in students' sustainability consciousness?
- In an integrated perspective, how do students rank the three SD dimension's importance in various real-life contexts?
- What are the differences and similarities of students' views from separated and integrated perspectives?

Method

This section of the study describes the development of the survey instrument, the selection of participants for the study and the collection and analysis of data.

Instrument

The separated perspective

The empirical information analyzed in this study was acquired using a survey instrument developed to investigate students' perspectives on SD and the relationships between SD dimensions. A review of the environmental education (EE) and ESD literature indicated that few survey instruments have been developed that focus on the multidimensionality of SD. The few instruments we found surveyed the SD concept from a teacher perspective (Borg et al. 2012, 2014) and from the perspective of younger students, 10–12 years of age (Manni, Sporre, and Ottander 2013).

The instruments used in the cited studies were not suitable for fully addressing the research questions posed in this study. However, a group of Canadian researchers recently developed an instrument to explore knowledge, attitudes, and behaviors connected to SD and its underlying dimensions, which they used to investigate

tenth-grade students' perspectives (Michalos et al. 2011, 2012). We further developed the instrument to adapt it to a Swedish context and categorized the items into the UNESCO descriptions of SD dimensions (see literature review section). Each item was related to one of the sub-themes underlying a specific dimension as outlined by UNESCO (2006, 18–21). In the transformation process, some items were deleted, some new items were added and many were revised. This resulted in a survey instrument rooted in a separated and holistic approach based on knowingness (K), attitudes (A), and self-reported behaviors (B) connected to the environmental, economic, and social dimensions of SD. This instrument combines multidimensional SD contents and cognitive and affective domains of learning and was developed to investigate students' sustainability consciousness. Littledyke (2008) addressed the importance of integrating cognitive and affective aspects to enhance pupils' interest and engagement in education. Consequently, cognitive factors are not alone in influencing conceptions and attitudes related to environmental, economic, and social issues of everyday life; factors including affective components are also important to empower students' decision-making (Tytler 2014). *Knowingness* reflects awareness about components of SD. The term knowingness is used because it is less associated to formal meanings as the more familiar term *knowledge*, which can exist on many levels (Krathwohl 2002). An *attitude* is often defined as an enduring positive or negative feeling about some object, person or issue (Kollmuss and Agyeman 2002). Attitudes are therefore associated with both cognitive and affective components (Eagly and Chaiken 1993) and included in the concept. Moreover, those who evaluate an attitude object favorably tend to engage in behaviors that support it (Eagly and Chaiken 1993); however, it has been shown that people's behaviors are complex and that many factors interact (Kollmuss and Agyeman 2002). Behavior was also integrated in the concept of sustainability consciousness. In this way, the concept of sustainability consciousness aims at investigating students' broader consciousness of SD by embracing knowingness, attitudes, and behaviors in relation to the three SD dimensions as outlined by UNESCO (2006), see literature review section.

In this questionnaire, the respondents mark their level of agreement or disagreement with a statement in a five-point Likert scale ranging from (1) *Strongly disagree* to (5) *Strongly agree*. A '*Don't know*' option is available for each item. The number of items connected to each dimension is shown in Table 1. Since each item in this section is connected to only one dimension of SD, it can be regarded as an instrument for evaluating views of the dimensions from a separated perspective. For a more detailed description of the instrument's development, see Berglund, Gericke, and Chang Rundgren (2014). The items are accessible via the Internet.[1]

The integrated perspective

In order to capture the tensions between dimensions of SD, a second instrument was added to the questionnaire designed to gauge respondent's priorities in the following real-life scenarios: (a) helping with the weekly grocery shopping in a supermarket, (b) global warming, and (c) dealing with waste products. We call them real-life scenarios, because they represent situations related to SD that students experience either in school or in their daily private life. Thus, the contexts are familiar to Swedish students, and the reasoning related to each dimension (see below) is based on arguments that they recognize. Swedish upper secondary students often reportedly

choose the topics of global warming and consumption when writing discursive texts about socio-scientific issues, and these issues are frequently debated both in schools and the media (Christenson, Chang Rundgren, and Höglund 2012), and were therefore regarded as appropriate scenarios. The scenarios are handled as a joint section in our analysis; however, it is important to acknowledge that they are substantially different from each other concerning the situation presented and the arguments related to each situation.

In each scenario in our instrument, the students were given six reasons for selecting products to buy (Scenario 1) or taking SD-related action (Scenarios 2 and 3), two related to each dimension of SD. The students were first asked to mark *the most important reason* and then *the three most important reasons* (see Table 2). The items in this section were developed in collaboration with two research colleagues; one who specialized in the field of argumentation. The items in this section are designed to assess respondent's views of the dimensions from an integrated perspective, since they have to consider and weigh arguments related to all three dimensions simultaneously when making a decision. Thus, the scores for choices linked to each of the dimensions should reflect their perceived relative importance.

The instrument was tested in a pilot study, in which two groups of 45 students in total were asked to mark items that they had any sort of difficulty with. A focus-group discussion was then held to improve the wording of problematic items, resulting in concretization of some items and linguistic simplification to make some clearer.

Sample and data collection

The questionnaire was distributed to 12th grade students (18–19 years old) in schools, scattered across Sweden. Two upper secondary programs were selected: the science and social science programs, both of which are popular in Sweden and preparatory for tertiary studies. In total, responses from 638 students from 15 schools were included in the study.

