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ENVIRONMENTAL RESPONSIBILITY: A CASE STUDY AMONG SIXTH GRADERS

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Abstract

The purpose of this study was to clarify sixth graders' (aged 12-13, N=87) perceptions about environmental problems and environmental responsibility. Four classes from two Finnish primary schools participated in the study. In the first case (n=62) which focused more on perceptions about environmental problems, the data was collected using a questionnaire. It was found that sixth graders perceived the most important environmental problems as being littering, pollution, climate change, and how much we waste. Pupils also highlighted environmental responsibility. Their answers revealed a wide range of ways for protecting the environment such as recycling, sorting, and favoring the use of environmentally cleaner vehicles. The second case more closely examined responsibility for the environment; with the aid of a picture/image to stimulate their perceptions, pupils were able to recognize environmental problems. The data comprised of writings in connection with the image (n=25) and interviews (n=12). Pupils were categorized into four groups according to their perceptions about responsibility: environmental citizens, daily active persons, free riders and disinterested persons. Environmentally responsible behavior in sixth graders was most significantly influenced by the home, being dependent upon which action model of sorting and recycling was in use there. Both data collection methods supported each other, providing similar results. The sixth graders were not only well aware of environmental problems, they were also committed to take the environment into account and act in an environmentally friendly way. In conclusion, sixth graders' environmental education could include discussion about actions on behalf of the environment, but additional sensitization towards the environment is still needed for some pupils.
Key words: *environmental education, environmental problems, environmental responsibility*.

Introduction

Generally, most environmental education models include four dimensions: sensitivity, knowledge, action, and participation (e.g. Hungerford & Volk, 1990; Palmer, 1998). Palmer (1998) recommended that all components of an environmental education model should be addressed in a systematic way. It means that education about the environment, in the environment and for the environment should run side by side, interlinked with issue-based, action-orientated, and socially critical education. At the beginning of education sensitivity should be aroused, with the aim of finally attaining the skills to participate in society as a globally responsible citizen. Sensitivity is more prominent in young children, older students ponder more on their actions and participation. (see Palmer, 1998.) According to Hungerford and Volk (1990), environmentally responsible behavior is gradually developed by entry level variables, including

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the ability to experience and enjoy nature and knowledge about ecology; ownership variables, such as in depth-knowledge and a personal investment in the environment; and empowerment variables like the natural locus of control and intention, and the ability to act on behalf of the environment.

The whole rationale underpinning arguments for sustainable development is the prevention of damage to the environment (Summers, Kruger, Childs, & Mant, 2000). Every environmental problem has causes, effects as well as solutions. Environmental education originally emerged to avoid environmental problems, on the other side environmental problems should be discussed in environmental education. Previous studies in this field concerning environmental problems have often focused on examining conceptions of climate change (e.g. Francis, Boyles, Qualter, & Stanisstreet, 1993; Andersson & Wallin, 2000; Shepardson, Niyogi, Choi, & Charusombat, 2009). These studies have revealed that students of different ages do not understand the complete picture of climate change, having many preconceptions and misconceptions about the phenomena. Shepardson, Niyogi, Roychoudhury and Hirsch (2011), stated that in order to understand climate change, students must first understand climate as a system and the human and natural factors affecting changes in this system.

Concerning environmental problems in general, results from the study of Michail, Stamou and Stamou (2007) revealed that even some teachers do not distinguish between the causes and consequences of different environmental problems. Population growth, human rights, international trade and pollution were viewed to be the most significant components of sustainable development, while biodiversity, international trade, unwarranted economic subsides and global warming were the least important among teachers of technology (Elshof 2005). According to Elshof (2005) this was not surprising, given that these issues may be perceived as being more abstract and distant from commonly held notions of sustainable behavior.

In the study of Tikka, Kuitunen and Tynys (2000), female students tended to show more responsibility toward the environment than male students. As a rule, people who came from the most densely crowded regions seemed to be most worried about the state of the environment, whereas students who had grown up on farms spent the greatest proportion of their time on nature-related activities. According to Chiu (2010), there were gender differences in multiple desirable outcomes regarding the effect of personal and social-oriented attitudes, boys tending to integrate and girls tending to contrast. There was also a slight difference between genders in the amount of cultural support needed for the development of the integrating effect, girls needing more cultural support than boys. Due to socialization, differences in science-related attitudes and learning outcomes were accounted for more by culture than by gender. In the study of Uitto, Juuti, Lavonen & Meisalo (2006), ninth graders' attitudes and values were linked with each other and their rejection of environmental problems, negative attitudes and anthropocentric values were closely correlated.

