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ABSTRACT

Ethical behavior towards the environment includes valuing nature, living sustainably in harmony within nature, and respecting the autonomy of all living things. This paper describes a study of Japanese high school students' attitudes with regard to environmental ethics. Findings suggest that students who value environmental conservation tend to abandon ideas of anthropocentrism. (Contains 16 references.) (WRM)

Environmental Education and Environmental Behaviour in Japanese Students

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1. Environmental education and ethics

Environmental ethics is to value nature or the environment and live sustainably in harmony within nature, and requires respect for the autonomy of not only human beings but of all creation (Callicott, 1995). The principle approaches to environmental ethics are anthropocentrism, biocentrism, and ecocentrism. In this paper we describe a questionnaire used on high school students that included questions related to anthropocentrism, biocentrism, and ecocentrism. An anthropocentric environmental ethics considers non-human natural entities to be only means for human well-being. Theories of environmental ethics that morally give value to both individual living beings and natural wholes, are called biocentric. The land ethics which sketched by Aldo Leopold (1949), suggests conservation of whole ecosystem. He is one of the representatives who suggest that whole nature, including ecosystem, landscape, rocks and so on, has intrinsic value, an ecocentric approach.

Environmental ethics is part of the broader concept of bioethics, which has been defined as love of life (Macer, 1994; 1998). The term bioethics originated in 1970 as a further word in response to the environmental crisis, being called as essential for bridging into the future (Potter, 1971), Bioethics encompasses both medical ethics and environmental ethics concepts, arguing that we cannot separate our treatment of any living being from the way we treat other human beings. It also attempts to simplify arguments using principles of autonomy, justice, do no harm, beneficence, and harmony, for example (Macer, 1998). Bioethics education also encompasses environmental ethics education, and surveys have found it is practiced to some degree by a majority of science teachers in Japan (Macer et al. 1996).

Although human beings have evolved in the environment, and there has needed to be respect for nature throughout history to some degree, the current environmental crisis has made most people more conscious of the impact of the cumulated actions of individuals on ecological systems. Ernst Haeckel (1834-1919), introduced the word ecology to describe the emerging new ideas about the relationships between living organisms and their bio-physical surroundings. Awareness of being in such a relationship with nature may depend upon personal worldview, and cultural traditions. Geddes (1854-1933) argued that a child who was placed in touch with the profound realities of its environment would develop a creative attitude to its surroundings (Wheeler, 1970). Environmental education involves education at home and at school, and later society.

From June 5 to 16 1972, the Conference on the Human Environment was held in Stockholm, under the slogan was "Only One Earth". Representatives from 114 countries attended this meeting, and the Human Environment Declaration and Action Proposals were adopted. In the Declaration, the necessity of environmental education was mentioned, and it was the first time to adopt suggestions about environmental education on a worldwide scale. UNESCO and UNEP started the International Environmental Education Program (IEEP) in 1975 January and this program has contributed to develop educational methods and materials, and to train teachers in environmental education. From October 14 to 26, 1977, the Intergovernmental Environmental Education Conference was held in T'bilisi, and many representatives from 66 countries attended it. This meeting was the first intergovernmental meeting about environmental education and presented the T'bilisi Declaration which mentioned improvements of the curriculum. From June 3 to 16, 1992, the United National Conference on Environment and Development (UNCED) was held in Rio de Janeiro, Brazil. Representatives from about 170 countries attended this meeting, and adopted the Rio Declaration on Environment and Development, Agenda 21 and other international treaties.

2. Environmental education in Japan

In Japan the origin of modern environmental education is considered to be public safety education. In 1950s many public health problems arose, for example Minamata disease and Itaiitai disease. In response the Japanese government enacted rules the purpose of which was concord between national health and industrial development, because there was insufficient progress on solving these problems. Under such conditions, public safety education was practiced, but many claim there was not a clear concept of environmental education

(Watanabe, 1997).

In 1970, Takako Doi who is a member of the Socialist Party pointed out textbooks on social studies gave a favorable description to factories which were public hazards. In 1971, it led to the revision of the course of study of elementary school and junior high school. In the same year, Tokyo Metropolitan Government published a book about public hazards, *Harmful things for human life* (Ningen no Seikatsu wo Musibamumono) for junior high school students, and such publications spread among other local public bodies. In addition there were individual activities by teachers.. In 1974, the first international symposium about environmental education was held in Tokyo and a study of the curriculum of environmental education was conducted with the support of the Ministry of Education.