This study is part of a larger investigation of ESD implementation in the Swedish school system. Therefore, the sample includes one group of students attending schools with a focus on ESD (62.3%) and another group attending schools without explicit ESD focus (37.7%). In this study we focus on comparisons between groups based on students' decision-making, thus ignoring differences between school types (ESD-oriented and regular schools). Differences between these groups have been addressed elsewhere (Berglund, Gericke, and Chang Rundgren, 2014). In the sample, 54.4 and 42.3% of the students attended science- and social science-oriented programs, respectively. 54.9% of the students were female and 44.2% male. The overall response rate was 65.7%. Very few students chose not to participate when present in the classroom. The students who did not participate mostly had other reasons for their absence, e.g., taking an exam or being ill.

The students completed an online version[2] of the final questionnaire (including both instruments) at their respective schools, but a paper version was also available in case computers were not available in the classroom. In all except one school, one of the authors or a colleague was present during the process to ensure that the participants were given the same instructions to ensure the study's reliability.

Analysis

The data acquired from the responses were downloaded into IBM SPSS Statistics version 20 for further analysis. The results presented in this study are based on factor analysis, correlation and reliability tests (Pearson r and Cronbach's Alpha (CA)), mean values, paired-samples t test, relative frequencies, multivariate analysis of variance/analysis of variance (MANOVA/ANOVA), and estimates of effect sizes (Cohen's d). MANOVA/ANOVA are statistical tests that can be used to test if mean values significantly differ between groups (Field 2013, 870). Three outcome variables need to be tested: the environmental, economic, and social dimensions of SD, here denoted as EnvKAB, EcoKAB, and SocKAB, where KAB is an abbreviation of knowingness, attitudes, and behavior. MANOVA was used to investigate relationships between responses to the scenario items, mirroring the integrated perspective, and responses to the KAB items, mirroring the separated perspective of the SD dimensions. Differences between means were deemed statistically significant if $p < 0.05$. However, if comparisons between groups are based on large numbers of participants, even very small differences can be statistically significant. A valuable complement to the p value, particularly in such cases, is the effect size, which provides an objective measure of the magnitude of an observed effect and is here indicated by Cohen's d, expressing the difference between two means in standard deviation units (Field 2013, 872). The size of an assessed effect is commonly defined as small if $d = 0.2$, medium if $d = 0.5$, and large if $d = 0.8$ (Field 2013, 80).

Results

This section presents results from validity and reliability analysis, results concerning student views from separated perspectives based on the knowingness, attitudes, and behavior sections of the questionnaire and results from integrated perspectives based on the scenario section of the questionnaire. Finally, combined results from the separated and integrated analyses are presented.

Validity and reliability analysis

Construct validity concerns if and how a theoretical construct correlates with the results provided by an instrument that proposes to measure the construct (Fischer, Boone, and Neumann, 2014). The construct validity of the questionnaire was checked by exploratory factor analysis based on the students' responses. Principal axis factoring as well as correlation tests between the exploratory factors and the corresponding SD dimension were used in the analysis. The factors that emerged from the factor analysis correlated highly with the corresponding SD dimension with Pearson correlations between $0.635 \geq |r| \leq 0.944$, $p < 0.001$. The correlations are high in general, thus indicating that the responses confirm the theoretical framework that the instrument is based on. However, and within the attitudes-section in particular, the economic and social dimensions correlated highly with more than one factor and the economic items were not distributed in one of the factors. This indicates the interconnectivity of the economic and social dimensions, as discussed in the literature review section. In general, patterns of the economic dimension were less clear, which would be expected based on findings from Manni, Sporre, and Ottander (2013) who found that the economy more often were related to the other dimensions

by students. Additionally, Borg et al. (2014) found that teachers are most uncertain about the role of economy in relation to SD. Based on their findings, it would have been surprising if our results had pointed in another direction. Recalling the 15 sub-themes outlined in previous sections that constituted the theoretical framework for the items in our instrument (UNESCO 2006, 18–21), it is clear that from a theoretical perspective also, the economic dimension is cross-border in nature, particularly in regard to the social dimension. Detailed results from the factor analysis can be found in Berglund (2014).

Table 1 presents results from reliability analysis. Reliability results are reported for all items (K, A, and B, see Note 1) in the environmental, economic, and social dimensions of SD (EnvKAB, EcoKAB, SocKAB). The CA indicates the ability of the instrument to generate the same results under the same conditions and thus the consistency of the underlying constructs over time (Field 2013, 706). There is no clear threshold for an acceptable CA value, since it depends on the nature of the focal construct. High to perfect reliability is indicated by CA values between 0.7 and 1.0 (Fischer, Boone, and Neumann 2014). However, if the diversity of the construct is large, values are likely to be lower than 0.7 (Field 2013, 709). The CA value also depends on the number of items reflecting the construct: increasing the number of items for a construct generally increases its CA value. Accordingly, the CA values obtained here correlate with the numbers of items for each dimension.

In conclusion, the reliability of the instrument is within an acceptable range, considering the vast diversity of SD issues related to the sub-themes connected to each SD dimension.

Table 1. CA from the reliability tests for the environmental, economic, and social dimensions of SD.