Palmberg and Kuru (2000) found that outdoor activities were a basis for environmental responsibility. Their study focused on 11- and 12 year-old-pupils in Finland, nature experiences developed pupils' self-confidence and feeling of security. According to Grodieska, Stepska, Niesszporek and Bryda (2006), six-years-olds were already familiar with the basic notions of environmental responsibility and could identify improper behavior with regard to the environment. Their parents showed favorable environmental attitudes, but were not always willing to change their habits or make sacrifices for environmental conservation. Past research has shown that a sense of personal responsibility for taking environmental action motivates pro-environmental actions (e.g. Fransson & Gärling, 1999; Kaiser & Shimoda, 1999), a finding that is in accord with the value-belief-norm (VBN) model (e.g. Stern, 2000). Stern (2000) argues that the relationship between values and environmental action is mediated by people's beliefs; beliefs about the threats to the environment and how people perceive their ability and responsibility to take action to address them. Young people, although pessimistic about the environment and

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about their ability to address environmental problems (Connell, Fien, Lee, Sykes, & Yencken, 1999), were more pro-environmental (i.e. had higher pro-environmental intentions and behavior), had a greater belief that it is the responsibility of the community to protect the environment and a greater sense that their actions could make a difference to the environment. Attributing greater responsibility to the community was related to more positive environmental intentions and actions, whereas attributing greater responsibility to the government for environmental protection was related to more negative environmental intentions and behavior. In addition, young people with higher environmental concern and knowledge and a more internal locus of control in relation to the environment, reported stronger pro-environmental intentions and behavior and less environmentally harmful behavior.

According to the study of Skamp, Boyles and Stanisstreet (2013) science education could make a real contribution to the adoption of pro-environmental behavior, if teachers saw their role as being wider than the development of science understanding and science inquiry skills. Fielding and Head (2012) highlighted that young people with higher environmental concern and knowledge, and more internal locus of control in relation to the environment, reported stronger pro-environmental intentions and behavior and less environmentally harmful behavior.

This study focuses on pupils' perceptions on environmental problems and their environmental responsibility. At present, the state of the environment is a significant global problem and in order to solve environmental problems, knowledge, information and responsible behavior are required. Environmental education at schools is one of the major sources of information for children; their right to participate in this form of education is supported by the school curricula, legislation and several national and international agreements. Despite this, involving them in the development of their own immediate surroundings has not become a daily part of the school curriculum and an established method within the schools.

Research Questions

The aim of this study is firstly, to analyze sixth graders' perceptions about environmental problems and secondly, to outline sixth graders´ environmental responsibility. Research focuses on the following questions:

What are sixth graders' perceptions about environmental problems?

What are sixth graders' perceptions about environmental protection?

What kind of environmental responsibility do sixth graders possess?

Methodology of Research

This study belongs to the framework of environmental education. In an authentic school context, this study examined learning processes in which pupils perceptions of environmental problems and environmental responsibility were analyzed. The environmental problems and environmental responsibility included in the research belong to the curriculum and yearly schedule of the schools, thus following their daily routines (see National Board of Education, 2004). The participants of this study were pupils (N=87) from four classes at two rural primary schools in Eastern Finland. The pupils were aged between 12-13 years old. The research followed the design of a case study, being descriptive and analytical by nature (Gomm, Hammersley, & Foster, 2000; Stake, 2000.)

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Instrument and Procedures

In the first case study (n=62) which focused more on environmental problems, data was collected using a questionnaire. The pupils answered questions concerning environmental problems and environmental protection; it took 30 minutes to fill in the questionnaire. After this they were asked to list the three most significant environmental problems in Finland and the three most significant environmental problems of the Globe. Pupils were then asked to write why we have such problems, what is their impact on the environment, and how they thought these problems could be solved.

In the second case study, pupils' responsibility for the environment was examined in more detail; the data comprised of essays (n = 25) and interviews (n = 12). The pupils were asked to write an essay: *"How can I impact the environment"*. A picture (Figure 1) which included the following themes was used to stimulate pupils' perceptions: traffic, the use of water, recycling and sorting, consumer options, water bodies and forests. The picture also included social aspects of environmental education and sustainable development: local paper, demonstration, meetings and a municipal memory board. Pupils wrote for the duration of 30-45 minutes.

