
Who is responsible for sustainable development? Attitudes to environmental challenges: A survey of Finnish 9th grade comprehensive school students

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ABSTRACT

In this study, survey data on the environmental attitudes of Finnish pupils were tested against the Hungerford and Volk (1990) model of environmental education. Gender differences in environmental attitudes were also examined. Pupils ($N=3666$, median age 15) from Finnish comprehensive schools responded to a number of statements on environmental issues. The Likert-scaled questionnaire data were analysed with explorative factor analysis. Four factors were identified: 1) *positive attitudes towards environmental responsibility* (PER), 2) *negative attitudes towards environmental responsibility* (NER), 3) *naturocentric attitudes towards environmental values* (NV), and 4) *anthropocentric attitudes towards environmental values* (AV). There were high positive correlations between PER and NV, and a similar relationship between NER and AV. These results support the model of environmental education in that positive environmental attitudes and values are linked with each other. In addition, rejection of environmental problems, negative attitudes and anthropocentric values were closely correlated. PER and NV appeared to be more related to an internal locus of control, while NER and AV seemed closer to an external locus of control. Effect sizes indicated moderate differences between boys and girls within the PER, NER and AV factors, but in NV this difference was only small. Further research is needed to clarify gender differences, especially why boys had more mixed attitudes towards environmental values.

Keywords: Environmental attitudes, responsibility, values, locus of control, factor analysis

1 INTRODUCTION

The concept *sustainable development* has many definitions, but the most commonly cited comes from Brundtland (1987), in a report from the World Commission on Environment and Development on Our Common Future: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. It contains four key dimensions: ecologically, economically, socially and culturally sustainable development. Despite the inviting simplicity of the idea, the work required for viable sustainable development is demanding.

At the end of the 19th century, *nature conservation* was understood as the preservation of untainted landscape and other valuable areas of nature. In the 20th century, serious environmental problems such as pollution aroused much concern about the relationship between humans and the environment. The concept *environmental education* is young, but it has its roots in the study of nature, conservation, and outdoor education. A great need for widespread environmental education was mentioned in the UNESCO Tbilisi Declaration (1978). Palmer and Neal (1994) define environmental education as: 1) education *about* the environment which builds awareness, understanding and the skills necessary to obtain this understanding; 2) education *in* (or from) the environment, where learning occurs in nature, outside of the classroom; and 3) education *for* the environment, which has as its goals in nature conservation and sustainable development. According to Hines, Hungerford & Tomera (1986/87) and Hungerford and Volk (1990) *environmentally responsible behaviour* [for instance recycling as personal choice or political activism] is gradually developed by 1) *entry level* variables, including the ability to experience and enjoy nature (*environmental sensitivity*) and

knowledge of ecology; 2) *ownership* variables, such as in-depth knowledge and a personal investment in the environment; and 3) *empowerment* variables like internal locus of control and intention and ability to act for the environment. In Finland, these models have been adapted for the teaching of environmental education (Cantell, 2003). In the Finnish comprehensive school environmental education is an integrating theme within the curriculum.

According to Fishbein and Ajzen (1975), attitude is learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object. Attitude creates action or behaviour that is generally consistent. Much research has been conducted concerning beliefs, although there seems to be no common use or definition of the concept of *belief* (Tobin et al., 1994, p. 55). In this study, we identify beliefs with an individual's personal knowledge which is a compound of the conclusions that an individual makes based on experience and perceptions (Green, 1971). Beliefs can also be called one's stable subjective knowledge. Conceptions or conscious beliefs are justified and accepted by an individual and they are regarded as higher-order beliefs that emphasise cognitive elements. Some researchers emphasise the affective (feeling) component of belief, and consider it a kind of attitude. According to Pajares (1992), beliefs form attitudes, which in turn become action agendas. Spontaneous conceptions with strong affective elements are called *views*. In the literature, use of the terms *belief*, *conception*, *view*, and *attitude* varies depending on the discipline, perspective, and researcher (Tobin et al., 1994; Pajares, 1992; Swain, Monk & Johnson, 1999).