	Cronbach's alpha	Number of items	Knowingness	Attitudes	Behaviors
Environment	0.783	17	6	4	7
Economy	0.684	13	5	4	4
Society	0.805	20	8	6	6

The separated perspective

Mean value calculations were applied to examine the extent to which the three dimensions of SD were recognized in the students' sustainability consciousness, using all of the students' responses. Each item in the KAB sections relates to one SD dimension; thus, these results reflect a separated perspective on the SD dimensions. However, there is a possibility that some respondents have an integrated perspective in mind when marking an answer, although it is not explicit in the question. For instance, if we consider the statement 'I think that companies in rich countries should give employees in poor nations the same conditions as in rich countries' (Item No. 26, see Note 1), our belief is that a proportion of people would agree with this statement, at least to some extent. However, if those people are asked to consider the statement in relation to, for example, higher prices for the products they buy, it is most likely that the level of agreement does not stay exactly the same, but drops a lot or a little. It is easier to agree with something good, if one does not have to reject something else that one values. In the latter case, a conflict arises between aspects of the SD dimensions. We define 'conflict of interest' in this situation as

when people are asked to choose between two things both regarded as desirable (here represented by arguments from the different dimensions of SD).

The overall pattern (Figure 1) indicated that the students recognize social issues most strongly, economic issues least strongly and environmental issues intermediately. Results from paired-samples *t* test verified that the differences in mean values between the three dimensions were statistically significant.

The mean value for the social dimension approaches the top of the scale (which ranges from 1 to 5), indicating the possible presence of ceiling effects, which reduce variance. Economic issues connected to SD are recognized by the students, but to a lower degree than social and environmental issues. As indicated by the CA for responses to items linked to the separate dimensions (Table 1), the students' views of the social aspects seem to be most homogeneous and their views of economic aspects most diverse.

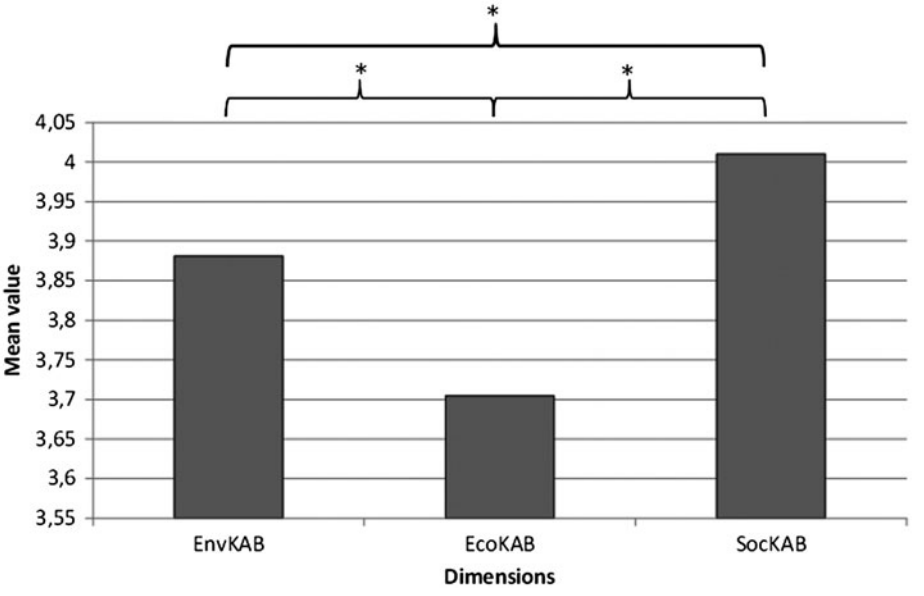

Figure 1. Mean values of the environmental, economic, and social dimensions of the 638 students' sustainability consciousness (knowingness, attitudes, and behaviors: KAB, see text for explanation), separately evaluated. *The difference is significant at the $p < 0.01$ level. Effect sizes: small to medium (Cohen's *d*: 0.25–0.61).

The integrated perspective

In the last section of the online questionnaire, students were given three scenarios and asked to indicate *the most important reason* and subsequently *the three most important reasons* for selecting products to buy or taking SD-related action. In the paper version, students were asked to choose three of the six options for each scenario (ranking them 1, 2, and 3), leaving boxes for the other three empty. The online and paper versions were slightly different since the software (see Note 2) did not allow ranking where three of the options were to be left empty. In order to make the paper version as short as possible, we used ranking since it provided the same information as from the online version. The results in this study are based on the

students' choices of the most important reason for each scenario. The scenarios and associated reasoning are designed to present the three dimensions holistically and are based on an integrated perspective. The results from the scenario items will therefore indicate their perceived relative importance. The three scenarios were:

Scenario 1: Imagine that you are standing in a grocery store helping with the weekly grocery shopping.

Scenario 2: One of our big problems today is global warming, which our way of life contributes to. Global warming leads to climate change, which has various impacts around the world.

Scenario 3: Today we are trying to organize society so that we can take better care of our waste.

The questions and optional reasons for selecting products (Scenario 1), taking action to ameliorate global warming (Scenario 2), and disposing of waste sustainably (Scenario 3) are shown in Table 2. The proportions of respondents who ranked each reason most highly are also shown.

Table 2. Relative frequencies of responses to the scenario items.