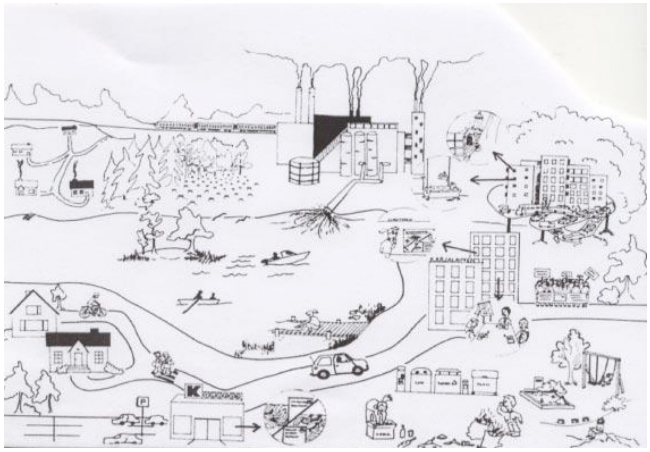

Figure 1: Pupils (n=25) wrote about environmental problems with the aid of the picture.

Interviews were organized in the week following the written work. Prior to the interview, all the essays were read through. The interview was informal; pupils were asked what they had written about the picture. In order to keep it as open and adaptable as possible to the interviewee's nature and priorities, no predetermined questions were included. The interviews lasted 20-30 minutes and all of the pupils (n=12) took part who had got permission from their parents to participate in the study.

These three data collection methods (questionnaire, essays and interviews) were used for a specific purpose; namely for capturing the pupils' perceptions of environmental problems and environmental responsibility, and to achieve as complete a picture of these perceptions as possible. According to Stake (2000), this kind of case study typically combines data collection methods. Open questions enabled the pupils to capture their own style of writing, providing data that had been personally produced by the pupils, using concepts that were already familiar to them. Essays reveal pupils' perceptions through their own individual way of describing and interpreting issues. In addition, writing supports relevant interpretation as the scientific phenomena is related to some particular context which makes descriptions more concrete and content based (Ellis, Taylor, & Drury, 2005.).

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Data Analysis

In this study, the questionnaire, essays and interviews were used and analyzed to complete the validity of the research and to provide the pupils with different ways of representing their perceptions about environmental problems and environmental responsibility. Content analysis was chosen to analyze the pupils' questionnaires, essays and interviews in order to find out the things that pupils connected to environmental problems, as well as to reveal signs of responsibility and the variances in their answers. The data coding and the approach to the data analysis was in every case inductive, which is typical for a naturalistic inquiry (see Stake, 2000). Data analysis consisted of scoring and grouping descriptions present in the questionnaire, essays and interview. The themes were put into main categories: similar answers – showing that pupils had similar perceptions about environmental problems and environmental responsibility, were included in the same category.

For example subcategories **'**cause' and "response" included pupils' descriptions as to why we have such kinds of environmental problems; 'impact on the environment' included pupils' descriptions about how these environmental problems impact the environment; 'response' included pupils' descriptions as to how they could solve these environmental problems. The two authors constructed the primary codes which were based on the individually analyzed data. The analysis unit could be a single word or a sentence representing the idea related to some concept under study. In this study, essays, questionnaire and interviews were also analysed qualitatively because the number of sixth graders. Research question was answered from several perspectives because the variety of data sources. Analysis of the questionnaire questions was done by triangulating the data to expand the richness of the answers and reduce bias. In this study the data triangulation increases the confidence in research data. The findings from all of the methods draw the same similar conclusions then the validity has been established.

Results of Research

Case 1: Environmental Problems

Table 1 presents sixth graders' perceptions of the most significant environmental problems in Finland and the frequency of each concerned. The subcategories **'**causes' included pupils' descriptions as to why we have such kinds of environmental problems; 'impact on the environment' included pupils' descriptions about how these environmental problems impact the environment; 'response' included pupils' descriptions as to how they could solve these environmental problems. Examples of typical descriptions given by the pupils were presented. The categories: 'environmental toxins' and 'ozone depletion' were excluded from the table because less than 10 descriptions were related to them. The four most significant environmental problems in Finland, according to the pupils, were littering, air pollution, climate change and waste. Pupils mentioned that human behavior, traffic and factories cause environmental problems which, in turn, have an impact on animals as well as plants. Pupils perceived that public transport would be a solution to environmental problems.

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Table 1. Pupils' descriptions about the most significant environmental problems in Finland.