In this study, the conception of *environment* refers mostly to the natural environment. *Environmental attitude* is defined as a learned belief which develops from an individual's knowledge and values about the environment and governs action to support

or sustain the environment. This attitude is evaluative in nature. Environmental attitude has been conceptualised as to be unidimensional, as in the first version of the NEP (New Environmental Paradigm), developed by Dunlap and Van Liere (1978), or multidimensional, composed of environmental knowledge, values, and behaviour intention (e.g. Kaiser, Wölfing & Fuhrer, 1999). This study used the concepts of *anthropocentric* (human-centred) and *naturocentric* (nature-centred) attitudes towards environmental values as defined by Vilkkka (1997).

To improve environmental responsibility, environmental education should focus on the personal *locus of control*, which can be either external or internal (e.g. Hungerford & Volk, 1990; Stern, 1992; Fransson & Gärling, 1999). External locus of control refers to the belief that the power to cause changes in one's own personal life is outside the individual and that he or she cannot do anything to affect it. Internal locus of control is the belief that one's own actions make difference.

Research questions

This study was conducted in connection with the international ROSE* project, initiated and co-ordinated in Norway (Schreiner and Sjøberg, 2004). This is a comparative research project meaning to shed light on important factors in science and technology education, especially how the perceptions of students affect their learning. Environmental attitudes are one aspect of this project. In our study, we wanted to reflect the attitudes of Finnish pupils under the Hungerford and Volk (1990) model of environmental education.

In his survey report, Järvinen (1995) found Finnish girls aged 15 to 17 to have more positive attitudes towards environmental responsibility than boys of the same age. The same difference was found in Finnish adults by Haikonen and

Kiljunen (2003) in the survey data they collected between 1984 and 2002. We can therefore postulate our hypothesis, that the environmental attitudes of girls are more positive than those of boys.

2 METHODS

Data collection

The original ROSE questionnaire was carefully translated into Finnish so that the meanings of the items in Finnish were as close as possible to the original English. For this study, 75 lower secondary schools were selected by weighted random sampling, which is 9.7% of all 777 lower secondary schools in Finland that had at least 20 students in grades 7 to 9 or 7 students in grade 9. The schools were weighted by the number of students in grade 9. This approach meant essentially that the students were selected at random from the whole age cohort. The typical group size was 12 to 25 pupils. The median age of the pupils was 15 years.

The questionnaire was sent to the schools in March 2003. To facilitate the timely return of questionnaires, reminders were sent to 26 (35%) of the selected schools in May. In ten schools, 5 to 20 questionnaires were returned (small schools), in six schools 21 – 40 questionnaires (small or middle size schools), and in the rest (53 big schools) over 41 questionnaires. Altogether, 3666 pupils from 92% of the schools answered the survey.

There were 11 sections to the questionnaire, but this study only used the answers to 22 statements which focused on environmental attitudes and interest in the environmental issues. Each item was measured using a Likert-type scale with four alternatives: *disagree* and *agree* were at the extremes, while the two

categories in the middle of the scale were unlabelled. The format forced choices from respondents, as there was no neutral middle point or a Do not know category. However, in the introduction to each question, it was clearly stated that the pupils may refrain from ticking any boxes if they cannot decide on an answer.

The questionnaire contained 18 statements in a section concerned with environmental issues. The following text introduced students to the topic: "Environmental challenges and me. To what extent do you agree with the following statements about problems with the environment (pollution of air and water, overuse of resources, global changes of the climate etc.)". Four additional items concerning environmental issues were also taken into the analysis from other sections of the questionnaire. These items are marked with B, G and H in Table 1.

Statistical analysis

International surveys like PISA (OECD, 2001) and TIMMS (Väljjarvi et al., 2002) indicate only minor differences between students' achievements in different parts of Finland. Thus, the target population of this study was assumed to be rather homogeneous as well.

The data was analysed using SPSS 11 statistical software. Coding for SPSS files was done by automatically scanning the completed questionnaire forms. An explorative factor analysis (EFA) was used to identify the latent variables describing basic environmental attitudes. The extraction method used was maximum likelihood with Promax rotation ($kappa = 4$). The Kaiser-Meyer-Olkin Measure of sampling adequacy was 0.871 and in the Bartlett's test of sphericity the approximate chi-square was 14147, $df = 231$, $p < 0.000$) which indicate that the data were adequate for EFA analysis. Boys' and girls' scores were

compared using an independent samples t -test. The strength of the statistical difference was also analysed by calculating the effect size (d) for the groups (Cohen 1988), because it is independent of sample size: d is the difference between the means, divided by standard deviation of either group.

