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This is the published version of a paper published in .

Citation for the original published paper (version of record):

Manni, A., Sporre, K., Ottander, C. (2013)

Mapping what young students understand and value regarding sustainable development.
, 3(1): 17-35

Access to the published version may require subscription.

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Permanent link to this version:

<http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-63809>

Mapping What Young Students Understand and Value Regarding Sustainable Development

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Received: March, 2012; Accepted: August, 2012

Abstract

This paper presents the results of a study carried out to investigate how 10-12 year old Swedish students understand and value the issue of sustainable development. The responses from open-ended questions in a questionnaire have been analyzed through a content analysis based on a phenomenographic approach. The results show that there are considerable variations in the level of understandings and the values related to the three aspects of sustainable development. Understanding within as well as between the aspects is noted, with students having the most difficulty in seeing the relationships between all three aspects, i.e. a holistic understanding. Furthermore, students' understanding and values are often expressed in an integrated way i.e. expressed in the same sentence. The variations, complex understandings, and expressions of understandings and values are discussed in relation to earlier research with a focus on ethical issues and systems thinking.

Keywords: Education for sustainable development, levels of understanding, values, student perspective, ethical reflections

Introduction

Education for sustainable development (ESD) is one of the international educational goals of United Nations (UNESCO, 2005), and also included in the Swedish curriculum (Skolverket, 2002; 2011). At the 2002 World Summit on Sustainable Development it was also stated that ESD is an investment for the future, and each country was encouraged to make resources available to develop ESD (UN, 2002). UNESCO has suggested the following key educational principles for the coming decade: interdisciplinary and holistic,

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value-driven, critical thinking, problem solving, multi method, participatory, decision making, applicability and locally relevant (UNESCO, 2005).

This article focuses on a study carried out in Swedish primary schools, where two of the suggested educational principles: *holistic and value-driven* are investigated. We posed questions to the students about what they know, and how they feel about the different aspects of sustainable development (SD). Through the questionnaire we tried to secure information both about their factual knowledge, i.e. understandings, and feelings or emotions in relation to SD. The results reveal how values form part of their understandings and feelings. By using this method the expressions of young students can assist in increasing our knowledge of ESD.

Understanding sustainable development

In some previous studies, young students' understandings of the three aspects of SD; ecological, economic and social, are explored separately. Results show that environmental/ecological understanding is in many cases, connected to personal emotions or values (Alerby, 2000; Palmberg & Kuru, 2000; Payne, 1998), economic understanding is difficult, but it is also socially and culturally contextualized (Belle, 2006; Davies & Lundholm, 2008; Furnham, 1987; Furnham & Cleare, 1988; Lundholm, 2007). Studies on poverty and social issues among children up to 11 years old reveal that they see poverty as unfair and believe that it has been caused by structural factors, e.g. caused by failures of social and economic systems (Belle, 2006; Feagin, 1975). Furthermore youngsters over 11 years old explain poverty both by structural factors and individualistic factors, e.g. behaviors of the poor. The understanding and perceived values of the relationship between ecological, economic and social aspects of SD in the 10-12-year-old age group have not been studied sufficiently.

When looking at a complex understanding of ESD, variations and relationships can be considered (Hjorth & Bagheri, 2006; Jonsson, 2007; Loughland, Reid, & Petocz, 2002; Wylie, Sheehy, McGuinness, & Orchard, 1998). One important perspective of SD is not only that it consists of several aspects, but also that these are related in complex ways. This is different from when school subjects in natural sciences are taught one by one and "classical science solves problems by breaking them down into elements and then focusing on the isolated elements" (Hjorth & Bagheri, 2006, p. 90). Systems thinking emphasizes that it is only when you understand the complex unity of all parts that you can understand the meaning and function of every consisting part and that the "relationships tie the system components together" (Wylie, et al., 1998, p. 118). In previous studies, young students describe concepts ranging from an object focus to a relational focus between objects (Jonsson, 2007; Loughland, et al., 2002). In similar ways they are capable of thinking in systems earlier than thought before (Magntorn, 2007; Wylie, et al., 1998). There are also variations in the understanding of sustainability issues, and the context is important in learning situations (Rickinson, 2001; Walshe, 2008).

The ideas behind systems thinking also deal with the ability of decision making (Dawidowicz, 2010), the main idea being that if the individual understands how things work in a system and how things affect each other, the ability to make good decisions increases (Hjorth & Bagheri, 2006). Decision making is very close to the concept of action competence within the ESD field (Jensen & Schnack, 2006). Action competence is defined as a will and an ability to decide and act for, in this case, sustainability, and it is seen as a crucial component in relation to learning about SD (Almers, 2009; Breiting & Mogensen, 1999; Jensen & Schnack, 2006; Mogensen & Schnack, 2010). Palmberg & Kuru (2000) argue that both knowledge and values play a major part in decision making. More specifically, knowledge about the interactive relations between man and nature together with personal values form a basis for a willingness to act.

Values within sustainable development

Nowadays, environmental problems are often seen as conflicts of interests between people, both globally and locally, that affect nature (Bäckstrand, Olsson, & Tengström, 2010; Kronlid, 2005; Lundegard & Wickman, 2007; Löfquist, 2010; Stenmark, 2000). Earlier views regarded environmental problems as technical problems to be solved or conflicts between human beings and nature. In the field of environmental ethics, discussions about development, welfare growth and social justice are ongoing with different perspectives (Lotz-Sisitka, 2007, 2009). The importance and understanding of the different contexts when learning about global issues as SD has also been discussed (Sporre, 2010). Reflections on different ethical issues raised in relation to ESD are recommended (Kronlid, 2005; Löfquist, 2010; UNESCO, 2005). Different moral statements articulated in a discussion are valued for ethical reflections, both contextualised and universal (Lotz-Sisitka, 2007; Löfquist, 2010). The ethical dimensions of SD have been highlighted, as well as looking at the environmental and climate ethics (Kronlid, 2005, 2009; Stenmark, 2000; Öhman & Östman, 2008). We can, according to Stenmark (2000), divide environmental ethics into human-focused (anthropocentric) or non human-focused (bio- or ecocentric) ethics. The field of ESD is, in terms of environmental ethics described as holistic and intergenerational anthropocentric. That means that SD focuses on a holistic and complex view of life and aims to improve peoples' welfare, both now and in the future which can only be reached if attention is paid to the ecological conditions of the world (Stenmark, 2000).