Environmental problem	Frequency	Causes	Impact on the environment	Response	Example of pupils' descriptions
Littering	40/62	-Human behaviour	-Animals suffer -Reduce human well-being	-No littering	*"People throw garbage into the woods and don't put them into the bin. Some of the waste does not decompose, and some of the debris can be toxic." Boy24*
Air pollution	36/62	-Traffic -Factories	-Plants and animals suffer -Damage nature	-Public transport	*"Gases of cars, rockets, factories and many other substances give off toxigents into the air. When the toxins go into the air, the air becomes polluted and the air is dirtier. "Girl4*
Climate change	30/62	-Traffic -Factories	-Ice melts	-Public transport	*"Factories give off some emissions as well as travel by car and aeroplane. Climate change is in process." Girl11*
Amount of waste	26/62	-Human behavior		-Sorting -Recycling -Re-using	*"People throw away waste without sorting. They do not think about recycling possibilities: old clothes can be sold, some of these items could be repaired." Girl5*
Non-renewable natural resources	18/62	-Over consumption (energy, water, oil) -Deforestation		-Recycling	*"Consumption of non-renewable natural resources which were born a long time ago. There are dwindling natural resources that soon may be no more. "Girl18*
Loss of biodiversity	14/62	- Expansion of dumping	-Habitat loss	-Protection of forest	*"New dumps replace forest and farms, the animals loose their homes." Boy24*
Water pollution	11/62	-Waste -Oil		-Water purification	*"When trash, debris, oil and other fuels are thrown into the water the waters perish, e.g. the Baltic Sea, because of a contaminated water area." Girl7*

Pupils' descriptions about global environmental problems are shown in Table 2. Subcategories 'causes' included pupils' descriptions as to why we have such kinds of environmental problems; 'impact on the environment' included pupils' descriptions about how these environmental problems impact the environment; 'response' included pupils' descriptions as to how they could solve these environmental problems. We present examples of typical descriptions

given by the pupils. The categories: 'environmental toxins', 'ozone depletion', 'desertification' as well as 'eutrofication' were excluded from the table because there were less than 10 descriptions of them. At the global level, the most significant environmental problems mentioned were air pollution, climate change, littering and loss of biodiversity. Human behavior, traffic and factories cause global environmental problems that have an impact on animals as well as plants; rainforests disappear and there are some natural disasters. Pupils wrote that recycling, forest protection, as well as public transport, would be the solution to global environmental problems.

Table 2. The most significant global environmental problems according to sixth graders.

Environmental problem	Frequency	Causes	Impact on the environment	Response	Descriptions
Air pollution	38/62	-Traffic -Factories		-Public transport	*"Car exhaust pipes produce bubbly gas the atmosphere will be polluted." Girl16*
Climate change	34/62	-Transport -Amount of CO_2 -Factories	-Species extinction -Natural disasters -Melting glacier	-Limitation of CO_2	*"The use of cars has increased the amount of carbon dioxide in the atmosphere. → the average temperature rises, glaciers melt." Boy6*
Littering	32/62	-Human behavior	-Health problems -Harmful to animals	-Recycling	*"People are littering the environment. → the environment becomes dirty." Girl1*
Loss of biodiversity	25/62	-Expansion of dumps	-Rainforest disappears -Habitat loss	-Protection of forest	*"Machines are human inventions which destroy forests, are used for building and such stuff. They also consume gas." Boy5*
Dwindling natural resources	25/62		-Disappearance of forest (rainforest) -Less oil, energy	-Economical use of resources	*"People are using natural raw materials and are wasting them. Natural resources will be completely exhausted if they are wasted, "Boy8*
The amount of waste	24/62	-Over consumption		-Recycling	*"There is so much waste in the environment because of overconsumption." Girl1*
Pollution of water	14/62	-Oil garbage	-Eutrofication -Loss of ozone layer	-Water purification	"*Waters become polluted when people drop toxic substances into them. → Aquatic organisms are reduced. "Boy13*

Six graders had a basic understanding of both national and global environment problems as well as human interaction within it. Sixth graders considered that the most important environmental acts were linked to protection of the environment and saw that it was possible for them to personally influence this through their everyday life. Pupils had some misconceptions concerning national and global environmental problems. For example, some pupils wrote that climate change is the same as ozone depletion; also that the layer of greenhouse gases is the same as ozone depletion. Two pupils mentioned that the changes in ozone depletion also cause changes in the Earth's temperature:

"Because people drive cars, the layer of oxides causes weakness in the atmosphere. Hair spray – some layer in the Earth weakens." (Girl22)

Some of the pupils also linked littering to climate change, writing that garbage in nature causes climate change; this was not however explained. Pupils were also unable to write specifically what issues are harmful to nature, nor were they able to clarify whether greenhouse gases lead to climate change.

"The reason for climate change is garbage, exhaust fumes, factories and harmful issues" Girl17

"Because people do not use garbage (bins) – it weakens the climate." Boy9.

Case 2: Responsibility for the Environment

In the second case, pupils' were categorized into four groups: environmental citizens, daily active persons, free riders and disinterested people (Table 3).