In 1981, Masutoku Hiratuka who was the director of the Japan Environment Assembly reported suggestions about *Environmental Education Teaching Material - Study on Environmental Education* (Kankyou Kyouiku Siryou-Kankyou Kyouiku no Kenkyu), in order to overcome the insufficiency of understanding about environmental education in Japan. Besides this study, further studies were conducted, for example a Report on the Actual Conditions of Environmental Education in School Education (Gakkou Kyouiku niokeru Kankyou Kyouiku Zittai Tyousa Houkokusyo) (Japan Environment Assembly, 1983), Report on the Development of the Curriculum for Environmental Education (Kankyou Kyouiku nikansuru Karikyuramu Kaihatsu no Zissyouteki Kenkyu Houkokusyo) (Japan Environment Assembly, 1984). Such studies pointed to a lack of teaching materials and methods.

From 1987, the Agency for the Environment set up a group of Environmental Education Specialists and began to study, investigate, and promote environmental education, for example showing local public bodies the basic plan for environmental education (the Environment Agency Kikaku Tyouseikyoku Kikaku Tyouseika, 1990), the report included an environmental education manual (Eco Kikaku, 1991), and the investigation of textbooks of environmental education (Tiiki Kaihatu Center, 1992). Private associations also tried to conserve the environment, and published a book which described how to train competent persons in environmental education.

In 1993 the Basic Environmental Law and in 1994 the Kankyou Kihon Keikaku were enacted, and these laws mentioned environmental education. The Ministry of Education, Science and Culture (MESC) published three books under the title *Environmental Education Teaching Material* (Kankyou Kyouiku Sidou Siryou) for junior high school and high school in 1991, elementary school in 1992, with examples in 1995 (MESC, 1991, 1992, MESSC, 1995). These books are the first presented as a national education policy, and they are well linked conceptually. These books discuss environmental conservation, the necessity of environmental education, the purposes of environmental education, and basic ways of thinking about environmental education.

In Action Proposals, the purpose of environmental education is defined as to develop persons who can manage and control the environment around them in the range they can do. Six concrete categories of purpose are given: awareness, knowledge, attitudes, skills, assessment ability, and participation. In detail these categories include:

(1) Awareness: To have awareness for and sensibility to the environment and problems relating to it.

(2) Knowledge: To basically understand the environment and problems relating to it, and, human responsibility and the mission for the environment.

(3) Attitude: To have sensitivity to social values and the environment, and a desire to participate in environmental protection and conservation.

(4) Skills: To learn how to solve environmental problems.

(5) Assessment ability: To assess measurements of the environment and educational programs from ecological, political, economical, social, and aesthetic points of view.

(6) Participation: To deepen recognition about responsibility for the environment and urgency of present conditions to make sure of action to solve environmental problems.

According to the above points of view, these all books say that the purpose of environmental education is to have awareness to the environment, to understand human responsibility and their role for the environment, and

to develop the attitude to participate in environmental conservation, and ability to resolve environmental problems. They discuss five issues on the points of view to conduct environmental education, as follows:

(1) Environmental education should be conducted at family, school, and regional levels.

(2) Environmental education should be conducted at all ages, according to each developmental stage. Especially, at the juvenile stage, to touch nature should be highlighted, and the stimulation of children's' sensitivity to the environment.

(3) Environmental education should be conducted not only to get knowledge, but also to learn skills and develop attitudes.

(4) In environmental education, people develop abilities to decide their will based on a lifestyle which is kind to the environment.

(5) In environmental education, people learn that environmental problems around them are connected to global environmental problems. People notice to think globally, but act locally to solve environmental problems.

The Environmental Teaching Material for practical examples says that environmental education should be conducted to correspond to each stage of development. To carry it out, eight points are emphasized:

(1) Development of abundant sensitivity

(2) Making much of activity and experience

(3) Making much of immediate events

(4) Development of the ability to grasp synthetically ideas

(5) Development of problem-solving ability

(6) Development of the ability to think and decide synthetically

(7) Development of ability and attitude to conduct independently

(8) Learning of knowledge and technical skills in the field of specialization

All the Environmental Education Teaching Materials argue that in elementary school, children should have more chances to come in touch with nature, and in order to stimulate their sensitivities their life experience should be more made much of, corresponding to their developmental stages. In the higher stages of elementary school and junior high school, development of the ability to understand cause-and-effect relationships and to solve problems independently should be made much of, through observation, experiment, audio-visual education in elementary school , and objective targeted research, investigation, field work in junior high school. In junior and senior high school, development of the ability to solve problems independently and to participate in actual activities is encouraged. In high school, the development of ability to think synthetically should be made much of, through debate. It is added that there is no way to apply to all students, so basically, environmental education should be conducted, corresponding to the situation and needs of each student.

