A Comparative Study of Forest Environmental Consciousness between Chinese and Japanese Elementary School Students

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Keywords: forest environmental consciousness, Chinese elementary school students, Japanese elementary school students, rural students, urban students, environmental education

Abstract: This is a comparative study of environmental consciousness between China and Japan, mainly regarding forests. We used questionnaires to research environmental consciousness of urban and rural elementary school students in China and Japan. The research was conducted in underdeveloped Sichuan and developed Fujian Provinces of China, and in Tokyo and Gunma Prefectures of Japan. We introduced five aspects of environmental consciousness: environmental sensitivity, attitude, conduct, knowledge, and participation. We performed multiple comparison testing using non-parametric tests. Overall, the results indicated that Chinese students' environmental consciousness is higher than Japanese students, with highest levels in Sichuan Province, followed by Fujian Province and Japan. Rural Sichuan students scored highest in sensitivity, conduct, knowledge, and participation. Urban Sichuan students scored highest in attitude, followed by rural Sichuan students. Japanese students scored lowest in attitude, knowledge, and participation, but higher in conduct than Chinese students, except for rural Sichuan students. Fujian students ranked between Japan and Sichuan.

1. Introduction

Environmental problems are now becoming the object of people’s attention on a global scale. Environmental education is becoming more and more important. The
improvement of environmental awareness is one of the main objects of environmental education. Heightened awareness of environmental risks first took shape in the 1960s. When Rachel Carson's *Silent Spring* was published in 1962, it generated a storm of controversy over the use of chemical pesticides. Her book initiated discussion of environmental risks that formed the foundation of current environmental education. Since the 1960s, many western scholars have used both quantitative and qualitative research methods to assess environmental awareness. Early in 1968, C.E. Charles suggested the term *environmental literacy* (Wang, 1999a). Wang suggests environmental literacy is a concept similar to environmental awareness. For Roth (1992), environmental literacy is an individual’s knowledge about and attitudes toward the environment and environmental issues, skills and motivation to work toward the resolution of environmental problems, and active involvement in working toward the maintenance of dynamic equilibrium between quality of life and quality of the environment. Based on Roth’s definition of environmental literacy, Hsu et al. (1999) selected ten environmental literacy variables to predict the responsible environmental behavior of Taiwanese secondary school teachers. These variables included environmental sensitivity, environmental attitude, environmental responsibility, responsible environmental behavior, locus of control, intention to act, and so on.

The Belgrade Charter was adopted as a global framework for environmental education at the International Environmental Education Workshop of 1975 (UNESCO-UNEP, 1975). The Belgrade Charter has been the most important guideline for environmental education authorized by the international community. It outlines objectives of environmental education, including awareness, knowledge, attitude, skills, evaluation ability, and participation. These six aspects formulate the right direction for environmental education. Hiroshima et al. (2006) implemented a forest education program in primary and secondary schools with the intent of teaching students about the multiple uses and functions of forests. Using the Belgrade Charter’s six objectives of environmental education as a guide, they designed a questionnaire to measure the program’s efficacy by statistical analysis.
In the research field of environmental awareness, comparison studies are frequently used to evaluate differences between countries, regions, and periods. With developing economic globalization, environmental problems are increasingly becoming borderless; thus, a cooperative effort is necessary between Japan (an industrialized country), and China (a developing country). Since the 1990s, many international comparison studies of environmental consciousness between Japan and China have been conducted. Yu et al. (2005) studied university students, Li et al. (1998) studied urban citizens, Zheng et al. (2002) studied nations, and so on. Wang (1999a) conducted a comparative study of national elementary and secondary school students’ environmental consciousness, and compared urban and rural students in China. These studies concerned mainly global and common environmental issues, such as environmental destruction, pollution, recycling, awareness of nature, etc. Forest environmental consciousness, on the other hand, has not been specifically researched. In Japan, some international comparison research regarding forest environmental consciousness has been conducted. Shidei (1981) conducted a comparative study between Japan, West Germany, and France. Kitamura (1986) conducted a comparative study between Finland and Japan.