Table 3. Classification of pupils' perceptions regarding environmental responsibility.

Classification of pupils'	Girl	Boy	Total
Environmental citizens	3	1	4
Daily active persons	5	2	7
Free riders	5	7	12
Disinterested people	1	1	2
Total	14	11	25

"Environmental citizens**"** (four pupils out of 27) described how people could have an impact on their environment. They also expressed how to act in a responsible way in their own everyday life and possessed a lot of information and knowledge on environmental issues, for example cause-and-effect relationships. In addition, these pupils had described environmental issues external to the picture. "Daily active persons**"** (seven students) differed from 'environmental citizens' in their absence of expressions concerning social impacts on their environment. They described many examples of how one can daily conserve nature and also offered many alternative models of action in their own everyday life. 'Daily active persons' had a fairly extensive knowledge of environmental issues and environmental problems. "Free riders" (12 pupils)

dealt with considerably less environmental practices and all of the environmental problems that they mentioned were based on the picture. Actions were not justified, their criteria were incomplete, and information on cause-effect relationships was unclear. "Disinterested pupils" (two students) had clear difficulties in addressing the environmental issues presented in the picture. They found only a few environmental problems and their arguments were very weak. Tables 4-7 present detailed categorizations of pupils' writings, interviews and responses concerning environmental problems.

"Environmental Citizens"

Pupils wrote about mobility, littering, recycling, everyday consumption, water and energy use, water bodies, forests and factories. In addition, each pupil's writings included environmental issues and environmental problems that were not visible in the picture. The most significant difference between the other groups was that the writings of "environmental citizens" included social impacts on the environment, for example, demonstrations or protests. "Environmental citizens" wrote and spoke about their own influence on the environment, acting responsibly both now and in the future. They were willing to act in a socially active way, for example, by participating in protests, and highlighted ecological and economic sustainability. This was reflected in these students' activities such as the use of bikes, sorting waste and recycling and being aware of the factors in consumer choice; they avoided, for example, the purchase of unnecessary goods. "Environmental citizens" had noticed a lot of environmental problems in the picture and even though some of the arguments were unrealistic, they clearly believed that they could have some influence. These pupils also had a lot of information about ecology and the environment (see Table 4).

Table 4. Classification of "environmental citizens' " (n=4) perceptions of environmental problems and environmental responsibility.

Environmental Problem	Response	Example of pupils' descriptions
Traffic -Private cars -Formula races and rallies	-Minimize exhaust gases -Environment-friendly transport	*"Well, I could go by bike more than by car because cars pollute."* *Essay, Boy15* *"I like to ride, then there is no pollution from the car. (Interview, Girl2)* *"I am opposed to rallies and formula races. They pollute the environment. "Essay, Girl1)*
Water and energy -Use of water -Use of energy	-The use of hot water -Water waste -Economical use of water -Minimize the use of energy	*"At home, I take a quick shower with cold water so that the water is not wasted and heating the water does not use up energy." (Essay, Girl3)* *"My mother always says that you should not put warm products into the fridge." (Interview, Girl3)*
Recycling and sorting **-**Amount of waste -Over-consumption	-Waste separation -Sorting paper, cardboard, organic waste, and glass -Useable goods circulated	*"If everyone's garbage bags of debris go into the refuse trip - it harms the environment" (Essay, Girl2)* "*Well my little sister or cousin uses my clothes, and sometimes we sell clothes at a yard sale."(Interview, Girl3)* *B: "Well in my home, paper, glass and bio-waste are recycled.* *I: "Why is it important to recycle?"* *B: "For example, glass and paper can probably still be used again." (Interview, Boy15)*
Consumption -Over-consumption	-Package size, -Organic products -Fair trade products	*I: "What is the difference when the same products are packaged in different container sizes? What size of container would you pick? "* *G: "Well, some stuff like shampoos might potentially be bigger. But then, what I don't use so much I stick to smaller packages. "(Interview, Girl3)* *"For example, I use hair sprays that do not reduce the ozone layer." (Essay, Girl3)*
Water bodies and forests -Deforestation	-Paper recycling -Welfare of animals -Policy instruments	*"Well earlier, birds or squirrels had nests but now these are a thing of the past." (Interview, Girl2)* *"I would show a view of nature, so that people could understand."* (*Essay, Boy15*)

"Daily Active Person"

"Daily active persons" dealt with most of the environmental problems that were in the picture. All the pupils wrote about traffic, water, energy, recycling and sorting, consumption, water bodies and forests. "Daily active persons" very well took the environment into account in their daily lives, but were not prepared to act in a socially active way; not all the pupils were willing to make the extra effort. In contrast, however, consumer education seemed to be taking place even better in this group than in the first group. The pupils' operational work was environmentally responsible, but it was difficult to say how responsible they would be in the future. They highlighted ecological and economic sustainability in the activities of their daily life by sorting waste and recycling and a major contributor to this was the home. "Daily active persons" were not as sensitive as the "environmental citizens" although they had a positive attitude towards the environment and were fully aware of the consequences of their own actions.