3 RESULTS

The EFA solution with 22 variables explained 46% of the variance, and the rotated solution accounted for 34%. The first factor explained 19%, the second 8%, the third 5%, and the fourth 3% of variance. The first two factors pointed to *attitudes towards environmental responsibility* and the second two suggested *attitudes towards environmental values* (Table 1, Figure 1).

Due to the items on the questionnaire, the factors describing attitudes towards environmental responsibility were dichotomous (first factor positive, second factor negative). The first factor was called *positive attitudes towards environmental responsibility* (PER) and the second *negative attitudes towards environmental responsibility* (NER), which included ignorance of environmental problems. The third and fourth factors were labelled *naturocentric* and *anthropocentric* attitudes towards nature and environmental values (NV and AV), modified from the conceptions defined by Vilkkä (1997). All factors, excepting the fourth showed adequate reliability (Cronbach's alpha) due to the large sample size. Multidimensionality may have affected the reliability of the fourth factor.

The PER and NV factors correlated positively with each other, as well as the NER and AV factors (Table 2). There was a significant negative correlation between the PER and NER factors, which is logical because they represent opposite attitudes. There was similar negative correlation between the NV and AV factors, which are conceptual opposites of each other. NER correlated significantly with AV (Table 2).

Table 1. Results of the EFA analysis. Variable loadings smaller than 0.25 are not included.

Item	1	2	3	4
D6. I can personally influence what happens with the environment	0.835			
D7. We can still find solutions to our environmental problems	0.676			
D12. I think each of us can make a significant contribution to environmental protection	0.644			
D14. I am optimistic about the future	0.564	0.291		
D10. People should care more about protection of the environment	0.413	-0.263		
D5. I am willing to have environmental problems solved even if this means sacrificing many goods	0.369		0.263	
H24. sorted garbage for recycling or for appropriate disposal	0.293			
D2. Environmental problems make the future of the world look bleak and hopeless	0.259		0.250	
D8. People worry too much about environmental problems		0.715		
D3. Environmental problems are exaggerate		0.653		
D1. Threats to the environment are not my business		0.533		
D9. Environmental problems can be solved without big changes in our way of living		0.502		
D13. Environmental problems should be left to the experts		0.497		

Table 1 continues

Item	1	2	3	4
D17. Nearly all human activity is damaging for the environment			0.641	
D18. The natural world is sacred and should be left in peace			0.514	
D15. Animals should have the same right to life as people			0.492	-0.300
D11. It is the responsibility of the rich countries to solve the environmental problems of the world			0.440	0.347
G10. Science and technology are the cause of the environmental problems			0.357	
B4. Working in the area of environmental protection			0.346	
D16. It is right to use animals in medical experiments if this can save human lives				0.518
D4. Science and technology can solve all environmental problems		0.284		0.435
G6. The benefits of science are greater than the harmful effects it could have				0.395
95 % confidence limits for	0.76	0.55	0.64	0.44
Cronbach's alpha	0.79	0.60	0.68	0.50

Table 2. Pearson's two-tailed correlations between different attitude factors (p<0.01)

	1. Positive attitudes towards environmental responsibility (PER)	2. Negative attitudes towards environmental responsibility (NER)	3. Naturocentric attitudes towards environmental values (NV)
2. Negative attitudes towards environmental responsibility (NER)	-0.562**		
3. Naturocentric attitudes towards environmental values (NV)	0.642**	-0.379**	
4. Anthropocentric attitudes towards environmental values (AV)	-0.025	0.415**	-0.158**