The word *environmental education* was introduced to Japan at the beginning of the 1970s (Kawashima et al., 2004). Then, Japan started with a Japanese model of environmental education, especially in the field of forest environmental education. Japan has maintained high forest coverage (approximately 67%) through the 20th and into the 21st century. It also has an established forest culture and long-standing experience with forest practices. Forest culture is one of the cores of environmental education and the promotion of forest culture is important for environmental education in Japan (Wu et al., 2007). In 2002, the Ministry of Education reformed public school curriculum to include time for integrated environmental education. Forest practice activities are usually part of elementary school curricula. Moreover, there are diverse social organizations and systems of forest practice in Japan, including the Kids Tree Doctor System, Forest Instructors System, Tamagawa Genliu University, and so on.
Environmental education in China has developed through a series of international conferences on environmental education that have taken place since the 1972 UN Conference on Human Environment held in Stockholm. Since its inception in the early 1980s, China has initiated environmental education systems that include penetrative teaching in primary and secondary schools and extracurricular activities in line with local conditions (Wang, 1999b). By the 1990s, China implemented policies of sustainable development, including environmental education. In the 21st century, environmental education in China has made a shift toward education for sustainable development (ESD). Specific guidance for environmental education in elementary and middle schools has also been introduced. Beginning in the 1990s, non-Governmental Organizations (NGOs), such as the Global Village of Beijing (GVB) and Friends of Nature, have developed grassroots movements for environmental conservation. It is important to note that forest environmental education primarily teaches forest conservation; teaching forest practices is rare. Compared with Japan, the scope of forest environmental education, as available to students and citizens, is limited.

In this study we define forest environmental consciousness as how students feel and think about nature; more specifically, forests and things related to forests. The purpose of this study is to compare the state of forest environmental consciousness between Chinese and Japanese students, and between urban and rural students. We use a questionnaire designed around the five key aspects of environmental consciousness—environmental sensitivity, attitude, conduct, knowledge, and participation. The research was conducted using quantitative analyses through multiple comparison tests. Our ultimate goal is to offer a reference and basis for the development of forest environmental education in China and Japan.

2. Methodology

2.1. Thoughts on the questionnaire

We know there are significant differences between urban and rural areas, and eastern developed areas and western underdeveloped areas because of China’s dual
economy structure. Thus, we classified areas as urban and rural, and developed and underdeveloped before administering the questionnaire. To thoroughly complete a quantitative comparative analysis of forest environmental consciousness, we focus on the key aspects (environmental sensitivity, attitude, conduct, knowledge, and participation) outlined by the Belgrade Charter (UNESCO-UNEP, 1975) and the ideology of environmental literacy (Roth, 1992; Shih-Jang Hsu et al., 1999). Our questionnaire was designed for grade five, 11-year-old elementary school students and consisted of 15 simple questions, three questions related to each key aspect. We developed a five-point scale that students used to rate their response to each question (extremely true with 5 points, fairly true with 4 points, relatively true with 3 points, slightly true with 2 points, and false with 1 point).

In this study, we define the five key aspects as follows:

A. *Environmental sensitivity* indicates how students feel toward forests when they have contact with nature. The survey questions included: (Q1) Are you comfortable recreating in nature? (Q2) Would you like to live in a wooden house? (Q3) Have you ever been deeply impressed when you have seen a natural scene such as flowers and trees?

B. *Attitude* indicates what attitude and awareness the students have about the relationship between nature and humans. The survey questions included: (Q4) Do you think there is a deep relationship between nature and human life? (Q5) Do you think it is necessary for people to use water more carefully? (Q6) Would you like to try living near nature?

C. *Conduct* refers to what students do when they are in nature. The survey questions included: (Q7) Can you enter a forest immediately without apprehension? (Q8) Do you make new discoveries when you are in nature? (Q9) Could you work with anyone when you are in a forest?

D. *Knowledge* is a measure of what students know about forests, or their common sense with respect to forests. The survey questions included: (Q10) Do you have any games you can play in a forest? (Q11) Can you recognize edible nuts and plants in a forest? (Q12) Are there many animals and insects living in a forest?