Reason no.	Q1: What reasons do you think are important to consider when you are shopping?	Q2: What do you think is the most important reason for braking global warming?	Q3: What do you think is the most important reason for taking care of our waste?
1	That the product is locally produced, to reduce transport emissions. *(Env) 15.2%*	People are exposed to great suffering from, for example, floods or drought. *(Soc) 26.2%*	Because it is often cheaper for us to recycle resources instead of extracting new ones, e.g., for aluminum cans. *(Eco) 8.9%*
2	That the product is produced under good working conditions for the workers, e.g., Fairtrade. *(Soc) 10.4%*	Global warming means high reconstruction costs in connection with, for instance, storms, and floods. *(Eco) 2.6%*	Because we need to conserve natural resources. *(Env) 54.2%*
3	That the product is cheap so that my money stretches to other things. *(Eco) 23.5%*	Global warming causes certain species to become extinct and ecosystems to be destroyed. *(Env) 33.5%*	So that poorer nations will not have to take care of our environmentally dangerous waste. *(Soc) 6.1%*
4	That the product has an eco-label, e.g., KRAV or Ekologisk. *(Env) 17.1%*	People will be forced to flee their homes and become climate refugees. *(Soc) 12.1%*	Because it is more expensive for us not to recycle, e.g., higher costs of garbage collection. *(Eco) 2.2%*
5	That the product is produced locally, creating jobs in Sweden. *(Soc) 3.2%*	Poorer nations are hit hard economically by emissions from richer nations. *(Eco) 14.2%*	So that dangerous substances are not released into our environment. *(Env) 20.1%*
6	That the product is of high quality and that the manufacturer is reliable. *(Eco) 30.6%*	Ecosystems which are in danger of disappearing must be preserved, e.g., the Arctic and Swedish alpine region. *(Env) 11.5%*	To avoid leaving our waste problem to future generations. *(Soc) 8.5%*

Notes: The dimension that each argument is related to is indicated within parentheses. Numbers indicate percentages of students choosing an argument as the most important one.

Figure 2 shows the compiled results of the three scenarios.

Intriguingly, the students' responses to the scenario items indicate different rankings from those obtained from separate evaluations of the dimensions of their sustainability consciousness (Figure 1). Only 13.6% of the students chose social reasons as the most important for selecting products to buy (Scenario 1): 32.3% chose environmental reasons and 54.1% economic reasons (which were thus clearly perceived to be the most important in this context). In contrast, in responses to Scenario 2, both environmental and social reasons were prioritized (response frequencies: 45 and 38.3%, respectively), while economic reasons were only selected by 16.8% of the students. In further contrast, environmental reasons were selected by most (74.3%) of the students when responding to Scenario 3 and social or economic reasons by just 14.6 and 11.1%, respectively. Thus, they seem to prioritize different dimensions in different scenarios, and the pattern obtained from the scenario responses differs from the pattern obtained from separate evaluation of the dimensions (Figure 1), which indicated that the students were most conscious of the social dimension.

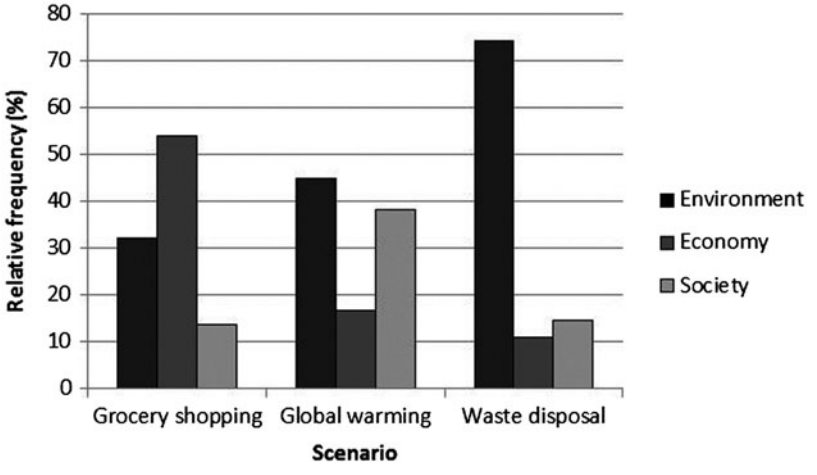

Figure 2. Relative frequencies of student priorities for the three scenarios.

Table 3 shows percentages of students who chose environmental, economic, and social reasons as most important 0, 1, 2, and 3 times in their responses to the three scenarios. Environmental aspects were clearly regarded as most important generally, as the environmental reasons were selected as most important for two of the three scenarios by 36.6% of the students and by 13.9% of the students for all three of the scenarios. Thus, slightly more than 50% chose an environmental reason as most important at least twice. In contrast, only 12% of the students marked social reasons as first choices for two or three of the scenarios and only 16.6% chose economic reasons as most important for two or three scenarios.

Comparing the two perspectives

To examine the students' decisions from an integrated perspective more thoroughly, we examined them (by MANOVA/ANOVA) in relation to the environmental, economic, and social dimensions of their sustainability consciousness representing the

Table 3. Percentages of students who chose environmental, economic, and social reasons as most important 0, 1, 2, and 3 times in their responses to the three scenarios.

No. of first choices	Environment	Economy	Society
0	12.6	36.7	46.6
1	36.9	46.6	41.4
2	36.6	14.7	11.0
3	13.9	1.9	1.0

separated perspective (based on the environmental, economic, and social KAB items in the first part of the questionnaire, see Note 1). This was done by defining three groups of students: (1) the students who chose *environmental reasons as most important* at least twice for the three scenarios, (2) the students who chose *economic reasons as most important* at least twice for the three scenarios, and (3) the students who chose *social reasons as most important* at least twice for the three scenarios. Then we analyzed the sustainability consciousness of the students in each group. Thus, this analysis combined the separated and integrated perspectives. The results are presented in Figures 3–5, showing the consciousness in the three dimensions for each group, based on their priorities in the scenario section.