In July 1998, Central Council for Education announced a report, *Our Country's Educational Contents Looking to the 21st century,* with environmental education mentioned in the 5th chapter. It gave three points which should be paid attention to. The first point is that environmental education through whole educational activities is important, because environmental problems are interdisciplinary problems. The second is that students should deepen their recognition about relationships between humans and nature, and have attitudes to create better environments. The third point is that in environmental education, experimental studies must be emphasized, so that students should experience close to themselves nature.

The theme, "Cross-curriculum studies" was announced on 22 June 1998 by the Curriculum Council, suggesting more elastic instruction or educational guidance, so that there could be characteristic education from each school. A new subject was set up cross-curriculum studies. This report suggested that Japan as a state should

not prescribe purposes and contents of the education so that each school could carry out their characteristic education, and it is a break with a more centrally controlled paradigm until then.

There are several issues in the origin of cross-curriculum studies. One is that students need to get the power to live in such a changeable society. Concretely, students need to develop ability to solve problems. Another is that students need to cope with new social problems, internationalization, information-oriented society, and environmental problems, and the aging society. The Central Council for Education suggested that education of international understanding, information education and environmental education are more necessary in the present society, and this education should be included in content of all other subjects, so demands of cross curriculum studies are growing. A third is to achieve the purpose to develop student's awareness as a Japanese, student's ability to learn and think by themselves, and student's individual character.

3. Teachers views on environmental education

During October-December 1998 a questionnaire survey was conducted in seven Japanese high schools and from two mailing lists of teachers interested in environmental education ZZZ or bioethics education. Two questionnaires were used in this survey. The one for students is described in the next section, and another for teachers. The questionnaire for teachers consisted of 4 sections containing 12 individual questions, including 12 open-ended ones. This paper considers the result from the nineteen teachers who responded, to Q1 (Q1a is related to units of environmental education, Q1b to purposes of environmental education, Q1c to its methods, Q1de are on teaching materials, and Q1f is on evaluation. Q2 is related to curriculum level, and in Q3 teachers wrote counter-measures needed to make environmental education active, and problems.

The full responses by teachers to the survey are presented elsewhere (Amemiya, 1999). Responses came from biology, science and social studies teachers, who conducted environmental education in a variety of classes and units (Q1a). Teachers gave several purposes for environmental education (Q1b), with awareness, knowledge, and lifestyle change being the main purposes given. For example some comments include:

"To review relationships between humans and nature. To review our lifestyle through learning the relationships between sciences and technologies, and societies. Having recognition of environmental problems to analysis its present conditions and to think of students' behavior."

"I think a global value of life is needed as the view to protect lives."

"Students recognize the environment and environmental problems deeply, and begin to think and behave to solve these problems by themselves."

"At first, students should learn about the region where they live, and students come to find out the present condition of environmental destruction and what they should do about them."

When asked what method they used to practice environmental education (Q1c), 9 included something practical, and 12 included either a speaker or a VTR to give new input (Q1cd). All of the teachers used supplements to the text books to teach, including newspapers and Internet. They were mixed in their attitudes to the sufficiency of the materials. Only 4 teachers used a paper test for evaluation, and 10 used student reports, and 4 said they did not like to evaluate the students.

In Q3 they were asked whether they thought environmental education will become more important? Some responses included:

"We should not teach specific values. We should teach in cross curriculum studies, not a specific subject. We should teach in society, not only at school."

"Training from the stage of the development of teachers, enrichment of training teachers (from a view to improve teacher's recognition); cooperation between schools and parties, school board and the ends (from a view to cooperation of schools)."

"From a high school point of view, the problem is the entrance examination and making manuals which every teacher can practice."

"Improvement of examination hell. Each school should invite a speaker who has interest in the environment from out of school and enhance student's abilities to carry out solutions to environmental problems. Improvement of social system where efficiencies are thought much of."

"The members of the Ministry of Education have not had environmental experiences. The Ministry of Education reduces the time for science education. Teachers who have not experienced science education are increasing. It is important that children experience in their class. There should be many fields where children can play. It is difficult for teachers not to disappoint students about environmental problems. For example, students think there is no way to escape the present conditions."