E. *Participation* indicates, overall, how concerned students are about forest conservation in the future. The survey questions included: (Q13) Would you like to work protecting nature in the future? (Q14) Do you think agriculture and forestry are related to human life? (Q15) Do you think it is necessary for people to manage forests? (Refer to Table 1.)
Table 1. The Questionnaire

| Questions                                                                 | Aspect                           |
|--------------------------------------------------------------------------|----------------------------------|
| Q1  Are you comfortable recreating in nature?                            |                                  |
| Q2  Would you like to live in a wooden house?                             |                                  |
| Q3  Have you ever been deeply impressed when you have seen a natural scene such as flowers and trees? | Environmental Sensitivity        |
| Q4  Do you think there is a deep relationship between nature and human life? |                                  |
| Q5  Do you think it is necessary for people to use water more carefully?  | Attitude                         |
| Q6  Would you like to try living near nature?                             |                                  |
| Q7  Can you enter a forest immediately without apprehension?              | Conduct                          |
| Q8  Do you have new discoveries when you are in nature?                   |                                  |
| Q9  Could you work with anyone when you are in a forest?                  |                                  |
| Q10 Do you have any games you can play in a forest?                       | Knowledge                        |
| Q11 Can you recognize edible nuts and plants in a forest?                 |                                  |
| Q12 Are there many animals and insects living in a forest?                |                                  |
| Q13 Would you like to work protecting nature in the future?               |                                  |
| Q14 Do you think agriculture and forestry are related to human life?      | Participation                    |
| Q15 Do you think it is necessary for people to manage forests?            |                                  |

2.2. Survey and analysis method

The questionnaires were administered in the underdeveloped Sichuan Province and developed Fujian Province of China, and in Japan’s Tokyo and Gunma Prefectures (Figure 1). Sichuan Province, located in southwest China, has a forest cover of 27.9% and an economy that is heavily dependent on agriculture. With approximately 87 million people, it is the most populous province in China. Fujian Province, located in eastern China’s coastal region, is mostly developed with a population of 35 million and abundant forest resources (52.1% forest cover). Even with the difference in population, Sichuan and Fujian have a comparable GDP (National Bureau of Statistics of China, 2006).

The questionnaires were distributed with the cooperation of local teachers in eight urban and rural elementary schools in China and Japan. Teachers gave the questionnaire to students in class and then collected them after students filled in the
sheets. In total, over 800 students responded (Table 2). We classified the schools into six groups, city and rural of Japan and China’s Sichuan and Fujian. The six groups are as follows:

Table 2. Questionnaire Response Rates

| Groups          | School No. | Total School Enrollment | Number of Students in Grade 5 | Questionnaire Respondents |
|-----------------|------------|-------------------------|-------------------------------|---------------------------|
| Japan           | I          | 1                       | 859                           | 155                       | 141                       |
|                 | II         | 2                       | 250                           | 35                        | 35                        |
|                 | III        | 3                       | 1723                          | 272                       | 208                       |
| China           | IV         | 4                       | 1781                          | 172                       | 122                       |
|                 | V          | 5                       | 391                           | 52                        | 52                        |
|                 | VI         | 6                       | 997                           | 186                       | 124                       |
|                 |            | 7                       | 661                           | 102                       | 77                        |
|                 |            | 8                       | 532                           | 86                        | 47                        |
| Total           |            | 7194                    | 1060                          | 806                       |

[I] = City school of Japan, ([City-JP] )
[II] = Rural school of Japan, ([Rural-JP] )
[III] = Sichuan city school of China, ([City-CN(SC)])
[IV] = Sichuan rural school of China, ([Rural-CN(SC)])
[V] = Fujian city school of China, ([City-CN(FJ)])
[VI] = Fujian rural school of China, ([Rural-CN(FJ)])

We analyzed the five key aspects using Excel and Statcel Soft to make multiple comparison tests (Yanai, 2005; Yishimura, 1996). We used the following steps:

1. A normal distribution test of each group was conducted.
2. If there was not a normal distribution, the Kruskal-wallis test - a non-parametric test method - was conducted to test the mean score difference.
3. Finally, Scheffe’s F-test method was used to make multiple comparisons.