As shown in Figure 3, students who chose environmental reasons as the most important at least twice in responses to the three scenarios (311 in total) had higher mean values, i.e., consciousness, for all three SD dimensions than other students. Effect sizes are small in the economic and social dimensions (Cohen's $d = 0.22$ and 0.27, respectively) and medium in the environmental dimension (Cohen's $d = 0.50$). This implies that students who ranked environmental considerations highly from an integrated perspective generally were characterized by the strongest environmental, economic, and social consciousness as defined in a separated perspective.

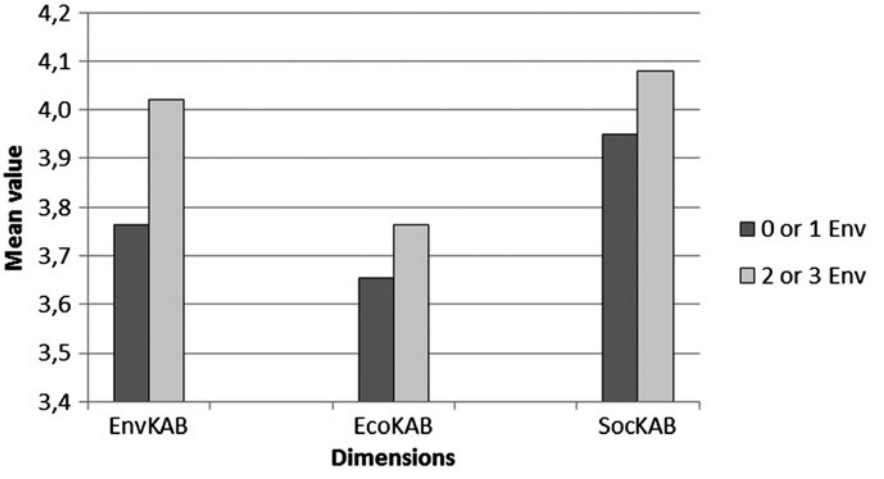

Figure 3. Differences in sustainability consciousness dimensions (environmental, economic, and social KAB) between students who chose *environmental* reasons as most important at least twice (2 or 3 Env) and less than twice (0 or 1 Env) in responses to the three scenarios. All differences are significant at the $p < 0.05$ level, Wilks' Lambda < 0.01. Effect size: small to medium (Cohen's d: 0.22–0.50).

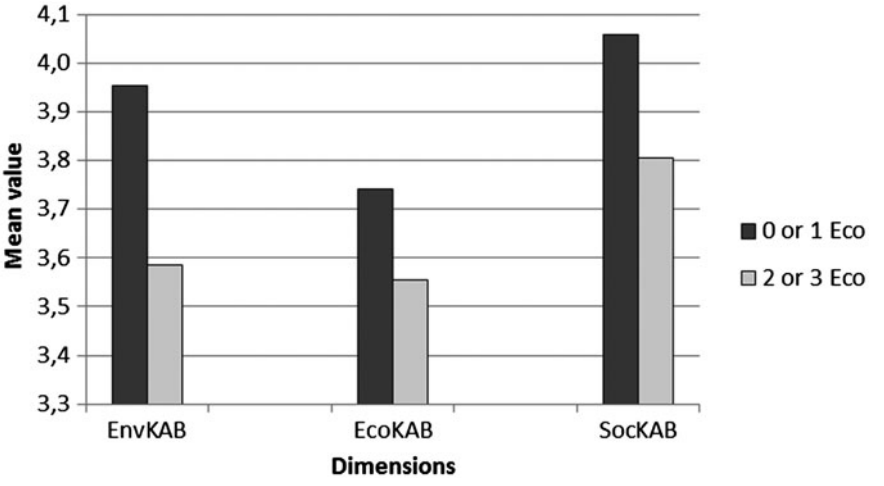

Figure 4. Differences in sustainability consciousness dimensions (environmental, economic, and social KAB) between students who chose *economic* reasons as most important at least twice (2 or 3 Eco) and less than twice (0 or 1 Eco) in responses to the three scenarios. All differences are significant at the $p < 0.05$ level, Wilks' Lambda < 0.01. Effect size: small to medium (Cohen's d: 0.35–0.65).

Figure 4 indicates that students who chose economic reasons as most important at least twice in responses to the three scenarios (102 in total), had lower mean values, i.e., consciousness, for all three dimensions of SD than other students. Effect sizes are small in the economic dimension (Cohen's $d = 0.35$) and medium in the social and environmental dimensions (Cohen's $d = 0.50$ and 0.65, respectively). Thus, the