4. Environmental behaviour of high school students

A deeper test of the effectiveness of education is to assess the student views. Present high school students in industrialized urban societies are forming their personalities in the absence of rural contact with the environment, and with ready availability of mass consumption goods. In October-December 1998 a questionnaire survey was conducted in seven Japanese high schools to examine the practice of environmental behaviour and types of reasoning the student had. The questionnaire for students consisted of 4 sections containing 14 individual questions, including 13 open-ended ones. This paper describes the results of Q4 (Q4a is related to anthropocentrism, Q4b to biocentrism, Q4c to ecocentrism, and Q4d is open to free response), and Q5 which includes a set of seven indicators of environmental behaviour. Students selected the answer that applies to them, and wrote under what situations they thought so. The ideas in each comment of the open-ended questions were assigned to different categories, which were compared..

The number of responses obtained from each school were: Mikita high school (64), Adachi Shinden high school (14), Mito Second high school (114), Zushi Kaisei high school (Private - 37), Hitachi Kita high shool (25), and Koukoku high school (Private - 48), and Urawa First Girls high school (201). Of the 503 responses, 73% were female, and 28% were 16 years, 50% 17 years and 21% 18 years in age.

Seven indicators of environmental behaviour were used (Q5) as in the International Bioethics Survey in 1993 (Macer, 1994). The results of the environmental behaviour question with comparisons to 1993 public (across Japan) and medical students (from Fukui and Tsukuba University Medical Schools) in Table 1. We should note that in 1993 the respondents were not asked to give comments about their choices.

The most common behaviour for the students was sorting waste for recycling (Q5f, 70%) and the second most common were the 57% of the students who said they have saved energy (Q5g) during the past 12 months. The reason for the very high proportion of "Don't know" responses to Q5a may be that most students do not know whether the foods their parents buy are labeled as pesticide free. However, high school students in Japan have considerable buying power, and so the low proportion in Q5b (17%) who stopped buying a product because it causes environmental problems suggests little impact of the environmental education on purchasing action. The proportion who contributed money to an environmental cause was similar to medical students.

The reasons given for environmental behaviour were also asked, and one third said they bought food labeled as pesticide free (Q5a). The most frequent food was vegetables (79%), including especially spinach, lettuce, tomato, potato, and cucumber, while another 14% mentioned fruit, including lemons. Six of the 23 students who answered where they learnt such things said that they learnt that pesticides are harmful for health from their mother, 6 learnt on TV, and 5 learnt in their class (3 from a homemaking class). Some example comments are:

"Vegetables which grow up in my house field."

"Fruits. Because I learnt they are good for health at the supermarket."

"Lettuce. Because I learnt they are harmful in my class."

"Vegetables. Because my grandmother grow up them."

The most frequent product that students stopped to buy (Q5b) were spray (27%), PET bottles (16%), shampoo (10%), tissue (7%), chopsticks (6%), wrap (6%), bath detergents (4%), cup noodles (4%), detergents (4%). Others included trays, paper packed juice, and canned juice. Examples included:

"Drinks packed paper. Because I saw that PET bottles and cans can be recycled on TV."

"I use a water bottle not to buy PET bottle or canned juice."

Few students had done activities to aid the environment (Q5c), consistent with surveys that find Japanese students have low participation rates in volunteer activity. The main activity was giving funds (57%), and 13 of these 40 students who had given funds answered where they gave funds. Eight of these students said they gave funds at a supermarket or a convenience store, three students gave at school, and two students at a station. The next common comment was recycling (29%), and 3 of the 7 students who wrote where they recycled said they recycled at the supermarket, two at school, and two recycled as their regional activity (see also Q5f).

"Green fund-raising"

"I recycle milk packs and newspapers."

"I did volunteer activities in my junior high school."

"I don't get too many bags in shopping."

Q5d had the least positive response among students, with 69% saying that they have not changed their lifestyle. Because this question asked if students changed their lifestyle in a "significant" way to protect the environment, students may think they did not change their lifestyle so much, and one said "I did not change in significant ways." The most frequent reason among students who were positive was that they save waste (22%), and 20% said recycling. There was considerable concern for water, with 30% having comments discussing saving and not polluting water. Others included 11% said they saved electricity, and 9% said they brought their own shopping bags, and 5% said they used a bicycle not car. Examples:

"I don't throw away oil."

"I don't use the air conditioner."

"I don't use detergents, throw water of rice in my garden, and use bath water for washing."

"My family doesn't have a car, and uses bicycle and trains."