Moral issues, values and emotions are complexly related and ethical theory is an effort to come to grips with this. A way of looking at values as expressed through emotions is exemplified in Lifmark (2010), building on Nussbaum (2001), in contrast to some contemporary ethical theory emphasizing the pure rational capacity of human beings. Nussbaum argues, in a neo-Aristotelian tradition, for the importance of emotions for the understanding of value judgments and moral decision making (cf. Lifmark, 2010, p.98).

Understanding and valuing sustainable development

The importance of exploring learning processes in environmental education is described by Rickinson and Lundholm (2008), who focus on the learning challenges. One challenge deals with the emotional responses the students have to deal with when meeting the subject of environmental education. How the students respond has a direct impact on how they then learn (Rickinson & Lundholm, 2008). In a review from 2009, some new ways or lenses for understanding environmental learning are presented. One of them emphasizes emotions and values as important factors, especially when it comes to scientific literacy. Participation, critical thinking and moral reasoning are highlighted as important factors for environmental learning (Rickinson, Lundholm, Hopwood, 2009).

Littledyke (2008) argues for the integration of affective and cognitive domains in science education, with the aim of developing a sense of relationship with the environment. In school the concept "scientific literacy", i.e. the knowledge and understanding of science concepts and processes required for personal decision making, participation in civic and cultural affairs, is stressed in the science curricula (e.g. Millar & Osborne, 1998; Roberts, 2007) and since the end of the 1990s teaching of socio-scientific issues (SSI) have been used to cover that content. Many socio-scientific issues involve ethical reasoning, a decision or an opinion in a current media-reported issue which is usually based on both knowledge and values. Schools should prepare young people to engage and act in society, which requires not only knowledge about scientific phenomena, but also ethical considerations, generic skills such as team-work, problem-solving and media literacy (Osborne & Dillon, 2008; Ratcliffe & Grace, 2003). Several studies with students learning and discussing SSI questions, such as environment and climate, have shown that

emotions, values and moral reasoning play an important role in their arguments as well as their decision-making (Aikenhead, 2003; Ekborg, 2005; Grace & Ratcliffe, 2002; Sternäng, 2011; Walker & Zeidler, 2007). However, working with SSI does not always result in that. In a study by Ekborg et al. (2012), it is shown that teachers used the cases to create interest when introducing a topic, but, generally, they did not stress the ethical issues, the conflicts of interest or scientific content, and they did not create an awareness of the interdependence between society and science, even if this was stressed in the framework. The importance of emotions and values when learning ESD is also emphasized when discussing pro-sustainability and behavior (Maiteny, 2002). In a special issue of *Research in Science Education*, 42 (2012) the role of the use of SSI in science education within the context of the UN Decade of Education for Sustainable Development is discussed further.

Alerby (2000) has, through the drawings of 7-16 years old children, analyzed their visualized thoughts about the environment. She found that children described the environment as either a good or a bad world or relations between them, and then, finally, they drew symbols or actions of environmental protection (Alerby, 2000). This is an example of how children integrate understandings and emotions in their expressions. A dialogue about *Learning in a Changing World* is introduced by Heila Lotz-Sisitka (2007) where issues like those above as well as culture, ethics and agency are discussed.

Student perspective

The OMEP (World Organization for Early Childhood Education) report from 2010 presents how children, from all over the world, describe the earth and SD with a deep sense of empathy. The authors' conclusions are that we should value the children's voices as an important factor for developing ESD in the world (Engdahl & Rabusicová, 2010). Important factors when working with young students are to pay attention to whether their thoughts are personal, self-centered and logical from their point of view (Helldén, 1994). Children's everyday thinking is very robust. According to Helldén (1994), language matters to children and it is very concrete. Since students have different experiences that have helped them to understand, Helldén argues that it is important that we, as researchers and teachers know more about how young students think to create learning situations where they are active participants and their thinking is challenged (Helldén, 1994). According to Payne, there has been "a lack of consideration in environmental education theory and research practices about the children who are the subjects of environmental education" (Payne, 1998, p. 20). What students understand about the issue of SD is valuable knowledge that can be used to develop teaching and learning of ESD, as well as empowering the children as world citizens and agents of change (McKenzie, 2006).

Aim

In this article, we have investigated how 10-12 year old students express their understandings of and feelings related to the different aspects of SD, as well as the relationships between the different aspects. The research questions were:

1. How do young Swedish students understand and value the aspects of SD and how these are related?
2. How can the relationships between understanding and valuing SD be described?

Method

This study is based on phenomenographic theory. From a phenomenographical point of view people experience, understand and ascribe meaning to a specific situation or phenomenon in different ways (Loughland, et al., 2002; Marton & Booth, 1997). The variations of concepts of a phenomenon are the most important. The interest lies in

developing teaching and learning through a deeper understanding of students' varied thoughts (Alexandersson, 1994; Marton & Booth, 1997; Svensson, 2011; Uljens, 1989).