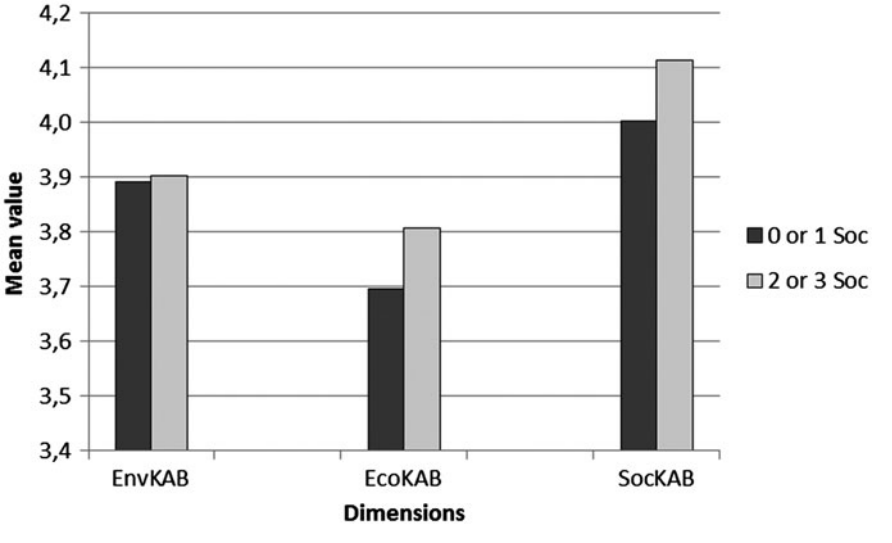

Figure 5. Differences in sustainability consciousness dimensions (environmental, economic and social KAB) between students who chose *social* reasons as most important at least twice (2 or 3 Soc) and less than twice (0 or 1 Soc) in responses to the three scenarios. The differences are not significant at the $p < 0.05$ level, Wilks' Lambda 0.11.

environmental, economic, and social consciousness as defined here generally appears to be lowest among the students who prioritized economic considerations.

As shown in Figure 5, no significant ($p < 0.05$) differences were found in students' sustainability consciousness in any of the three SD dimensions between students who chose social reasons as most important in responses to at least two of the scenarios (73 in total) and other students.

To conclude, the results indicate that students who prioritized environmental reasons in responses to the scenarios had higher environmental, economic, and social consciousness, and students prioritizing economic reasons had lower consciousness in all three dimensions of SD, compared to other students. The group that mostly prioritized social arguments did not seem to differ in their environmental, economic, and social consciousness from others, according to the MANOVA/ANOVA.

Discussion

A separated perspective on the environmental, economic, and social dimensions of SD

The results indicated that the center of gravity of the students' views of SD was placed in the social dimension (Figure 1) when answering from a separated perspective. This was a bit surprising since findings by Borg et al. (2014) and Summers, Corney, and Childs (2004), Summers and Childs (2007) show that upper secondary teachers and student trainee teachers were least aware of the social factors in relation to SD. Our results also indicated that the students had intermediate awareness of the environmental dimension and were most uncertain about economic aspects. Our results may at least partly be explained by the separated perspective in the KAB items in the questionnaire. Statements about the value of social aspects might be particularly easy to agree with when no additional aspects have to be considered that could incur costs or conflict with objectives related to the other two dimensions.

The most diverse viewpoints in the separated perspective seemed to be associated with the economic dimension, according to the CA (Table 1). This is consistent with findings by Borg et al. (2014), who found that the economic dimension was connected to the greatest uncertainty from teachers' perspectives. The uncertainty among students might be a reflection of the uncertainty among teachers concerning the role of economy in SD. However, 10- to 12-year-old students reportedly related economic issues to other dimensions of SD more frequently than social and ecological issues (Manni, Sporre, and Ottander 2013). In their study, student answers mostly focused on adverse effects of using money, long-distance transportation and unfair trade. If economic aspects are more frequently related to environmental or social factors, then economic factors might be downgraded in favor of the others, which might partly explain our results regarding the economic dimension.

An integrated perspective on the environmental, economic, and social dimensions of SD

In the section of the survey instrument designed to investigate student views of the environmental, economic, and social dimensions of SD from an integrated perspective they had to choose reasons for buying products (Scenario 1) or taking actions

(Scenario 2 and 3) representing the three dimensions of SD. The overall results of these items showed that environmental reasons were generally favored more than social and economic reasons (a little more than 50% of the students selected environmental reasons as most important at least twice, see Table 3). However, the expressed preferences (and hence rankings of the dimensions in responses to the three scenarios) differed, implying that the context significantly influenced students' responses. Thus, the students' responses to each scenario are discussed below, before considering the contextual elements more generally.

Scenario 1: grocery shopping

The most frequently selected reasons for selecting products when shopping for groceries were the economic options, particularly the importance of buying high quality products from reliable manufacturers. This probably mirrors the recent debate in Swedish society concerning the contents of food products following mislabeling scandals. The other economic reason, that products should be cheap, also scored quite highly. This is not surprising since factors that affect people's personal finances are known to influence their behavior and decisions strongly. Thus, they are important targets of policies intended to change people's behavior (Kollmuss and Agyeman 2002).

In sharp contrast to the results from the KAB sections, which investigated the students' views from a separated perspective, the social dimension was associated with the lowest frequencies of responses to this scenario. Among the social perspectives, fair working conditions were considered more important than local production creating new jobs in Sweden. However, the two social reasons only appealed to a total of 13.6% of the students. The perceived importance of social factors may decline when factors related to other dimensions must be considered simultaneously and may explain why social issues are less prominent than economic and environmental issues in the SD debate (Giddings, Hopwood, and O'Brien 2002). The responses to this scenario clearly indicate that social factors are not the main concerns when the young respondents buy groceries.

Scenario 2: global warming

Scenario 2 presents economic, social, and environmental reasons for taking action to mitigate global warming (Table 2). The media have been shown to strongly influence both public perceptions and policy agendas regarding global warming, and the reporting of climate science has been found to vary among countries (Anderson 2009). European media tend to report climate science in an alarmist way, using language of catastrophe, disaster, and fear. Nisbet and Mooney (2007) found a number of frames that occur in connection to global warming, e.g., the Pandora's Box of catastrophe metaphor, the unfair economic burden frame and the scientific uncertainty frame. The framing of this field in media sources may influence responses to this scenario. For instance, if images of polar bears on shrinking ice floes come to people's minds, as discussed by Nisbet and Mooney (2007), environmental factors may predominate. Accordingly, our respondents frequently selected the environmental reasons (avoiding species extinction and ecological destruction) and social reasons (minimizing risks of people suffering from floods or drought) for slowing

global warming. Few considered the economic reason (avoiding high reconstruction costs associated with storms and floods) to be the most important.