The most frequently cited food that students stopped to eat because of health concerns (Q5e) was coloured foods (31%), followed by cup noodles (18%), and food additives (15%). Other concerns were less frequent, including imported foods (4%), pesticide residues (3%). Only 2% answered that they stopped to eat salmon roe because of food poisoning with E. coli O-157. All of the students who mentioned where they learnt coloured foods and food additives are harmful for health said that they learn such things in their homemaking class at school G, which shows that there is some impact of the class at the time of the survey at least. Examples:

"Cup noodle. Because I learnt its cup includes dioxin."

"Lemons. Because my parents taught me that they used many pesticides."

"I don't eat foods related to 0-157. Because I learnt it dangerous from TV and newspaper."

"Coloured foods. Because I learnt they are harmful in my class."

"Foods including additives. Because my mother teach me they are harmful for health."

"Transgenic potato. Because I have an allergy."

More than two thirds (70%) said they had sorted items for recycling (Q5f), making it the most common environmental behaviour. Recycling of cans, bottles, and PET bottles seem to be a common activity to all students. However only 2% of students specifically said that recycling was common sense. Examples:

"I recycle paper, even if it is a cash-register receipt."

"Cans, PET bottles, and bottles. Because it is decided in my town."

Saving energy (Q5g) was the second most frequent behaviour (57%). About half, 43% of the students who gave an example of how they saved energy said that they saved electricity, concretely, they switched lights or appliances off frequently, reduced to use the air conditioner, and pulled out wall plugs. Saving heat (39%) included closing doors and curtains, hurrying to take a bath so there was no need to reheat it, and they did not use a bath room fan to save heat while taking bath. Saving water (18%) included using bath water for washing, and reduced to shower. Examples:

"I reduce to use hot water"

"I close doors not to let heat escape."

"I use cold water to wash my face, even if it is in cold mornings."

"My house has the ability to make useful energy from solar energy."

"I close curtains."

"The person who likes the hottest bath takes a bath at first."

5. Environmental reasoning of students

Before the examples of action (Q5), students were asked their general feelings over their relationship to nature (Q4). The question read:

Q4. What do you think are the relationships between humans and nature? Please select the answer that applies to you, and write why you think so concretely.

a. Nature and all living things exist for human, and it is natural for humans to use (cannot help). When do you think so?

b. All living things are equal, and humans should be treated as well as other animals. When do you think so?

c. All things existing in nature are equal, and humans, other living things, and natural things (soil, water...) should be treated equally. When do you think so?

d. other (Please write concretely) When do you think so?

The students could chose multiple answers to Q4, and 61% of students selected only one answer in Q4, with 22% selecting Q4a (Anthropocentrism), 14% Q4b (Biocentrism), 10% Q4c (Ecocentrism), while 15% said something else in Q4d. The responses to Q4 are summarized in Table 2, which includes for comparison the positive responses to Q5 on behaviour. Some example comments are below:

Q4a. Anthropocentric

"The law of the jungle"

"When I cook and eat them."

"I don't think all living things exist for humans, but we cannot live without using them."

"It cannot be helped that humans eat other living things, because of the food chain, however, I don't think they exist for humans."

"When I eat and hear of experiments in which humans use animals. However I understood the importance of life deeply and thanked the frogs, when I dissected them."

Q4b. Biocentric

" When I watch dogs and cats which are run over "

"Human have great power, so other animal cannot beat them. Humans throw many things to rivers. Sea is becoming dirty."

"When I was watching on TV, I knew that other living things suffered from human's destruction of nature. Humans have their own way, in spite of having benefits from other living things."

"When humans have their own way, kill pets and shoot an arrow at a duck. I think they should be shot with an arrow."

"Because anthropocentrism caused the present global problems, I think all living things are equal if I reflection different points of view."

Q4c. Ecocentric

" When I am talking with the earth."

"We cannot live without water."

"When I look at humans suffering from disaster (I see humans are not the greatest species)."

"When humans destroy the environment, and have bad influences on other living things and natural things."

"When I watch water and air pollution on news."

Q4d. Other (open comment)

" Domestic animals are needed for humans to live, but they can not be treated as well as humans. Humans kill them for human desire, we should think more about this situation."

"It cannot be helped that humans use other living things and natural things, however, I think it is good that humans respect them in other cases. For example, it cannot be helped that humans eat them to live and use them for experiments, humans should stop to exploit new golf links."

"I think it is strange that humans kill other animals to make fur coats. When I am watching TV."

"I think humans see themselves as the highest species, but we are the lowest one. When I think that dolphins and chimpanzees think more of the earth than humans, knowing dolphins can talk with others who are remote, and that chimpanzees don't eat up all the foods that exist in their habitat."