Sample

The study was carried out during 2010 in 11 different classes in Swedish schools, involving 209 students in total (105 girls and 104 boys) aged between 10-12 years. Searching for students varied understandings of ESD in the Swedish school context schools were selected on the basis of official websites and background information from the teachers. The schools that agreed to take part were located throughout Sweden and in towns of varying sizes. They also represented variations between schools, with and without green/environmental profiles. Against this the background, the sample represents a diversity of 10-12-year-old Swedish students expressing their different views (cf. Agresti & Finlay, 2009). Recommended research ethics and confidentiality were also considered when conducting and performing the study (Vetenskapsrådet, 2002, 2011).

Instrument

For the study, a comprehensive questionnaire about ESD was created. This article reports the results from the open ended questions of the questionnaire, which deal with understanding and valuing the different aspects of SD: ecological, economic, and social, and the relationships between them. The open-ended questions were supported by pictures. A picture, as an artifact or conversation piece, has been shown to be useful in earlier studies (Hartman & Torstensson-Ed, 2007). Also, a variety of questions were used in the questionnaire due to the age of the children (Cohen, Manion, & Morrison, 2010; Creswell, 2005; Trost, 2007). In each aspect of SD, two questions were posed: one about knowledge and the other about students' feelings together with the accompanying picture.

Implementation

In order to avoid bias in content validity, pre-tests of the questionnaire were also carried out before visiting the participating classes. At the moment of students' answering, a researcher, in two cases a teacher, helped explain the questions, assisted slow readers and writers, and collected the students' answers. It generally took the students 25- 45 minutes to complete the questionnaire. All of the distributed questionnaires were responded, although not all of the questions. The questionnaires were filled in and gathered in the classes as a joint school activity. Through that volunteer bias was avoided which could otherwise be a problem with questionnaires (Cohen, et al., 2010).

Analysis

A content analysis of the answers was done in line with a phenomenographic approach searching for the variations in the ways students understood and valued SD (Marton & Booth, 1997; Uljens, 1989). After careful readings of the answers critical aspects for each question were explored and when identified used for the forming of categories. By a critical aspect is meant what is found to make up the qualitative differences between answers for each question (Alexandersson, 1994; Svensson, 2011). The critical aspect when dealing with understanding in this study focuses levels of complexity and relational thinking (cf. Jonsson, 2007; Loughland, et al., 2002). When looking at valuing (cf. Lifmark, 2010; Rickinson, Lundholm, & Hopwood, 2009; Stenmark, 2000), the critical aspect focuses on the strength of the emotional expression and, or value judgment. Consequently the categories outline the different ways these young students' experience and describe the aspects of SD, but they do not primarily focus on the individual student (cf. Loughland, et al., 2002; Uljens, 1989). Each answer was seen as a unity and categorized according to the most significant statement, i.e. we did not analyze all the aspects of the statement, but used a more holistic interpretation. Exclamation marks and capital letters were seen as adding emphasis to the statement.

A content analysis implies interpretations of the students' writings. Through citations of the original statements, reliability and validity is shown (Cohen, et al., 2010; Creswell, 2005). For this article, the responses, originally in Swedish, have been translated into English. In the categorization, the statements were coded, which meant that they were possible to count. Frequency tables were made in order to analyze the percentage of different answers in the various categories.

Results

The results of how young Swedish students understand and value SD will be introduced in the following order: the level of understanding and values of: 1) the ecological aspect; 2) the economic aspect; 3) the social aspect; and, finally, 4) the relations between all of the aspects. This is the same order as the open-ended questions were posed in the questionnaire. Through the content analysis, categories were made and distinguished with the help of the critical aspects identified for each question. As already mentioned, the questions in the questionnaire had picture support. Consequently the picture and the questions jointly worked as triggers for the answers reported below. The actual questions are here translated into English and are presented below together with the respective pictures used in the questionnaire. In addition to reporting the results question by question, for question 1a and 1b an in-depth analysis has been carried out and is presented as Figure 1.

1. The ecological aspect

1a What do you know about our environment?

1b How do you feel about the environment and the impact humans have had on it ?



Almost all, 95.2 %, of the students answered question 1a, concerning their understanding of the ecological aspect. Examples of their answers are given in Table 1. The students' answers were varied and the critical aspect for categorization was the degree of complexity. In the first category, the students made descriptions of both biotic and abiotic factors seen in the picture. In the second category, the students showed that they understood simple relations in the environment. In the third category, the students showed that they understood more complex ecological relations. The students' answers showed, both positive and negative emotions regarding relations in nature. Categories, frequencies and examples of students' statements are shown in Table 1. The answers were distributed in the different categories, with the highest response rate for simple relations, and these often expressed a negative emotion.

Question 1b, concerning the feelings of the students regarding the impact of human beings on nature, had a response rate of 89.5%. A variety of emotions and values were shown, many focusing on the negative impact of human beings on nature. When categorizing emotions and values, the strength of the value judgment was identified as the critical aspect. In the written responses we found statements that were more spontaneous, weak in judgment and more emotional; which were described as an emotional expression, for example: *"I think it is lovely to be out in the forest!"* *"I want the environment to get better!"*. We also found statements that had a stronger sense of judgment, then described as a value statement, for example: *"I think you should clean up stuff that others have thrown away."* *"We throw out a lot of things that can be recycled. We are also responsible for all of the pollution."* *"Bad!! I think people are violating nature."*

Nature is important for future generations!”. Many of the statements included both emotions and stronger values and were categorized after its main expression.

Table 1.

Categories of students' understandings of the ecological aspect (question 1a) and quotations of students' answers in respective category.