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In addition, they did not show any particular belief in their own ability to influence nor did they see their own activities as being mandatory. For example this was reflected in the fact that for the future they took the sorting of waste and recycling for granted. (Table 5.)

Table 5. Classification of "Daily active persons' " (n=7) perceptions of environmental problems and environmental responsibility.

Environmental problem	Response	Examples of pupils' descriptions
Traffic	-Public transport -Sharing car rides -Walking, cycling	*"Well, I would walk whenever I could, I would go by bike, why not? Walking or cycling does not pollute. "(Essay, Girl8)* *"Pollution will also be reduced if I choose the bus; many people can travel the same distance and the air is still only polluted by one vehicle." (Essay, Girl7)*
Water and Energy	-Ecological use of water and energy -Turning off lights	*"So when I go to the shower… I turn off the water when I put shampoo on my head. So I won't waste water, which takes so much energy from nature. "(Essay, Girl8)* *"Clean water is important. We have the opportunity to have clean water. Now in Finland we have clean water, so I guess it should be used sparingly. "(Essay, Girl7)*
Recycling and sorting	-Waste sorting -Recycling -Waste collection	*"I want to recycle in the future if it is easy. Sorting waste depends on how close the recycling center is." (Essay, Girl7)*
Consumption	-Organic products	*"I do not eat foreign fruits or other foods, meats, and cheeses. Finnish foods are domestic products and do not use unnecessary preservatives." (Essay, Girl8)* *I: "Why do you use organic products?"* *B: "Well, they are healthier; it is more expensive, but they must be better. At least at home we have organic all the time. "(Interview, Boy 16)*
Water bodies and forests	-Avoid littering -Paper cycling -Watershed protection	*"Many of the animals have nests in trees."(Essay, Girl4)* *"Cutting clearings is obviously not a good thing. There should always be an area for some of the seedlings to grow for the forest to rejuvenate. "(Essay, Boy16)* *"Wood is a Finnish export product, but logging operations should be limited, so that forests should be left for the future." (Essay, girl 7)*

"Daily active persons" highlighted waste sorting, recycling, as well as waste collection, but no reasons were given to support these actions. The interview revealed that every child recycled paper, cardboard, glass and organic waste; pupils were able to take the environment into account in their everyday life. There were, however, noticeable flaws in this information/data. For example, one of the pupils did not want to recycle in the future; some wrote that sorting waste depends on how close the recycling center is. Pupils were aware of the importance of their own actions and the protection of the environment. "Daily active persons" were not categorized in relation to the social impact of their ways, but with regard to how the environment was influenced through the actions of their everyday life. The pupils reacted negatively to industry because of pollution, but not all the pupils believed in their own ability to influence. (see Table 5.)

"Free Riders"

These pupils wrote about traffic, recycling and sorting, as well as water bodies and forests. These environmental problems were linked with the picture. "Free riders" rather thought in terms of 'black-or-white' and presented no arguments. (Table 6.)

Table 6. Classification of "Free riders' " (n=12) perceptions of environmental problems and environmental responsibility.

Environmental problem	Response	Example of pupils' descriptions
Traffic -Private cars	-Public transport	*"We make short distances on foot or by bike; for long journeys we would use public transport, a bus or the subway." (Essay, Girl13)* *"Cars would be reduced if driving is prohibited and people should go by bike or on foot." (Essay, Boy21)*
Water and Energy	-Economical use of water and energy -Turn off lights	*"I use less water in the shower." (Essay, Boy22)* *"Water should not be consumed too much. Lakes and ponds evaporate." (Essay, Boy23)* *"Well, turn off the lights." (Interview, Boy22)*
Recycling and sorting	-Sorting	*"Take the garbage and sort it into the right categories, that ...?" (Essay, Girl11)* *"We have recycled goods." (Essay, Boy23)* *"I do not. - If you do not even feel like it. "(Interview, Girl11*)
Consumer Options	-Fair trade organic products	*I:"What products do you buy in stores?"* *B: "Well, at least we have fair trade bananas and organic products."* *I: "Well, what choice will work?"* *B: "Well, I do not know, but I take organic products."(Interview, Boy18)*
The water bodies and forests	-Recycling -No factories	*"I do not wash mats in the lake because the detergents would go into it and contaminate the water." (Essay, Girl12)* *"Water pollution: fish, seals, and other animals suffer." (Essay, Girl10)* *I: "What is the impact on foresting?"* *B: "Well forests will be reduced." (Interview, Boy22)*