3. Results

Table 3 shows the mean scores and standard deviations of the responses. The mean scores of students’ environmental consciousness from Sichuan Province, specifically rural students, were higher than the others. Sichuan rural students had the nine highest mean scores for questions 1, 3, 6-11, and 13, and Sichuan city students had the highest mean score for questions 4, 5, 12, 14, and 15. Japanese rural students had the highest mean score for question 2, but the 11 lowest mean
scores for questions 1, 3-6, 8, 10, 11, 13, 14, and 15. Fujian Province had the lowest mean scores for questions 2, 7, 9, and 12. (Refer to Table 2.)

The following is an overview of the observed trends:

Questions 1 & 3: The percentage of students answering ‘extremely true’ in the Sichuan Province was higher than in any other region. In particular, Sichuan rural students selected ‘extremely true’ (Q1: 63.4% and Q3: 47%) most frequently.
**Question 2:** Japanese rural students offered the highest positive response to Question 2. If the ‘extremely true’ (33.3%) and ‘fairly true’ (39.4%) responses are summed, 72.7% of rural students in Japan expressed a desire to live in a wooden house.

**Question 4:** The percentage of Chinese students answering ‘extremely true’ were as follows: [City-CN(SC)]: 78.8%; [Rural-CN(SC)]: 73.2%; [City-CN(FJ)]: 64.5%; and [Rural-CN(FJ)]: 63.7%. These responses were far greater than Japanese students - [City-JP]: 39.7%; [Rural-JP]: 39.4%.

**Question 5:** The responses show Chinese Students have very high ‘water consciousnesses.’ The percentage of Chinese students who answered ‘extremely true’ were as follows: [City-CN(SC)]: 86.5%; [Rural-CN(SC)]: 82.3%; [City-CN(FJ)]: 76.6%; and [Rural-CN(FJ)]: 74.2%. These responses were far greater than the Japanese students - [City-JP]: 41.8%; [Rural-JP]: 45.5%.

**Question 6:** The answers showed a pattern similar to that observed in the responses to Q4 and Q5; the order is Sichuan, Fujian, and Japan.

**Question 7:** The answers varied widely. On the whole, Japan’s students and China Sichuan rural students scored higher than the others. It should be noted that the number of students from Fujian (32.3%) and Sichuan (29.3%) answering false was far higher than Japan’s city (2.8%) and rural (3.0%) students. This implies most of Japan’s students can enter a forest without apprehension, while China’s students may have little experience in forests.

**Questions 8 through 12:** Chinese students scored higher than Japanese students.

**Question 13, 14, & 15:** Overall, Chinese students scored higher than Japanese students. In particular, Chinese students displayed very high ‘forests management consciousnesses.’ The percentage of Chinese students who responded ‘extremely true’ were as follows: [City-CN(SC)]: 90.4%; [Rural-CN(SC)]: 61.0%; [City-CN(FJ)]: 58.1% and [Rural-CN(FJ)]: 64.5%. These responses were far greater than the Japanese students, [City-JP]: 27.3%; [Rural-JP]: 25.5%). Table 4 shows the results of multiple comparison tests. Sichuan students, specifically Sichuan rural students, had many significant values on the whole.
Table 4. Results of multiple comparison tests