** Correlation is significant at the 0.01 level (2-tailed).

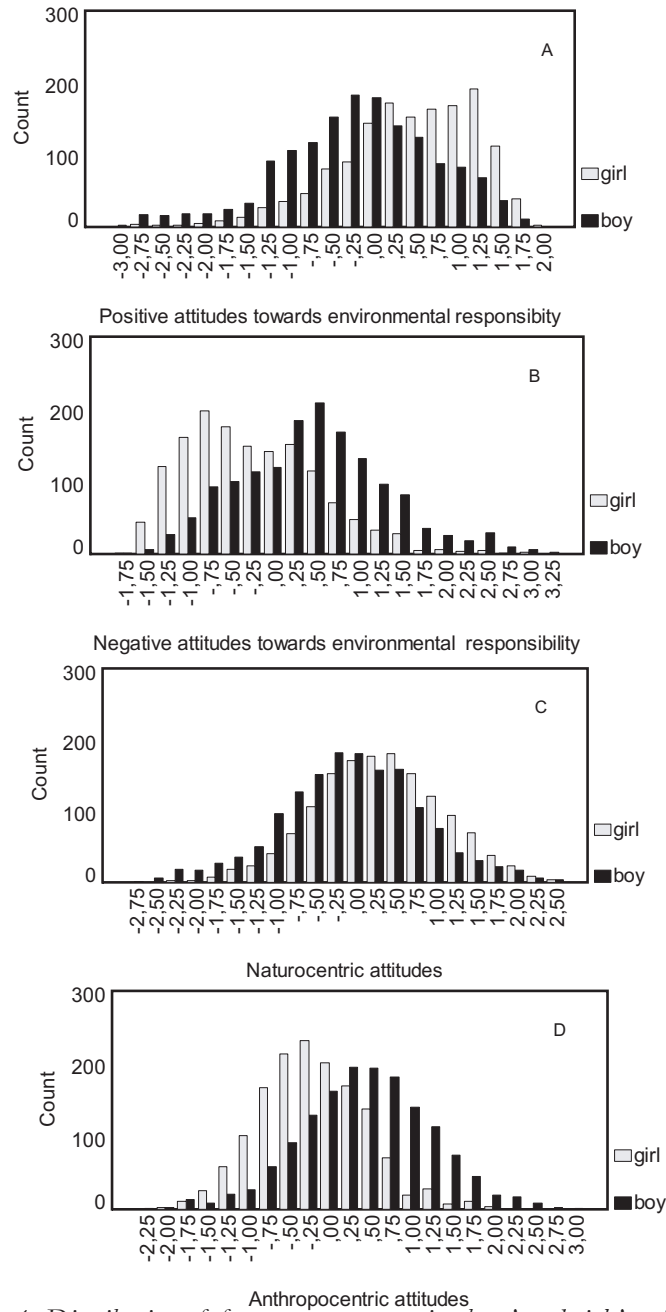


Figure 1. Distribution of factor scores measuring boys' and girls' attitudes towards environmental responsibility (A-B) and environmental values (C-D).

Attitudes towards environmental responsibility

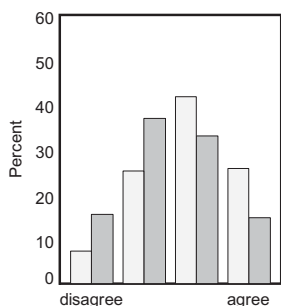
The first factor describing positive attitudes towards environmental responsibility (PER) included items which suggested that environmental problems are real. It also contained several positive environmental responsibility items. However, it showed that pupils were optimistic about their own future but concerned about the future of the environment (Table 1, Table 3). There were also items measuring environmental-action intention (D5) or active environmental behaviour (H12).

Six positive statements concerning positive attitudes towards environmental responsibility have been rearranged according to locus of control; moving from personal responsibility towards more distant position to environmental challenges (cf. Hungerford & Volk, 1990; Stern, 1992) (Figure 2). The statement of the item in Figure 2A “*I am willing to have environmental problems solved even if this means sacrificing many goods*” represents the strongest personally responsible statement for the environment (cf. Palmer and Neal, 1994) and internal locus of control. About half of the pupils agreed, and half disagreed, but more girls than boys agreed with the statement. The responses to other statements (Figures 2B-2E) were more towards the *agree* end of the scale, and the focus of responsibility moved from the empowered “self” through the able “we” to a general conditional responsibility statement of “each of us” and “people”, until it reached most external locus of control (Figure 2 E-F). Again, girls leaned more than boys towards an *agree* response. However, the pattern of girls’ and boys’ responses became different for the statement on the responsibility of rich countries to solve environmental problems. Girls mostly disagreed, but the responses of boys were more evenly distributed (Figure 2F).