"It cannot be helped that humans use other animals, but humans respect them. When I eat and go to nature, I think humans are a part of nature."

Table 1: Environmental behaviour

Comparisons of 1998 high school student responses with public and medical students from 1993 (Macer, 1994).
Q5. During the past 12 months have you...? **1 Yes 2 No 3 Don't know**

a	School student	Public	Med. student
a. Bought foods labeled as "pesticide free"			
Yes	32	57	45
No	19	24	32
DK	48	19	23
b. Stopped buying a product because it caused environmental problems			
Yes	17	51	38
No	50	29	46
DK	33	20	16
c. Contributed money or time to an environmental cause			
Yes	19	39	18
No	63	56	75
DK	18	7	7
d. Changed your life style in significant ways to protect the environment			
Yes	10	28	12
No	69	58	71
DK	21	14	17
e. Stopped eating a certain food because of concerns over its safety			
Yes	34	66	57
No	44	30	36
DK	22	4	7
f. Sorted out certain types of household waste (glass, papers, ...) for recycling			
Yes	70	90	87
No	16	8	9
DK	13	2	4
g. Saved energy, for example, by using less hot water, by closing doors and windows in winter to save heat			
Yes	57	78	60
No	25	18	32
DK	18	4	8

Table 2: Relationship between answers to Q4 and those who answered Yes to Q5 (%)

Response to Q4 N Q5a Q5b Q5c Q5d Q5e Q5f Q5g Ave*

a. Anthropocen 110 22 11 8 5 32 62 46 0.9

b. Biocentrism 69 36 16 25 9 41 81 57 1.3

c. Ecocentrism 50 36 16 26 8 38 80 62 1.3

d. Others 76 45 30 29 17 47 76 76 1.5

** Average number of positive responses selected by students to the behaviour consistent with strong interest in environmental conservation (Q5bcd).*

The responses to Q5 give some measure of action, and three questions (Q5b, c, d) represent behaviour consistent with strong interest in environmental conservation. The average of these three questions, is shown in Table 2 as a measure of environmental conservation. Because some students saved energy (Q5g) to save money, it is unclear whether agreeing with this is a behaviour rooted in strong interest in environmental conservation.

There are differences in the tendency for those who gave no answer and those who gave anthropocentric responses to show environmentally friendly behaviour. Students who selected only one answer in Q4, or gave no answer, were analyzed statistically using Kruskal-Wallis test ($p<0.0001$) and Mann-Whitney test. Students who selected Q4a had an average positive behaviour of 0.9/3 for these three questions as indicators of desire for environmental conservation, while students who selected Q4b and Q4c had done an average positive behaviour of 1.3/3 for environmental conservation, while students who selected Q4d had done an average positive behaviour of 1.5/3 for environmental conservation. Students who did not select any answer to Q4 had a lower average of 0.7/3 for environmental conservation (Table 2). There is a significant difference found between samples who selected Q4a and those who selected Q4b ($U=2849.000$, $p=0.0051$), Q4c ($U=1961.500$, $p=0.0037$), Q4d ($U=2690.000$, $p< 0.0001$). There is also a significant difference between those who gave no answer and Q4b ($U=1513.000$, $p=0.0008$), Q4c ($U=1038.500$, $p=0.0007$), and Q4d ($U=1445.000$, $p<0.0001$). However there is no significant difference between samples who selected Q4a and those who did not select any answer, and no difference between samples who selected Q4b and those who selected Q4c.

The comments given for Q4 about relationships to nature were analyzed and are reproduced elsewhere (Amemiya, 1999). Comments were written by 80% of the respondents, and 130/193 who selected Q4a, 131/175 who selected Q4b, 91/130 who selected Q4c and 50/108 who selected Q4d. Categories were made based on words in the answers.

Overall 60% of students did not mention any experience despite the common idea that experience is a prime determinant of environmental action. Only 40% of students mentioned an experience, and the most commonly cited experience was eating, which was mentioned by 25% in total (82 persons who chose Q4a, 14 who chose Q4b and 5 who chose Q4d, but none of those who chose Q4c). Experiments were mentioned by 3% and other experiences included 1% who had anthropocentric feelings when they are attacked by animals; 1% who feel biocentrism when they see deserted animals, and 2% when they see animals run over. The most frequently cited experience of Q4c was when students go to nature and feel nature, as they feel ecocentrism. TV was the most frequently cited replacement for actual experience (12%), with only 0.5% mentioning magazines and 0.5% mentioning books, while 2% mentioned classes.