Category	Example	%	N
No response	-	4,8	10
Description	“I see a fox, a rabbit, trees, water, flowers and a house.” “There are bears and trees.”	27,8	58
Understandings of simple relations	“A big factory emits bad smoke, which is not good for the animals or nature.” “I know that the animals and the plants are important in nature.”	51,7	108
Understandings of complex relations	“I know that big factories emit bad smoke, both humans and animals get sick from the smoke, even flowers and plants. It is bad that some people throw away waste in nature.” “I know how trees flower and.... The rabbit eats the plants and the fox eats the rabbit. The fox dies and decomposes in the soil and then a plant grows again.”	15,7	33

As already mentioned a comparative analysis was made combining how the students described what they knew about the environment (Q1a) and their feeling about humans in nature/ the environment (Q1b). The interesting result was that those who did not respond, or who just described the picture in question 1a, had a higher response rate in question 1b. Responding to Q1b they both expressed emotions and reported some factual knowledge. We noticed further that the more complex understanding the students showed in question 1a, the stronger value statements they also expressed in question 1b. In other words, the results show that those who displayed less knowledge in 1a could express what they knew if they started with expressing their feelings. Those who had a more complex understanding also showed stronger value statements.

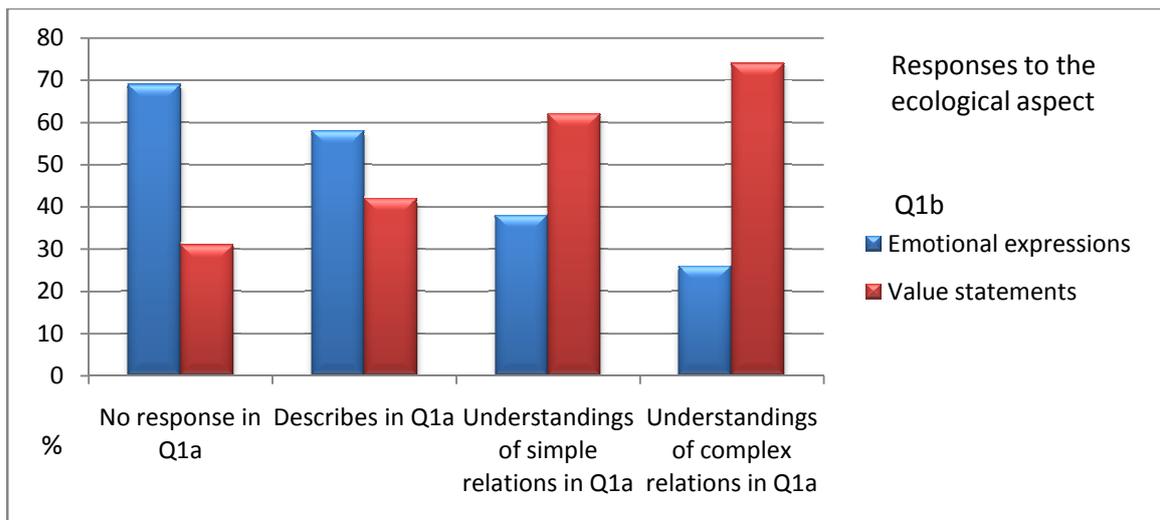


Figure 1. The students' ways of describing relations in Q1a, combined with their expressions of emotions and value statements in Q1b, in percentage within each category. Responses refer to the ecological aspect.

For Q1b the answers were categorized as either an emotional expression or a value statement even though there was not a sharp distinction between the two categories, but rather a continuum. A value statement could include emotional expressions, and vice versa, but was categorized according to the overall impression of the statement.

2. The economic aspect

2a - What do you know about how things are made and traded?

2b - How do you feel about that and how money is used?



As in the previous section about the ecological aspect, the first question within the economic aspect asked the students about their knowledge and the second question focused on their feelings. Question 2a had a response rate of 86.6 %. The critical aspect that was focused on here was the complexity, and this was divided into four different categories: the description of different goods; simple knowledge of goods and trade; economic issues related to ecological aspects; and economic issues related to social aspects. Knowledge and values were also integrated in the answers, even though to a lesser extent than in the ecological aspect. It was particularly noticeable among those who also described and understood that economy is related to the ecological and social aspects. Many answers expressed thoughts of fair trade and how long-distance transports affect the environment. The students were aware that Sweden imports goods from other parts of the world; however, none of the students wrote about Swedish export.

Table 2

Categories of students' understandings of the economic aspect (question 2a) and quotations of students' answer in respective category.

Category	Example	%	n
No response	-	13.0	27
Description	<i>"I see a fish, money, bananas and shoes." "Bananas grow on trees and the fish are caught and....I don't know."</i>	25.4	53
Relational understanding of goods and trade	<i>"They catch some fish and sell it to a country, then the fish travels in an aeroplane and in the end the fish is sold in a shop." "Many things are made in other countries and are flown to Sweden."</i>	36.4	77
Relational understanding of economy and ecology	<i>"The plane is there because things are transported a long way to be sold. That is absolutely not good for the environment!" "I do not like the stuff they put on the bananas to protect them from bugs. My family always buy eco-bananas and other fruits."</i>	16.7	35
Relational understanding of economy and social issues	<i>"In poor countries, children have to work all day to earn some money for their family. The goods are sold abroad and we, the rich people, are responsible for the poor children not receiving enough money." "You have to manufacture stuff...if you don't, you don't get money and then you cannot live."</i>	8.1	17

The responses to question 2b expressed values, emotions and money usage and had a response rate of 74.6 %. The critical aspect identified value judgments about economy,

either more general or more personal. Two main categories were formed; in the first category the value judgments were related to an individual economy and in the second category, they were related to national economy. Sub-categories were then defined through the different characters of their statements within those two main categories. This question was more difficult for the students to answer, since 25.4 % did not respond and the rest described mostly usage of money, often with a negative value judgment. The students' understanding of use of money is on an everyday level, but it is also connected to emotions of injustice and waste of money. However, many of the students have difficulties explaining where money comes from and factors that can affect economic circumstances, both on an individual and a national level.