Pupils highlighted sorting waste and recycling; they knew how and what should be recycled but they could not justify this. A sense of meaninglessness was widespread and their own actions were perceived to have a negligible role. Two of the interviewed pupils highlighted organic products and fair trade but they could not justify their choice. The writings of "Free riders" did not include any social impacts on the environment and although the pupils recognized pollution they did not write about how to act to prevent it. The eight pupils who wrote about littering highlighted the aesthetics of nature. These pupils' writings included less knowledge about environmental issues and problems. Pupils were concerned about the environment, but in practice they do not want to act on its behalf. Pupils did not give any arguments as to how to critically evaluate consumer choices, and some of their arguments were unrealistic. (see Table 6.)

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"Disinterested Persons"

The pupils only wrote about a few elements from the picture. Neither of them had any social impact on the environment; their writings were short, their arguments weak or totally absent. Pupils drew attention to lakes, factories, boat traffic, and washing mats (Table 7.)

Table 7. Classification of "Disinterested pupils" (n=2) perceptions of environmental problems and environmental responsibility.

Environmental problem	Response	Example of pupils' descriptions
Traffic	-No argumentation	*I: "How do you travel short distances?"* *G: "bike or on foot."* *I: "Why?"* *G: "Well, I do not really know" (Interview, Girl 14)*
Water Energy	-Turning off the lights	*I: "What about how to save electricity at home?"* *B: "Well, turn off the lights if you are going (out) somewhere." (Interview, Boy 25)*
Recycling sorting	-Recycling	*I: "How about at home, what about waste?"* *G: "It's thrown into the garbage."* *I: "Where do you put your papers?"* *G: "Well yes, they are later recycled."* *I: "What about glass?"* *G "It also recycled." I: "What about metal cans?"* *G: "Well, I do not know."* *I: "What about the batteries."* *G: "also them."(Interview, Girl14)*
Consumption	-No argument	*I: "What is the trademark of the products you choose?"* *B: "Oh, why? I do not know. I never really buy. "(Interview, Boy25*)
Water and forest	-No social responsibility	*I: "Do you think that a demonstration would make a difference?"* *B: "Well, I guess not"* *I: "Could you see yourself participating in that sort of demonstration?"* *B: "No." (Interview, Boy25)*

These two pupils did not show any interest in environmental issues, and in their daily life their actions were not always environmentally responsible; in addition, their information on environmental issues had significant shortcomings. Pupils also did not critically evaluate their consumption, how this had an impact on the environment, and did not realize the objectives of sustainable development. In this group, the influence of the home was negative; pupils did not recycle at home nor did they believe in recycling in the future. Their attitudes and behavior towards environmental issues were neither particularly positive nor moderate. (see Table 7.)

Discussion and Implications for Teaching

This study has given an overview of pupils' perceptions about environmental problems and their environmental responsibility. Sixth graders highlighted the same national and global environmental problems: air pollution, climate change, littering, loss of biodiversity and waste.

Sixth graders also gave the reasons and consequences of environmental problems. The study was able to identify environmental problems that were already well understood and those that were less so. Sixth graders highlighted that human effects on the environment have caused environmental problems; that environmental problems have occurred due to technological development, and unconsciously usage of natural resources. The emergence of these problems is caused by many environmental factors. One interesting point is that sixth graders' perceptions about environmental problems are contrary to the results of the study of Elshof (2005). Sixth graders did not mention such global environmental problems as, for example, human rights and population growth. According to Elshof (2005) these problems are not abstract and not distant from commonly held notions of sustainable behavior.

Although sixth graders knew about and named the main national and global environmental problems, they did have some misconceptions. For example, some of the pupils wrote that climate change and ozone depletion are the same thing; this is in line with the results of previous studies (Andersson & Wallin, 2000; Shepardson et. al., 2009, 2011). It is quite hard for students to differentiate between reasons and consequences; this is not unique because teachers also had the same problems (see e.g. Michail et. al., 2007). Sixth graders named multiple environmental problems including climate change. However, there are multiple factors in the background to climate change, and it was quite hard for the pupils to name these.