Half of the students who selected Q4a and mentioned when they felt anthropocentrism, said it was when they think about and see use (or waste) of animals, while only 8% students said so when they see the use (waste) of plants. About 70% of these comments discussing animal use included eating, 20% experiments on animals, with 11% giving other comments including waste of animals as goods, for example, coats, mufflers, and shoes. Twenty five of the 193 students who selected only Q4a in Q4, said that it cannot be helped that humans use other living things (51 students said so over all for Q4). The animals mentioned includes dogs, pigs, cows, birds, and elephants. Otherwise 2% mentioned nature, 3% forests and no one mentioned water, air or soil.

While a total of 53% of the comments for Q4a mentioned animals, the proportion who thought of biocentric feelings (Q4b) when thinking of animals was higher, 78%. Only 1% mentioned plants, 15% nature, 5% forests, 3% water, and no one mentioned air or soil. In addition 11 of the 15 students who said they feel biocentrism when they think about and see destruction of nature were considering nature as an animal habitat. Among the animal use comments for Q4b, 25% were considering abuse of animals and 24% mentioned experiments, while only 9% discussed eating. Only 18% of the students who selected Q4c mentioned animals, while 23% felt ecocentrism when they think about and see nature, and 12% mentioned plants, 13% water, 9% forests, 4% air

and 4% soil.

To allow for freedom in expressing their ideas, students could also write any comment they wanted in the Q4d option. The most frequent reason among the 110 comments to Q5d (Others) was the idea that it cannot be helped that humans use other living things, but it is wrong to use more than necessary (14%), and the second was the idea that it cannot be helped that humans use other living things, but humans should respect them (12%). A total of half of the comments suggested that it is best to restrict human activities, including also these types of reasons: I think all living beings are equal but I cannot behave so (12%), Humans should coexist with nature (11%), and Humans are one part of nature (7%), and Humans have their own way too much (6%). There were a variety of other reasons, for example to manage the environment better (4%); the law of the jungle (4%), 2% considered that the law of the jungle was a reason to use other living things and 2% mentioned the food chain made it a reason to use other living things.

6. Discussion and Conclusion

In general researchers have agreed with the process for environmental education where at first students become aware of the environment (Awareness), secondly they recognize or review the relationship between humans (or students themselves) and nature (Knowledge), thirdly they get skills to solve environmental problems (Skills), and fourth, develop the attitude to participate (or behave) in environmental conservation (Attitudes and Participation). In the teachers survey, seven teachers mentioned both recognition and behavior as the purpose of environmental education. A survey of 42 Japanese papers found that knowledge is the most frequent purpose (57%) (Amemiya, 1999).

Many suggest that experience is very important to develop children's sensitivity and awareness to the environment, and this was also seen in the survey of teachers. However, the result of the student survey discussed here reveals that the school curriculum may not be the main influence on students. Four teachers in their survey mentioned the necessity of a new synthetic curriculum. In 1998, Curriculum Council announced it would introduce a new synthetic cross-curriculum approach. But the problem seems to be not the establishment of a new curriculum, but its practice. Two teachers mentioned the necessity of manuals for practice. However, the Curriculum Council recently suggested that Japan as a state should not now prescribe purposes and content of cross-curriculum studies, so that each school could carry out their characteristic education. Because characteristic education depends on the characteristic of teachers in each school, the essential problem seems to be development of teachers, which was mentioned by four teachers in the survey.

Since the closest field where students can learn by experience is the local region where they live, teachers must practice learning by experience, adjusting it for these fields. There are different conditions in the different places, so in the field of environmental education, it is natural that teaching contents and methods are different between each local environment. Thus, there is no standard of learning by experience to fit any place, and how students learn by experience depends on the characteristic of each school and teacher. While learning by experience is needed, it should be followed up in class enough after that.

Though importance of learning by experience is recognized generally, there seems to be few chances for experience where students think about the relationship between humans and nature. Especially in class, students experience relationships between humans and nature only through experiments. In most cases, students get chances for experience to think about relationships between humans and nature accidentally, not by intentional education, such as when students see deserted or run over animals. However, some students have ecocentric feelings when they go to nature and feel nature. This shows that experience that students can feel nature seems to be effective for students to leave anthropocentric feelings.

On the other hand, many students think about relationships between humans and nature, when they are watching TV. In 1998, Central Council for Education described the present condition of the relationship between children and the mass media, writing that children have little time for experience in fields, while they take much time to contact with the mass media and virtual reality. In the Bioethics Education Network meetings (Asada & Macer, 1997), we can often hear comments that the mass media has a strong influence on class.