Table 3.

Categories of emotions/ values within the economic aspect, dealing with trade and money (question 2b) and quotations of students' answers in respective category.

Category	Sub-category	Example	%	n
No response			25.4	53
Values related to an individual economy	<i>Everyday use –less value</i>	"You get money when you work and then most of it is used for food, when you pay for the food you can keep the change." "You buy things for your money, you need money to live."	18.7	39
	<i>Consumption-stronger value</i>	"I think that you should not waste money because money is important and you should not buy unnecessary things." "I think that we use the money for bad things, for example to buy new clothes and toys. I think we should buy the most necessary things instead of buying things we don't really need."	17.2	36
Values related to the national economy	<i>Appreciation of international trade</i>	"I think it is good that you can sell things to another country. The money is used pretty well." "We should have euro because many other countries have that."	10.5	22
	<i>Critique of how money is used a certain way</i>	"Money is wasted at unnecessary things when there are people starving." "Money is used in a wrong way, but you can give money to those who help save the environment."	18.2	38
	<i>Critique of how money rules; power and greed</i>	"Money governs the world" "I do not think that money should exist because it causes criminality." "Money is many people's weakness."	10.0	21

Question 3a, which focused on the level of understanding the students had on the social aspect via pictures of people's housing conditions, had a response rate of 90%. The students' described that there are rich and poor people in the world and that this is unfair. A few students wrote about causes of poverty/wealth and how we live in Sweden. The pictures shown had a strong impact on the children and they wrote more emotionally about the social aspect than the ecological and economic aspects.

3. The social aspect.

3a What do you know about the different life situations of people?
 3b How do you feel about that?

Picture support to Q3 consisted in four pictures contrasting the conditions of children. One child was eating a hamburger, others were asking for food showing an empty plate. A simple hut was shown and a Swedish good house. Due to copyright restrictions the photos cannot be shown.

The critical aspect distinguishing the categories of understandings within the social aspect also dealt with levels of complexity. The first category contains descriptions of rich and poor in the world. The second category focuses on understandings/expressions of the different life conditions for rich and poor in a simple way. In the third category, expressions of what may cause the different life situations for people in the world, i.e. a complex understanding, is included. Sub-categories were also formed here since values/ emotional expressions were expressed within the category of simple understanding.

Table 4.

Categories of students' understandings of the social aspect (question 3a) and quotations of students' answers in respective category.

Category	Sub-category	Example	%	n
No response			10	21
Description		"I know that there are rich and poor people." "In some parts of the world people don't get food and are homeless"	31.6	66
Understanding of simple relationships	<i>No values</i>	"They live on the streets not in a house and look for food in rubbish bins." "I know that all children do not go to school. I know that some do not get clean water, and that they do not get so much food, and that they do not live in good houses."	28.7	60
	<i>Values/ emotions about justice</i>	"I think the world is pretty unfair! We get food everyday while children in other countries have to work for maybe a potato." "Children in other countries don't have clean water and food. I think it is awful if you look into how children live in other countries."	13.9	29
	<i>Values/ emotions about welfare</i>	"I would like all people to have it as good as we have it in Sweden. Here we are really spoiled because we have running water, we throw lots of things away and are choosy." "We are lucky in Sweden since we are a wealthy country. It is also very unfair because millions of poor people in the world die."	12.9	27

Table 4. (Cont.)

Complex understanding	<i>Values/emotions related to specific causes</i>	"In some countries when there are wars you get lack of money and are forced to work at the age of 11. They have almost no food and simple houses. We do not have wars in Sweden. We have food, clothes, big houses and lots of money. "Some don't get food, clean water (or water at all) and they can't live in real houses because they are poor and have to live in the streets. They often get sick and do not live as long as we do. They also suffer from many natural disasters such as earth quakes, hurricanes, floods and tsunamis.	2.9	6
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Question 3b, which specifically focused the students' feelings on the social aspect, had a response rate of 84.2 %. When dealing with emotions and values, the strength of the value judgment was identified as the critical aspect. In the first category, the statements were more spontaneous, weak in judgment but emotional, an emotional expression. In the second category, the statements had a strong sense of judgment, a value statement. Also within this aspect, an analysis was made of how emotions/values relate to the categories of understandings.

The results showed that emotional expressions, when compared with value statements, had the highest frequencies in all of the categories. More specifically, the students who did not respond to question 3a all responded with emotional expressions in question 3b. In the category of description there were 70.2% of emotional expressions, in the category of simple understandings there were 50% and in the category of complex understanding 83% of emotional expressions. Examples of an emotional expression: "I feel mean towards poor people" and "I feel sad for them". Value statements were mostly about justice: "It is not fair that some people are poor!".

Ten percent of all the answers in question 3b indicated action-oriented opinions: "I want to give money to the poor." This is interesting as action-competence is an often discussed aspect of ESD. Only 1.4 % of all students made some reflections about factors causing poverty, e.g. "I feel sad for the poor people but what happened that put them in this situation?". The statements about factors or causes lead to further reflection about relationships and system thinking and these are some of the most important issues of ESD.

4. Relationships in sustainable development

4 These are the aspects of SD, how are they related?
(Pictures from questions regarding all three aspects repeated)

Question 4 focused on the understanding of the relationships between all of the aspects within SD. This question had a response rate of 55%, while 45% of the students did not answer or answered that they did not know. It is obvious that this is the most difficult question to respond to, e.g., "It is hard to explain" and "I do not know how to write".