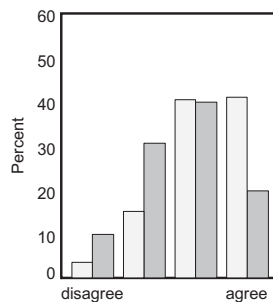
Table 3. Comparisons of girls' and boys' responses on different items on environmental challenges and calculated environmental attitude factor scores.

N = number of cases, M = mean, SD = standard deviation, d = effect size: 0.2 = small, 0.5 = moderate, 0.8 = large effect. For statements; see table 1. The highest values, responding moderate effect, are bold.

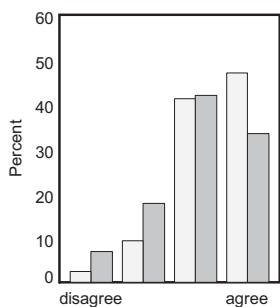
Statement	Girls			Boys			d
	N	M	SD	N	M	SD	
D1	1770	1,60	0,81	1791	2,08	1,00	0,48
D2	1769	3,12	0,86	1780	2,83	0,94	-0,32
D3	1761	1,81	0,79	1769	2,20	0,90	0,43
D4	1739	2,01	0,75	1761	2,52	0,90	0,57
D5	1764	2,86	0,88	1788	2,47	0,92	-0,42
D6	1771	3,28	0,81	1782	2,76	0,93	-0,57
D7	1760	3,33	0,75	1776	3,02	0,89	-0,35
D8	1757	1,52	0,73	1774	1,97	0,89	0,51
D9	1764	2,06	0,84	1775	2,38	0,91	0,35
D10	1762	3,31	0,78	1775	2,86	0,88	-0,52
D11	1757	2,16	0,87	1769	2,51	0,94	0,37
D12	1757	3,19	0,82	1780	2,70	0,90	-0,55
D13	1753	2,07	0,82	1774	2,45	0,91	0,41
D14	1734	2,80	0,82	1768	2,66	0,87	-0,16
D15	1747	2,58	0,96	1772	2,14	0,95	-0,46
D16	1757	2,13	1,01	1767	2,69	1,04	0,54
D17	1762	2,23	0,84	1781	2,16	0,90	-0,07
D18	1768	2,86	0,87	1773	2,51	0,94	-0,38
B4	1766	2,19	0,91	1792	1,93	0,88	-0,29
G6	1733	2,35	0,77	1776	2,68	0,87	0,38
G10	1726	2,29	0,79	1769	2,31	0,90	0,02
H24	1742	2,67	1,00	1777	2,31	0,96	-0,37
PER factor	1459	0,451	0,807	1506	-0,190	0,915	-0,70
NER factor	1459	-0,221	0,787	1506	0,456	0,870	0,78
NV factor	1459	0,322	0,799	1506	-0,067	0,878	-0,44
AV factor	1459	-0,185	0,651	1506	0,426	0,796	0,77



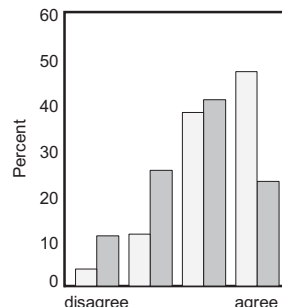
A. (5) I am willing to have environmental problems solved even if this means sacrificing many goods.



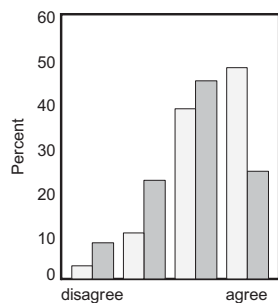
B. (6) I can personally influence what happens with the environment.



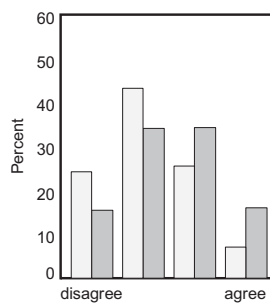
C. (7) We can still find solutions to our environmental problems.