The information source used depends on the particular environmental behaviour, as found in comments given for Q5. Overall the most frequently cited source of information was the TV (24%), because it was cited at a rate between 5-10% in all questions. Overall the second was city ordinances (22%), but these were cited by 33% of respondents to Q5f (recycling) and not for any other questions. The third most common was class (18%), seen

for Q5a (5%), Q5e (10%), and Q5f (12%). Family was next, with 10% of the students who mentioned a sources of information saying their mother was the source, seen in all questions, most for Q5a (6%). Five of the 84 students (8%) who said they have sorted waste for recycling said that recycling was common sense, a response not seen for the other questions. Books, newspapers and advertisements were occasionally mentioned.

Five teachers mentioned cooperation with persons outside of school, and in 1998, the Ministry of Education suggested to develop schools which are open to the local community. Because environmental problems are social problems, environmental education is closely connected with present society. This can include invited speakers and chances for experience. One of the purposes of environmental education is to behave better towards the environment, and there seems to be a common process to achieve this purpose. Because the first process is that students become aware of the environment, and recognize or review relationships between humans (or students themselves) and nature, the first step to measure the effectiveness of environmental education is for teachers to grasp students' recognition about the relationships between students and nature.

The results of Q4a and Q4b show that students tend to associate nature and living things with animals, not plants. Even students who felt associated with nature by choosing the biocentric option (Q4b), tended to consider nature as an animal habitat. A positive result for Q4c (Table 2) reveals that students tend to associate themselves with all things which exist in nature. Compared with the results of Q4a and Q4b, proportion of students who associate nature with plants is higher for those choosing Q4c. This may show that students tend to consider plants as things which exist in nature, not living things, and is similar to some of the comments given about nature in the Biocult survey (Macer et al. 1997).

The common results to Q4a, Q4b, and Q4c reveal that few students are associated with conservation. This result seems to show that students give up thinking about solving environmental problems. Among options in Q5, the most common reported behaviour was sorting waste for recycling (Q5f, 70%). One third of the students who have sorted waste for recycling said that they sorted waste, because sorting waste was required in the waste-collecting system in their city. Thus public policy can be effective to encourage people to behave for environmental conservation. In Germany, which is often considered as a progressive country in the environmental movement, many public policies can work with support of high public environmental consciousness. For example, there are many Environmental Conservation Cities which are selected in the contest which sponsored by Deutsche Umwelthife (Environmental NGO). The contest is fair, and a city which gets name "Environmental Conservation City" must make the city's environmental institutions, civil activities, and atmosphere to other self-governing bodies. The citizens in the city come to support the public policies through these process (Kan, 1998). Thus, when we consider behaviour for environmental conservation, we should not disregard recognition which is a basis of behaviour.

Following the recognition that there is a problem, the final purpose of environmental education is one of environmental ethics, namely to act considering the environment. Student data was analyzed from the view of the relationship between student's recognition and their behaviour to nature. The students who selected only Q4a (anthropocentrism) indicated significantly less environmental conservation behaviour (Q5) than those who selected only Q4b (biocentrism), Q4c (ecocentrism), and Q4d (other opinions) (Table 2). The students who selected Q4d were the group with the highest frequency of positive behaviour for environmental conservation. Half of the comments to Q4d were critical of anthropocentric human activities. We might consider students who wanted to write their original opinions may have considered nature more deeply than those who only select existing answers, and this result is consistent with that. It would tend to reinforce the view that students should come to have their original opinions about nature, so that students come to behave for environmental conservation.

These results suggest that many students leave anthropocentrism in order to behave for environmental conservation, if we consider young children generally start life self-centred. Kato (1991) said that one of the main suggestions in environmental ethics was that humans admitted the right to live of other things including species, ecosystem, and landscape. He suggested that humans should no longer be anthropocentric in order to continue to exist on the earth.

Debate, especially role play, may be one of the effective teaching methods for students to leave anthropocentrism. Because students can see themselves from objective views in debate (Kawamoto, 1989), and students can develop their sensitivities to others in role play (Shaftel and Shaftel, 1971), students are expected to come to understand different opinions from themselves. Moulding of such an attitude may be the first step so that students come to leave anthropocentrism.

In conclusion, a full understanding of environmental education requires complete knowledge of local and national culture. Although the international media may broadcast the same stories, and curriculum has many similarities between countries, individual responses to these inputs are varied, as seen in the responses to the surveys conducted here. Like all ethics education, we need to examine the link between knowledge and action, and environmental education is a part of our total moral development as a citizen.

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