The critical aspect distinguished which aspects of SD were related to each other and six categories were formed: category of description of the parts in the pictures; understandings of simple relations between the aspects; understandings of relations between ecology and economy; understandings of relations between ecology and social aspects; understandings of relations between economy and social aspects; and finally the category of relations between all of the aspects. Relationships between understandings and values were analyzed in this question as well. The students that describe relationships also write emotionally and some of them with value statements i.e. a relational understanding and value laden statements are integrated. Examples of this are shown in table 5.

Table 5.

Categories of students' understandings of relationships in sustainable development (question 4) and quotations of students' answers in respective category.

Category	Example	%	n
No response/ did not know	"It is hard to explain..."	45	94
Description	"Nature, money and food" "The earth - all of the things exist all over the world."	11.5	24
Understanding of simple relations	"All pictures are related because there is food in all of the pictures" "Everything concerns earth and nature because it all comes from nature.. sort of.."	22.5	47
Relate ecological and economic aspects	"When we manufacture something in a factory that will be sold throughout the world we destroy nature." "It is good and bad with factories. Factories make clothes but do also emit fumes into nature."	1.4	3
Relate ecological and social aspects	"We feel good when we spend time in nature." "The world feels bad from all pollution. You have to stop polluting so much." "We humans destroy nature more and more. We do not help the poor that much."	3.3	7
Relate economic and social aspects	"The countries with most money buy most of the stuff. The countries with less money have no power to change." "It is really sad that in some countries people live in luxury and in others they live in poverty, in nature there are bad factories that let out poison and exhausts fumes."	4.8	10
Relate all of the aspects	"Well, those who sell bananas get some money but are still poor. When the bananas are exported the air and water are polluted." "Poor people do not have that much money and have to work very hard. Rich people just want more money to start building dirty factories."	11.5	24

Summary

When summarising the results of young students' level of understanding and values of SD we find a rich diversity. The level of understandings was analysed through the critical aspect of complexity, and emotions and values were analysed through the critical aspect of the strenght of the emotional expression/value judgment. The analysis of relationships between the level of understanding and values was also carried out within every aspect and presented in the results.

The students had the least amount of difficulty answering questions regarding the ecological aspect, i.e. this had the highest response rate. Most of the students answered this question with descriptions of simple relations integrated with a negative emotion regarding the negative influence of human beings on nature. However, there was a variety

of answers ranging from a descriptive level to a complex level. The relations between the level of understanding and values in the ecological aspect show that higher complexity in the described understanding also relates positively to value statements rather than more spontaneous emotional expressions. Furthermore did the question about students' feelings result in answers from those who did not respond to the question about knowledge about the ecological aspect, and, to some extent, was this also reflected in the social aspect.

Regarding the economic aspect, most of the students expressed simple economic relations of goods and trade. However, in contrast with the result of the ecological aspect, they related economic issues to other aspects of SD. Within the categories of understanding relationships between aspects of SD, emotions and values were also integrated in the answers. The answers mostly focused on negative aspects of the use of money, unfair trade and long-distance transportation. These students also expressed values and understandings at both an individual level as well as at a national level of economy.

The social aspect turned out to be the most emotional in the responses. Most of the students' described their knowledge of people's different life situations. Generally, they did not relate social circumstances to either ecological or economic issues, and only a few of them wrote about the possible causes of poverty. When analysing values and emotions in this question, the results showed that emotional expressions had the highest response rate in all of the categories.

Finally, the question of relationships between the aspects of SD had the lowest response rate, only 55%, which indicates that this was the most difficult question to answer. Furthermore the students answered by expressing simple relationships. Among those who did actually describe the relations between some or all of the aspects, emotions and values were integrated in their answers.

Discussion

We asked how these students understood and felt about the aspects of SD, and studied if and how it was related in their statements. The answers from the students in this study show similarities with previous studies dealing with the complex understandings of both SD and environmental issues (Jonsson, 2007; Loughland, et al., 2002; Wylie, et al., 1998). As in those studies, these students expressed understandings within or between the objects asked about, which, in this case, were the aspects of SD.

What distinguishes this study from those listed above is that we also asked for students' feelings and found emotional expressions/value judgments to be present in the responses when questioning their understanding of the different aspects, not least in terms of injustice, environmental problems and a wish for change, e.g., "I want the environment to get better!" and "Money is wasted at unnecessary things when there are people who are starving".

The questions of injustice, environmental problems and change were also focused in comprehensive Swedish studies of "Children's vital issues". In that study, important questions for children in early school age are described. These children raised matters of justice, friendship and expressed concerns about the future (Hartman & Torstensson-Ed, 2007). In Palmberg & Kuru (2000), environmental knowledge and emotional attitudes were found to be important factors for taking environmental responsibility. In this study, young students' expressions about aspects of SD, understandings and emotions were also often integrated in the answers. This confirms that the ethical dimension and emotional aspect of environmental issues (Rickinson & Lundholm, 2008) is to be taken seriously when teaching SD, as has already been noted (Öhman & Östman, 2008).

Economic issues were somewhat difficult for these students to describe, and in the social aspect we could see expressions at a structural level rather than an individual level (cf. Belle, 2006; Feagin, 1975).

The interesting findings of this study are the specific relationships between understandings, emotions and values. In the ecological aspect, the question about their feelings made some of the students write more about their knowledge than the actual question about knowledge made them do. According to Lifmark (2010) emotions and value judgments are complexly interwoven. An ethical theory such as used by Lifmark can assist in interpreting the results of this and similar studies. The more complex understanding the students describe the more emotions and values they also seem to express. When we analyze the content of emotional expressions and value statements, we see that emotional expressions are more present in understandings of simple relations of all aspects as well as in understandings of the social aspect in total. Value statements occur more frequently in both the ecological and the economic aspects, and also, more specifically, in the more complex or relational understanding of these aspects. The development of value-driven education within ESD (cf. Öhman & Östman, 2008) needs to pay attention to how emotions and values form part of the students' understanding.