D. (12) I think each of us can make a significant contribution to environmental protection.



E. (10) People should care more about protection of the environment.



F. (11) It is the responsibility of the rich countries to solve the environmental problems of the world.

Figure 2 A - F. Pupils' responses to the statements of environmental challenges rearranged according to the locus of control in environmental responsibility. The numbers in parentheses indicate the order in the questionnaire. Light grey = girls (N = 1776), dark grey = boys (N = 1795).

The second factor described negative attitudes towards environmental responsibility (NER) and included items in which the threat of environmental problems is ignored, neglected (Table 1, Figure 1). The factor also included items which take distance to environmental challenges. The problems are thought to belong to the experts rather than the individual, and science and technology were seen as solutions to all problems. Thus, items comprising the NER factor indicate an external locus of control.

Attitudes towards environmental values

The third and fourth factors described attitudes towards environmental values, weighted by attitudes towards the value of nature (Table 1, Table 3, Figure 1C and 1D). The *naturocentric* (NV) factor was composed of items that emphasised the concept of the sanctity of nature and that humans generally have a rather destructive impact on the environment. The items also emphasised animal rights and was sceptical about the ability of science and technology to solve environmental problems and even suggested that they might cause environmental problems themselves. As environmental action intention, this attitude factor included an item (variable B4) emphasising readiness to work in the area of environmental protection in the future.

The *anthropocentric* (AV) factor revealed a utilitarian and, rational attitude towards the value of natural environment. It contained items in which animal rights were neglected and the use of animals in medical experiments were allowed if it could save human lives. This factor did not reveal attitudes towards environmental problems themselves. It suggested that problems do not belong to oneself, but to, rich countries, indicating an external locus of control.

Differences between boys and girls

Independent samples *t*-tests revealed a statistically significant difference between boys' and girls' responses to all statements ($p < 0.001$). However, the effect size was moderate ($d \geq 0.5 < 0.8$) for statements 4, 6, 8, 10, 12 and 16, concerning environmental responsibility and animal rights (Table 3, for statements see Table 1). Girls' scores in the PER and NV factors were also significantly higher than those of boys'. As for the NER and AV factors, boys' scores were higher (Table 3, Figure 1). The effect size of factor scores indicated that the difference was moderate for PER, NER and AV scores while the NV factor score showed only a small the difference (Table 3).

4 DISCUSSION AND CONCLUSIONS

Multidimensional nature of environmental attitudes

According to Hungerford and Volk (1990), environmental education enhances major and minor variables that gradually produce responsible citizenship behaviour. The results of this study indicate that naturocentric values and positive attitudes towards environmental responsibility are linked with each other. Thus, the former would represent 'entry level variables' and the latter 'ownership variables' in the H&V model. The results also indicate that negative attitudes towards environmental responsibility and anthropocentric attitudes are linked with each other, which indirectly support the model as well.

The questionnaire items were composed mostly of items that measured attitudes towards environmental responsibility and values, thus this study cannot point to many empowerment variables or those indicating factual environmentally responsible

behaviour. However, the statements "*Working in the area of environmental protection*" within the NV-factor and "*Sorted garbage for recycling or for appropriate disposal*" in PER-factor would indicate intention to environmentally responsible behaviour in 'empowerment variables' and 'responsible citizenship behaviour' of the H&V model.

However, the goals of environmental education are not reached in the target group since a considerable number of pupils had negative attitudes towards responsibility for the environment. They deny or dismiss the existence of environmental problems and think that the challenges are exaggerated. Consequently, their locus of control is more external than internal and they do not see any need for personally responsible behaviour. This agrees with former studies on the importance of the internal locus of control in developing environmental responsibility (e.g. Hungerford and Volk, 1990; Stern, 1992; Fransson & Gärling, 1999). In addition, many studies show only a weak or non-existent link between attitude and behaviour, which is explained as a *free-rider* mentality (Uusitalo, 1990). For example, Järvinen (1995) found that Finnish young people aged 15 to 17 willing to work for a better environment only as long as it did not affect their own standard of living. Thus, *environmental concern* does not directly predict environmentally responsible behaviour.