Sixth graders highlighted littering as a national and global environmental problem, and said that the state of the environment could be improved if people personally avoided littering and picked up trash. The "environmental citizens" and "daily active persons", in particular, were fairly optimistic about their own ability to influence the environment and there was clear indication of responsible environmental behavior in a few of the pupils' perceptions ("environmental citizens"). Although the perceptions of "daily active persons" were mainly environmentally responsible, their willingness lessened if they themselves had to make the effort. "Disinterested persons" did not show any particular interest in acting responsibly; similar results were found by Palmberg and Kuru (2000). According to their study, students had difficulties in thinking about actions that would help the environment when the magnitude of the environmental problem was that of climate change. In this study, more than half of the pupils ("free riders", as well as "disinterested pupils" in case 2) did not experience their own actions as being significant.

Data on the effectiveness of environmental attitudes and behavior is divergent (see Hungerford & Volk, 1990; Palmer, 1998). This study, however, showed that pupils who had knowledge of environmental issues and environmental problems also possessed more positive environmental attitudes and behaved responsibly. In practice, the connection between information and responsible environmental behavior will appear in the form of consumer choices and recycling. Sixth graders, whose home used organic products, highlighted the environmental impact of organic farming. The same appeared in recycling. Those pupils who were aware of the impact of recycling are considered likely to recycle in the future. Although recycling is one of the topics covered in school in studies on the environment and in the Natural sciences, quite a large proportion of the pupils were still confused about its effect. It would be easy to recycle waste if collection bins were located near home; if not, enthusiasm for recycling was weaker. For example, Grodieska et al. (2006) had the same results.

In the Finnish primary school curriculum (2004), Environmental education is closely related to consumer education. The aim is to guide pupils to critically evaluate the factors that affect consumer choices and preferences, being aware of the effects both in their own lives as well as in their surroundings. According to results of this study the will to act responsibly was apparent in those pupils who daily experienced environmentally responsible activities, and were willing to behave in a socially active way. Even in everyday life, the actors may be educational objectives of a plan considered fairly well met, because their daily life activities are mainly environmentally responsible. Responsible, "daily active persons" can also be made aware of

consumer choices in which they take into account environmental considerations. "Disinterested pupils" were still quite far from environmentally responsible civic behavior and did not show any particular signs that they would act responsibly in the future. Also, consumer choices and environmental considerations could be taken into account regarding the observed deficiencies, which could be partially explained by incomplete information.

In Finnish primary schools, Environmental and Natural studies best put sustainable development into practice. The topic of ecological sustainability is mainly associated with the syllabi of the Natural sciences; elements of economic, cultural and societal sustainability are found in almost all subjects. Environmentally responsible participation offers a chance to learn the competence that an environmental citizen needs; the knowledge, skills and willingness to act. Most of the pupils possessed sensitivity towards the environment, generally possessed a positive attitude toward environmental protection and had knowledge about environmental problems. However, the BIG question remains, how did pupils aim to act and participate in environmental issues. According to previous studies (e.g. Palmberg & Kuru, 2000; Skamp et al., 2013), scientific knowledge and understanding, although important, are by themselves usually limited in generally encouraging action on behalf of the environment. One possibility is to highlight pupils' sensitivity towards nature with the aid of fieldwork.

Sixth graders did indeed possess environmental responsibility, the object of the final stage of EE. They highlighted the decrease of biodiversity as a national and global environmental problem; this is important to human existence in the world, because biodiversity provides functioning ecosystems. Negative attitudes towards forest felling were possibly due to the fact that forest logging is a radical change in the environment and its negative effects seemed to the pupils to be bigger than they actually are. In reality, Finnish forests are not, however, cut down at random. In this study, pupils used explanations claiming that they had understood something because they could relate to it by reasonable arguments to common, or other familiar knowledge. It was also interesting that there were few arguments concerning human wellbeing, instead, pupils highlighted the wellbeing of animals. These research results provide useful background information about the environmental knowledge of primary school aged children and help to develop environmental education in schools. It is also important for environmental education to highlight such environmental problems as the increasing human population, poor health, hunger and the lack of pure water.

This was a case study therefore the results cannot be generalized. To increase the internal validity of the research, pupils' descriptions have been described in detail. The plausibility and integrity of the research have been made explicit by giving authentic data and interpreting this data. In addition, the results completely represent the current data. Interpretations of the data have been linked to theoretical discussion and previous studies, and the validity of research results is based on the process of data analysis. The data analysis in this study has been based on pupils' writings and interviews. Open instruction (Case 1) and the use of the picture (Case 2), may have influenced the research results; use of the picture may have influenced pupils to find some environmental issues more significant than others, although it is also important to notice that the pupils mentioned some other environmental problems and issues not found from the picture.

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