Coming to the results of the study concerning student participation, a few conclusions can be drawn. First we had a high percentage of answers, many of them rich in content. Second, some students spontaneously said, when answering the questionnaire: "No one has asked for our opinions like this before" and "I think these are really important questions but we have not really discussed them in class", which indicates that the writing in itself was a moment of meaning making. Important questions for ESD research and development are increasing participation (UNESCO, 2005) and empowering of children (Engdahl & Rabusicová, 2010; McKenzie, 2006; Payne, 1998), which this study also emphasize through its methodological approach. Third, some teachers in the classes said "Oh, now I got some new ideas of how to approach this issue of sustainable development!" This was both referring to the questions in the questionnaire and how their students dealt with it. This was a non-intentional by-product of the research, which was interesting to observe. The results of the study are in line with the phenomenographic theory of developing learning through a deeper understanding of students' thoughts (Doverborg & Pramling, 1992; Helldén, 1994; Marton & Booth, 2000). The choice of individual questionnaires was, of course, meant to give every student the opportunity to express their thoughts (Cohen, et al., 2010), but the personal empowering impact for the participants was a bit unexpected.

Conclusions and implications

The results show that knowledge, emotions and values were integrated in young students' expressions of SD. This means that ethical issues form an integrated part of ESD and could be a possible pedagogical starting point from which to involve students. Some of the students show a complex, relational understanding, but, in general the students' show a level of understanding which is at a less complex level, indicating problems in describing relationships between the aspects. Furthermore, the results show that complex understandings and values are related, which is important for decision making (cf. Dawidowicz, 2010; Hjorth & Bagheri, 2006; Palmberg & Kuru, 2000). Awareness about the formation of different emotions and values in relation to SD seems to be important for the development of ESD, which needs further research.

Considering the complex area of ESD, teachers' awareness about the importance of understanding relationships and systems thinking must be enhanced. We also wonder, together with Alerby (2000), if the Swedish school is a milieu where children's experiences and thoughts are given enough attention. This leads to another conclusion that deals with

- Doverborg, E., & Pramling, I. (1992). Att förstå barns tankar, Metodik för barnintervjuer: Almqvist & Wiksell Förlag.
- Ekborg, M. (2005) Is heating generated from a crematorium an appropriate source for district heating? Student teachers' reasoning about a complex environmental issue. *Environmental Education Research*, 11(5).
- Ekborg, M., Ottander, C., Silfver, E., & Simon, S. (2012). Teachers' Experience of Working with Socio-scientific Issues: A Large Scale and in Depth Study. *Research in Science Education*.
- Engdahl, I., & Rabusicová, M. (2010). Children's Voices about the State of the Earth and sustainable Development: OMEP, World Organisation for Early Childhood Education.
- Feagin, J. R. (1975). Subordinating the poor, welfare and American beliefs: Prentice-Hall, Inc.
- Furnham, A. (1987). School Children's perception of economic justice: A cross-cultural Comparison. *Journal of Economic Psychology*, 8, 457-467.
- Furnham, A., & Cleare, A. (1988). School children's conceptions of economics: Prices, Wages, Investments and Strikes. *Journal of Economic Psychology*, 9, 467-479.
- Grace, M & Ratcliffe, M (2002). The science and values that young people draw upon to make decision about biological conservation issues. *International Journal of Science Education* 24(11).
- Hartman, S., & Torstensson-Ed, T. (2007). Barns tankar om livet.: Natur & Kultur.
- Helldén, G. (1994). Barns tankar om ekologiska processer: Liber utbildning.
- Hjorth, P., & Bagheri, A. (2006). Navigating towards sustainable development: A system dynamics approach. *Futures*, 38(1), 74-82.
- Jensen, B. B., & Schnack, K. (2006). The Action Competence Approach in Environmental Education. *Environmental Education Research*, 12(3-4), 471-486.
- Jonsson, G. (2007). Mångsynthet och mångfald. Luleå tekniska universitet, Luleå.
- Kronlid, D. (2005). Miljöetik i praktiken: Studentlitteratur.
- Kronlid, D. (2009). Climate Capabilities and Climate Change Education Research. *Southern African Journal of Environmental Education*, 26(Sigtuna Think Piece 2).
- Lifmark, D. (2010). Emotioner och värdegrundsarbete - om lärare, fostran och elever i en mångkulturell skola. Umeå University.
- Littleddyke, M. (2008). Science education for environmental awareness: approaches to integrating cognitive and affective domains. *Environmental Education Research*, 14(1), 1-17.
- Lotz-Sisitka, H. (2007). An open dialogue with Think Pieces and Feature. Articles on Learning in a Changing world in This Journal, Editorial. *Southern African Journal of Environmental Education*, 24, 8-18.
- Lotz-Sisitka, H. (2009). Why Ontology Matters to Reviewing Environmental Education Research. *Environmental Education Research*, 15(2), 165-175.
- Loughland, T., Reid, A., & Petocz. (2002). Young People's Conceptions of Environment: A phenomenographic analysis. *Environmental Education Research*, 8(2), 187-189.
- Lundegard, I., & Wickman, P.-O. (2007). Conflicts of Interest: An Indispensable Element of Education for Sustainable Development. *Environmental Education Research*, 13(1), 1-15.
- Lundholm, C. (2007). Pricing Nature at What Price? A study of undergraduate students' conceptions of economics. *Southern African Journal of Environmental Education*, 24, 126-140.
- Löfquist, L. (2010). Tillväxtens framtid: Studentlitteratur.
- Magnorn, O. (2007). Reading Nature- Developing ecological literacy through teaching. Linköping University.