Because attitudes and values often agree, these factors are likely to correlate with each other, as positive attitudes towards environmental responsibility correlated with naturocentric attitudes. In their study Kaiser, Wölfling and Fuhrer (1999) found that environmental knowledge, environmental values and intention of ecological action behaviour to be the three main factors predicting actual ecological behaviour of adult people. The results of our support the H & V model in such a way that once they appear, the components (entry level, ownership and empowerment variables) are likely to remain. In addition to

ecological knowledge and environmental sensitivity, it is important to arouse ethical considerations for environmental values, which may help to reach at least ownership level for teenagers. According to Kaiser & Shimosa (1999), it is moral rather than conventional responsibility that predicts person's ecological behaviour. Fransson & Gärling (1999) suggest that knowledge, internal locus of control, personal responsibility and perceived threats to personal health to be the main factors affecting environmentally responsible behaviour.

The results support the view that environmental behaviour cannot be predicted by a unidimensional measure of attitudes (Kaiser, Wölfing & Fuhrer, 1999). EFA found two main attitude dimensions towards environmental responsibility and two towards environmental values. Each of these may be divided further. Some items of *naturocentric* attitude factor are related to *biocentric*, *ecocentric* and *zoocentric* attitudes towards the nature as defined by Vilkkka (1997). The *anthropocentric* attitude factor was also multidimensional, emphasising the role of science and technology in solving environmental problems. Following on from this, some items of this attitude factor could also be named *technocentric* (Vilkkka, 1997).

Knowledge and values in environmental education

An example of an environmental challenge is global warming. There has been some controversy over its existence. Thus, pupils having negative attitudes towards environmental responsibility might be critical towards the diverse information (scientific and non-scientific) on environmental challenges. It can also be rather difficult to understand the risks of complex environmental phenomena. However, environmental values such as anthropocentricity and ecocentricity are likely to affect more strongly pupils' attitudes than pure knowledge on environmental

challenges. As Hungerford and Volk (1990) remarked, environmental sensitivity is important to help enhance positive environmental values. To develop self-responsibility, it is important own internal locus of control, the feeling of competence in the ability to personally affect one's own life and surroundings.

Positive attitudes towards environmental responsibility included suspicion about science and technology in general, although the existence of environmental problems was accepted. This may indicate an understanding that the origin of problems is social, cultural and economic in nature. For naturocentricity, science and technology often represent utilitarianism and even the cause of environmental problems. Thus, attitudes towards science and technology and environmental attitudes may conflict. The relationship between these attitudes would be an interesting subject for a new study.

Differences between boys and girls

The results of this study support the hypothesis that there are differences between the factor scores describing boys' and girls' attitudes towards environmental responsibility. The factor scores describing girls' attitudes towards environmental responsibility were higher than those of boys, while the girls' scores describing negative attitudes were lower than those of the boys. The results support the survey report of Järvinen (1995) that Finnish young people aged 15 to 17 have environmentally dichotomous attitudes, girls having more positive attitudes towards environmental responsibility than boys. When compared to the survey report of Haikonen and Kiljunen (2003), which examined the environmental attitudes of Finnish adult men and women, possibly parents of the surveyed teenagers, the result was the same. This trend has been found also in Sweden,

Germany, USA and Japan (Eisner, Eisner & Yoshida, 2003). In that study, males demonstrated better environmental knowledge, whereas females showed higher motivation for ecological thinking and behaviour.

Despite of the significant and meaningful gender difference in the PER and NER score distributions, one should beware of misinterpreting that all girls had somewhat positive and all boys negative environmental attitudes. For instance, in 37% of boys the PER-factor scores, and in 32% of girls the NER-factor scores, were above the group mean. Unless boys had higher scores in the AV-factor, the effect size indicates that NV-factor (naturocentricity) was rather alike in both genders (Figure 1). The reason for this must be partially overlapping attitude score distributions, so that both the NV and AV factor scores of the same pupils were above the mean. Overlapping NV and AV attitudes were found in 15% of girls while in boys this percentage was as high as 26%. This can be named as a sign of 'ecological humanism', which claims the rights of people, animals, and nature are the same (Vilkkä, 1997). An interesting direction for future research would be an investigation into why this mixed attitude was more common in boys.

Further research by the ROSE project partners would reveal new information on environmental attitudes in different countries.

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