The overall pattern that emerged from responses to this scenario was that environmental factors were most frequently prioritized, closely followed by social factors. Economic considerations were only prioritized by a small proportion of students. These results are consistent with findings by Christenson, Chang Rundgren, and Höglund (2012) that students applied environmental and ecological subject content more often than sociological, cultural or economic subject content in socio-scientific essays on global warming. An interpretation of our results is that the economic aspects may be regarded as concerns for policy-makers, rather than private citizens. Another possible explanation is that most students may not consider a strong economy to be a goal in itself, and only valuable if it improves people's lives. This is further discussed in the following sections.

Scenario 3: disposal of waste

Scenario 3 concerned the sustainable disposal of waste. The students focused on environmental reasons, particularly the need to conserve natural resources. Most young people in Sweden have been exposed to recycling activities, food separation etc. during their daily lives, and environmental aspects generally predominate during discussions of the need for recycling and safe waste disposal. However, substantial proportions of used goods such as electronic products are exported from Western countries to developing countries, causing serious social problems elsewhere. Studies within EE and ESD have shown that teachers are least aware of social aspects of SD (Borg et al. 2014; Summers and Childs 2007), implying that relatively little attention may have been paid to the social dimension in the sustainability education the students have encountered. Few students also selected economic reasons as the most important for disposing of waste sustainably. In conclusion, most students do not regard either economic or social factors as major motives for recycling or other activities designed to optimize waste disposal.

Comparing the scenarios

Some of the reasons for selecting products or taking action presented in the three scenarios can clearly be connected to interests of the individual (e.g., reasons 3 and 6 for Scenario 1 and reason 4 for Scenario 3, Table 2) while others are clearly connected to interests of other people or nature (e.g., reasons 2 for Scenario 1; 1 and 6 for Scenario 2; and 3 and 6 for Scenario 3, see Table 2). This distinction is important to recognize since it could influence the results. However, we cannot determine if the respondents primarily had their own or broader (public or nature) interests in mind when choosing a reason. Thus, the direction of the possible influence is unknown, which is a limitation of this study. Schwartz et al. (2001) have identified 10 basic human values, defined as desirable goals in people's lives that are trans-situational and serve as guiding principles, and two orthogonal dimensions that summarize their relationships. One of these orthogonal dimensions is self-enhancement vs. self-transcendence, reflecting values of power and achievement vs. values of universalism and benevolence. Self-transcendence values are connected to the welfare of people and nature, while self-enhancement values are more connected to the individual. Consequently, a self-enhancement perspective could result in

strong preferences for options related to individual interests, which are often linked (in the scenarios presented here and elsewhere) to the economic dimension. Similarly, a self-transcendence perspective could result in strong preferences for options related to interests of the public and/or nature, which are often linked to the social and environmental dimensions. However, we have no information about the participants' basic values and determining whose interests they were primarily considering when choosing options is difficult. Even reasons like 'So that dangerous substances are not released into our environment', or 'The product should have an eco-label, e.g., KRAV or Ekologisk', which seem to be linked to the preservation of nature, may have been selected for more personal reasons, such as not wanting to breathe polluted air or eat food that could contain toxic substances.

The reasons for mitigating global warming (Scenario 2) can be less clearly divided into sets associated with individual or public/nature interests, and economic reasons were selected much less frequently than environmental and social reasons. This may be linked to the distinction between instrumental and intrinsic values (Justus et al. 2009; Sandell, Öhman, and Östman 2005). Our results indicate that most students regard the economy as having no value in itself, and thus, only instrumental value, i.e., it provides a means for obtaining something desirable, while the environment and people may have intrinsic value, i.e., has value in itself (although not necessarily). The low frequencies of preferences for the economic arguments might be connected to this division between instrumental and intrinsic values, as the students may not make connections between high economic costs and adverse consequences for people.

The apparent shift in the ranking of economic factors, from most important in the students' consideration of Scenario 1 to least important in their consideration of Scenario 2, raises interesting questions about their perception of the economy and its role. They clearly distinguish between matters that they perceive as affecting themselves financially and others that will 'only' affect the national or global economy. Environmental and social aspects can also be related to a similar division between things that they perceive will affect themselves personally and others, but less conspicuously.

The differences in students' patterns of responses to the three scenarios clearly indicate that the context was significant. The relative importance of economic, social, and environmental factors shifted, depending on whether they were considering shopping for groceries, global warming or waste disposal. Hence, different dimensions were emphasized in different contexts, and further patterns may have been found if other contexts had been added.

Comparing the separated and integrated perspectives

The patterns of the students' responses differed between the separated and integrated perspectives, i.e., depending on whether they were considering environmental, economic, and social dimensions of SD singly or in combination. Notably, they clearly regarded social aspects as less important than environmental aspects when they considered them from an integrated perspective rather than a single perspective (Tables 2 and 3). Thus, we decided to combine and compare the findings from the separated and integrated perspectives, by analyzing the responses to the scenarios in relation to the analysis of their consciousness (knowingness, attitudes, and behavior)

of the three SD dimensions. The results from this analysis were shown in Figures 3–5.