| Groups       | City-CN(SC) | Rural-CN(SC) | City-CN(FJ) | Rural-CN(FJ) | City-JP | Rural-JP |
|--------------|-------------|--------------|-------------|-------------|---------|---------|
| Environmental Sensitivity |             |              |             |             |         |         |
| City-CN(SC)  | 3.54        | **           |             |             |         |         |
| Rural-CN(SC) | **          | 4.11         | **          | **          | **      | **      |
| City-CN(FJ)  | **          | 3.5          |             |             |         |         |
| Rural-CN(FJ) | **          | 3.29         |             |             |         |         |
| City-JP      | **          |              |             |             |         |         |
| Rural-JP     | **          |              |             |             |         |         |
| Participation Environmental Sensitivity |             |              |             |             |         |         |
| City-CN(SC)  | 4.51        | **           | **          | **          | **      | **      |
| Rural-CN(SC) | **          | 4.43         | **          | **          |         |         |
| City-CN(FJ)  | **          | 4.23         |             |             | **      |         |
| Rural-CN(FJ) | **          | **           |             |             | **      | *       |
| City-JP      | **          |              | **          | **          |         | *       |
| Rural-JP     | **          | **           | *           | 3.89        |         | 3.83    |
| Conduct      |             |              |             |             |         |         |
| City-CN(SC)  | 3.27        | **           |             |             |         |         |
| Rural-CN(SC) | **          | 3.7          | **          | **          |         |         |
| City-CN(FJ)  | **          | 3.15         |             |             |         |         |
| Rural-CN(FJ) | **          | 3.19         |             |             |         |         |
| City-JP      | **          |              |             |             |         |         |
| Rural-JP     | **          |              |             |             |         |         |
| Knowledge    |             |              |             |             |         |         |
| City-CN(SC)  | 3.49        | **           |             |             |         | *       |
| Rural-CN(SC) | **          | 4.09         | **          | **          | **      | **      |
| City-CN(FJ)  | **          | 3.69         |             |             | **      |         |
| Rural-CN(FJ) | **          |              |             |             |         |         |
| City-JP      | *           | **           |             |             |         | 3.18    |
| Rural-JP     | **          |              |             |             |         | 3.35    |
| Participation |             |              |             |             |         |         |
| City-CN(SC)  | 4.24        | **           |             |             |          | *       |
| Rural-CN(SC) | **          | 4.33         | **          | **          | **      | **      |
| City-CN(FJ)  | **          | 3.8          |             |             | **      | **      |
| Rural-CN(FJ) | *           | **           |             |             | 3.97    | **      |
| City-JP      | **          | **           | **          | **          |         | 3.23    |
| Rural-JP     | **          | **           | **          | **          |         | 3.24    |

A. Environmental Sensitivity

The mean score of [Rural-CN(SC)] (4.11) was the highest, [City-CN(SC)] (3.54) was next, followed by [City-CN(FJ)] and [City-JP] with the same value of 3.50; the last two were [Rural-JP] (3.44) and [Rural-CN(FJ)] (3.29). [Rural-CN (SC)] was significant at the 0.01 level with the other five groups, which were not significant amongst each other. Scores between [City-CN (FJ)] and [Rural-CN(FJ)], and [City-JP] and [Rural-JP] were not significant.

B. Attitude

The mean score of [City-CN(SC)] (4.51) was the highest, followed by [Rural-CN(SC)] (4.43). The two lowest scores were [City-JP] (3.89) and [Rural-JP]. In the
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same region, there were no significant differences between [City-CN(SC)] and [Rural-CN(SC)], [City-CN(FJ)] and [Rural-CN(FJ)], and [City-JP] and [Rural-JP].

C. Conduct

From highest to lowest, the mean scores were as follows: [Rural-CN(SC)] (3.70), [City-JP] (3.43), [Rural-JP] (3.29), [Rural-CN(FJ)] (3.19), and [City-CN(FJ)] (3.15). [Rural-CN(SC)] was the highest and significant with [City-CN(SC)], while [City-CN(FJ)] and [Rural-CN(FJ)] were not significant with [City-JP] and [Rural-JP]. Scores between [City-CN (FJ)] and [Rural-CN(FJ)], and [City-JP] and [Rural-JP] were not significant.

D. Knowledge

The mean score of [Rural-CN (SC)] (4.09) was the highest and was significant at the 0.01 level with the other five groups. The lowest was [City-JP], which was significant with each of China’s four groups. Scores between [City-CN (FJ)] and [Rural-CN(FJ)], and [City-JP] and [Rural-JP] were not significant.

E. Participation

The mean score of [Rural-CN (SC)] (4.33) was the highest; the next was [City-CN(SC)] (4.24). These two groups were significant with the other 4 groups, but there was no finding of significance between the two groups. The two lowest were [City-JP] (3.23) and [Rural-JP] (3.24).

4. Discussion and Conclusions

Based on our results, we can surmise that Chinese students’ forest environmental consciousness is generally higher than that of Japanese students. Students in China Sichuan displayed the highest levels of environmental consciousness, followed by China Fujian and Japan; in terms of economic development, we found the reverse relationship. We reviewed other environmental consciousness studies that made comparisons between the Japanese and Chinese. Yu et al. (2005) studied Japanese and Chinese university students’ environmental consciousness using common environmental questions. The results showed Chinese university students’ environmental consciousness was generally higher than that of Japanese university
students. Li et al. (1998) conducted a comparative study of citizens’ environmental awareness and policy related to the urban environment between Hangzhou City in China and ordinance-designated cities in Japan. The results showed that Chinese citizens’ environmental awareness was higher than Japanese awareness, especially when making environmental policy. In this study, we found a similar tendency with Chinese and Japanese elementary school students’ forest environmental consciousness.