- Maiteny, P. T. (2002). Mind in the Gap: summary of research exploring 'inner' influences on pro-sustainability learning and behaviour. *Environmental Education Research*, 8(3), 299-306.
- Marton, F., & Booth, S. (1997). *Learning and Awareness*: Erlbaum.
- McKenzie, M. (2006). Three Portraits of Resistance: the (Un)making of Canadian Students. *Canadian Journal of Education*, 29(1), 199-222.
- Millar, R., & Osborne, J. (1998). *Beyond 2000. Science education for the future*. London: Kings's College London, School of Education.
- Mogensen, F., & Schnack, K. (2010). The action competence approach and the 'new' discourses of education for sustainable development, competence and quality criteria. *Environmental Education Research*, 16(1), 59-74.
- Nussbaum, M. C. (2001). *Upheavals of Thought: The Intelligence of Emotions*. Cambridge: Cambridge University Press.
- Öhman, J., & Östman, L. (2008). Clarifying the Ethical Tendency in Education for Sustainable Development Practice: A Wittgenstein-Inspired Approach. *Canadian Journal of Environmental Education*, 13(1), 57-72.
- Osborne, J., & Dillon, J. (2008). *Science education in Europe: Critical reflections. A report to the Nuffield foundation*.
- Palmberg, I. E. a. Kuru, J. (2000). Outdoor Activities as a Basis for Environmental Responsibility. *The Journal of Environmental Education*, 31(4), 32-36.
- Payne, P. G. (1998). Children's conceptions of nature. *Australian Journal of Environmental Education*, 14, 19-26.
- Ratcliffe, M., & Grace, M. M. (2003). *Science education for citizenship. Teaching socio-scientific issues*. Maidenhead: Open University Press.
- Rickinson, M. (2001). Learners and Learning in Environmental Education: a critical review of the evidence. *Environmental Education Research*, 7(3).
- Rickinson, M., & Lundholm, C. (2008). Exploring students' learning challenges in environmental education. *Cambridge Journal of Education*, 38(3), 341-353.
- Rickinson, M., Lundholm, C., & Hopwood, N. (2009). *Environmental Learning; Insights from research into the student experience*: Springer.
- Roberts, D. A. (2007). Scientific literacy/ Science literacy. In S. K. Abell & N. G. Lederman (Eds.), *Handbook of research on science education* (pp. 729-780): Mahwah: LEA.
- Skolverket (2002). *Hållbar utveckling i skolan*. Stockholm.
- Skolverket [The Swedish National Agency for Education] (2011). Curriculum for the compulsory school, preschool class and the leisure-time centre http://www.skolverket.se/2.3894/publicerat/2.5006?_xurl_=http%3A%2F%2Fwww4.skolverket.se%3A8080%2Fwtpub%2Fws%2Fskolbok%2Fwtpubext%2Ftrycksak%2FRecord%3Fk%3D2687 [Retrieved 2012-09-12]
- Sporre, K. (2010). What Name Are We? Global Citizenship Education for Whom? In K. Sporre & J. Mannberg (Eds.), *Values, Religions and Education in Changing Societies*: Springer.
- Stenmark, M. (2000). *Miljöetik och miljövard: Studentlitteratur*.
- Sternäng, L. (2011) *Ethical and normative reasoning on climate change - Conceptions and solutions among students in a Chinese context*. Stockholm University
- Svensson, M. (2011). *Att urskilja tekniska system-didaktiska dimensioner i grundskolan*. Linköping University.
- Trost, J. (2007). *Enkätboken: Studentlitteratur*.
- Uljens, M. (1989). *Fenomenografi- forskning om uppfattningar: Studentlitteratur*.

- United Nations (2002). World Summit on Sustainable Development- Implementation plan. Johannesburg.
- UNESCO (2005). UN Decade of Education for Sustainable Development Paris.
- Walker, K & Zeidler, D (2007) Promoting Discourse about Socioscientific Issues through Scaffolded Inquiry. *International Journal of Science Education* 29(11)
- Walshe, N. (2008). Understanding students' conceptions of sustainability. *Environmental Education Research*, 14(5), 537-558.
- Vetenskapsrådet (2002). Forskningsetiska principer inom humanistisk-samhällsvetenskaplig forskning Vetenskapsrådet (2011). God forskningssed. Stockholm.
- Wylie, J., Sheehy, N., McGuinness, C., & Orchard, G. (1998). Childrens Thinking about Air Pollution: a systems theory analysis. *Environmental Education Research*, 4(2), 117-137.

Öğrencilerin Sürdürülebilir Kalkınma ile İlgili Düşüncelerinin ve Değerlerinin Belirlenmesi

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Özet

Bu makalede 10-12 yaşındaki İsveçli öğrencilerin sürdürülebilir kalkınma ile ilgili düşüncelerini ve değerlerini belirlemek amacıyla yapılmış çalışmanın sonuçları sunulmaktadır. Açık uçlu sorulardan elde edilen bulgular fenomenografik yaklaşıma dayanan içerik analizi yoluyla analiz edilmiştir. Sonuçlar sürdürülebilir kalkınmanın üç boyutu ile ilgili öğrencilerin anlama ve değer düzeylerinde önemli farklılaşmaların olduğunu göstermektedir. Üç boyut arasındaki farklılık dikkate alınmış ve öğrencilerin bu üç boyut arasındaki ilişkiyi anlamakta zorlandıkları belirlenmiştir. Ayrıca öğrenciler anlayış ve değerleri sık sık birbirleriyle iç içe ifade etmişlerdir. Farklılıklar, kompleks anlamlandırmalar, düşünceler ve değerler etik ve sistemli düşünme üzerine odaklanarak tartışılmıştır.

Anahtar Kelimeler: Sürdürülebilir kalkınma için eğitim, anlama düzeyi, değerler, öğrenci bakış açısı, etik yansıma.

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