The combined analysis clearly showed that the students who favored environmental and economic reasons in their responses to the three scenarios had higher and lower consciousness, respectively, of the environmental, economic, and social dimensions of SD when compared to other students. Decision-making is complex, and many factors might interact in the process of making decisions. Our results suggest that increased consciousness among students concerning SD issues is associated with a shift in their decisions from an economic basis to a more environmental basis. Thus, when facing conflicts between dimensions of SD as in the integrated perspective, students who have developed strong environmental, economic, and social consciousness (i.e., are most cognitively and affectively aware of SD), are most likely to favor environmental factors over economic concerns.

These findings might at first glance raise hope that if we can find ways to develop students' sustainability consciousness through formal education, this could in the same time influence their decision-making. However, our previous studies of ESD implementation have shown that attending a school with an ESD focus has minor effects on students' sustainability consciousness (Berglund, Gericke, and Chang Rundgren, 2014; Olsson, Gericke, and Chang Rundgren 2015). Thus, a key question to address is whether this is because it is very difficult to influence students' sustainability consciousness by specific teaching approaches as advocated in the literature, or because most schools that are implementing ESD today are not following recommended approaches (see Berglund, Gericke, and Chang Rundgren (2014) for further discussions)?

Conclusions and educational implications

Students' understanding of the SD dimensions and their relationships seem to depend on the perspective (separated or integrated SD dimensions), context (as illustrated by responses to the three scenarios), and other influential variables, such as value structures. A main conclusion we can draw from this work is that students' meaning making of the dimensions of SD is highly situated and not fixed. Lundegård and Wickman (2009) noted that different circumstances and contexts can engender different situated identities among students, and our results show that individual student's views of SD and its underpinning dimensions are context-dependent. Various models have been developed to represent the concept of SD on the basis of its inherent environmental, economic, and social dimensions (see e.g., Giddings, Hopwood, and O'Brien 2002; Walshe 2013). Based on the findings from our study, it seems difficult to find one specific model that captures views of the relationships between the three dimensions across all situations. Instead, the results from this large-scale quantitative study show, in line with the qualitative case study from Lundegård and Wickman (2009), that people construct new, context-dependent meanings of SD.

Our results are consistent with previous findings that multiple perspectives should be used in education generally and ESD particularly (Björneloo 2007; Sund 2015; Warburton 2003). Young people's environmental, economic, and social consciousness seems related to their decision-making. From an ESD perspective, it is important to focus on tensions between dimensions of SD to nurture students' understanding of the roots of conflicts and the difficulties in finding solutions.

Furthermore, it is also important for creating possibilities for students to learn to deal with alternative and sometimes conflicting opinions and values constructively. This can be linked to the action competence of young people and the ESD objective to foster democratic and active citizenship (see Mogensen and Schnack 2010).

This study has shed some light on the diversity of views that exists among students in relation to SD. The results from the study relate to the pluralistic teaching approach aiming to highlight different opinions concerning SD issues. Alternative arguments provide foundations for discussions about core SD issues and can be a way to experience and learn about democratic processes (see Rudsberg and Öhman 2010). The results of this study can be regarded to support the recommendation to include both conflict- and congruence/harmony perspectives in ESD teaching and learning (Herremans and Reid 2002; Öhman and Öhman 2012). From a holistic point of view, it is clear that the outcome is different when integrated perspectives are applied, in comparison to using a separated perspective on the SD dimensions. Addressing the question 'What are the difficulties in achieving SD' in relation to a particular task given the students implies a different purpose and a different outcome of the question 'What is SD'. If the dimensions are not addressed in an integrated manner, tensions between them cannot be illuminated. In addition, it is important to cover a diversity of issues and contexts connected to SD in teaching, as emphasized by Warburton (2003). In his study, an approach is suggested on how to work with deep learning in sustainability education where attention is drawn to underlying meanings. Presenting different scenarios to the students provides them opportunities to investigate and analyze arguments connected to different SD dimensions and experience how they are expressed in different contexts. A way to deal with this in practice has been suggested by Walshe (2013). In her longitudinal case study on 14- to 15-year-old students, she used dialogic diaries to explore the students' understandings in a geography course during one year. A written dialog between teacher/researcher and individual students provided opportunities for the students to reflect upon their learning, to develop critical thinking and conceptual understanding. A similar study illuminating how tensions and complexities are handled in practice was performed by Sund (2015). In his study, experienced ESD teachers were interviewed in order to find out how they deal with the complexity of the SD concept in their teaching. The teachers described how they use the complexity as a starting point for achieving long-term teaching purposes (developing awareness, humility, personal connection, negotiable truth, and personal connection). Our study has contributed to the existing research about the complexity and tensions concerning some of the diverging and multiple perspectives on SD-related issues that coexist within students' perceptions. The conclusions we draw from this large-scale quantitative study apply for a broad Swedish context and possibly even further; however, more research is needed to confirm these conclusions in sustainability education research in other countries.

Finally, the results reveal that the students have ambiguous perceptions of the role of the economy in SD. The economic dimension seems to be associated with the most diverse viewpoints, and in different contexts, the primary economic factors considered may be either personal or communal. Thus, it is important to distinguish between personal and communal (local, regional, national, and global) finances and highlight the relationships between them in teaching. This raises another important issue for ESD, the complex links between the well-being of the individual, the well-being of his or her host society, and the vitality of the global community.

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Notes

1. http://www.intra.kau.se/dokument/upload/C10B9B9407f0220FC9Njh15BB799/Survey%20instrument%2012th%20grade%20webversion.pdf.
2. Artologik software for the web; www.artologik.com.

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