In this investigation, we found that Chinese students thoroughly understand the importance of water, necessity of forest management, the deep relationship between nature and humans, and believe agriculture and forestry are related to human life. Within these areas, Sichuan students scored higher than Fujian students, but there were no significant differences between urban and rural students of the same region in Sichuan or Fujian. Nevertheless, Chinese students demonstrated a negative reaction to wooden houses, entering a forest, and so on. The Chinese government and some NGOs are emphasizing natural resource-related issues, such as forest
management and water protection, in school textbooks and public relations, but discussion of forest practices is rare in students’ environmental education materials for two reasons. First, until now China has not had an organic forest practice system, which integrates forest management agencies, education committees, schools, and civic groups. Second, the One Child Policy has resulted in the overprotection of children living in urban areas. We think less experience with forest practices caused a bigger gap between consciousness and conduct in China, even though Chinese students demonstrated higher environmental consciousness, especially for urban students.

Rural Sichuan students scored highest in environmental sensitivity, conduct, and knowledge and participation, while urban Sichuan students scored highest in attitude. With the exception of rural Sichuan students, urban and rural Japanese students scored higher in conduct. Rural and urban Sichuan students scored highest in participation. Japanese students scored lowest in attitude, knowledge, and participation. There were significant differences for environmental sensitivity and knowledge between urban and rural Sichuan students, and rural students scored higher than urban students. China Fujian and Japanese students showed no significant differences between urban and rural students with respect to the five key aspects. We think this is because economic development has tempered the lifestyle differences typically observed between urban and rural populations.

It is important to note that rural Sichuan students scored highest in almost all of the key aspects. We think this is because rural Chinese students’ lifestyles reflect and maintain many traditional features, which include living in a natural environment and assisting with family agricultural and forestry chores.

On the other hand, the forest environmental consciousness of most Japanese students was lower than their Chinese counterparts. We believe this is because there are fewer practical opportunities for agricultural and forestry work in Japan, especially as urban and rural lifestyles have changed significantly. It is necessary for Japanese environmental education programs to promote traditional forest culture and provide practical opportunities for agricultural and forestry work, as well as
increase opportunities for students to have contact with nature.

We can say that the results of our survey clearly show differences between Japanese and Chinese students’ forest environmental consciousness. China has made some progress in environmental conservation and education, and environmental consciousness is increasing. However, the Chinese implementation of forest environmental education has not been sufficient. We have shown that environmental education issues, such as forest practices, must be further emphasized in China. A new forest environmental education system is needed to establish an organic and cooperative network that integrates forest management agencies, education committees, schools, and civic groups. Studying Japan’s experiences is extremely valuable for China and is an important area for further longitudinal research. We also suggest Japanese environmental education programs should provide practical opportunities for agricultural and forestry work, as well as increase opportunities for students to have contact with nature.

Acknowledgments

We thank Kaoru Matsuno, Takuya Sugino, Bin Zhang, Ze Tang, Tao Tang, for their cooperation with the questionnaires used in this study. This research was sponsored by the Japanese Society for Promotion of Sciences.

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中国・日本の小學生を対象にした森林環境認識に関する比較分析
呉守蓉・宮林茂幸

要約：本研究は主に森林を中心に、中国及び日本の小學生の環境認識の比較したものである。調査対象地区は四川省、福建省、東京都及び群馬県である。比較においては、環境に対する感受性、態度、行為、知識及び参加という5つの視点を導入した。ノンパラメトリックテストによる比較を行った結果、中国の小學生の方が環境に対する意識が高く、四川省、福建省、続いて日本の地域という順であった。四川省の田舎では、環境感受性、行為、知識、参加の点で最高点を示し、態度に関しては、四川省の都市部で最高点を示した。日本の小學生は行為の点において高い得点を示した。福建省の小學生は日本と四川省の間の位置を示す結果となった。

キーワード：森林環境認識、中日小學生、田舎学生、都市学生、環境教育