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**Abstract.** *This research aims to explore the tendency of the New Ecological Paradigm and environmental concerns on local environmental issues of secondary school teachers. Two hundred seventy teachers were selected by stratified random and cluster sampling from 13 schools to participate in the survey. The seven teachers were interviewed on their concepts and beliefs on the ecological worldviews and local environmental concerns. The results of the research include: With high pro-environmental beliefs, most of the teachers expressed their concerns about the environment. However, teachers believe that “Human will eventually learn enough about how nature works to be able to control it,” which is labeled as anti-NEP item. It seems that teachers mostly notice to “human learn” not to “human control”. It also seems that teacher’ environmental worldviews may be affected by their career training. The results of the research provide some implication for strengthening teachers’ environmental endorsement and therefore to affect people’s environmental ethics and friendly behaviors.*

**Keywords:** *environmental education, local environmental concerns, new ecological paradigm survey.*

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## THE ECOLOGICAL WORLDVIEWS AND LOCAL ENVIRONMENTAL CONCERNS AMONG SECONDARY SCHOOL TEACHERS

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### Introduction

A person’s ecological views are generally subjective beliefs about human–nature relationship that forms a conceptual basis for more specific attitudes, beliefs, and behaviors toward the environment. Ecological views are embedded in various cultural messages, and these beliefs are a component of individual or group-level environmental mentality (Raudsepp, 2001). Throughout history, the way in which people conceive nature–human relation has changed dramatically, and different cultures also have divergent notions regarding the role that man plays in nature (Bechtel, Asai, Corral-Verdugo, & Riesle, 2006). The human exception paradigm (HEP) or dominant social paradigm (DSP), and the new environmental paradigm (NEP) were introduced as a 12-item measure of basic environmental belief system by Dunlap and Van Liere (1978). The HEP is a worldview that conceives human beings as entities superior to all other organisms. Such vision establishes that humans are independent from nature and have a strong confidence in science as a means to control nature or solve problems regarding man’s adaptation to the environment (Dunlap, Van Liere, Merting, & Jones, 2000). On the other hand, the NEP considers human as just one component of the ecological network, subject to the rules of the interdependence and diversity, which oblige this species to maintain a balance with the rest of the components of nature and limit the impact of its activity on earth. The HEP is conceived as an anthropocentric system of beliefs, since it places the human beings in the center of everything, while the NEP is conceived as an eco-centric system of beliefs (Bechtel, Asai, Corral-Verdugo, & Riesle, 2006).

Rapid, extensive, and ongoing environmental change increasingly demands that humans intervene in ecosystems to maintain or restore ecosystem services and biodiversity (Hobbs, Hallett, Ehrlich & Mooney, 2011). One of the main challenges to society is to find a balanced relation between human and natural environments. Sustainable development is an accepted



concept for development aimed at finding a balance between providing the needs for the present and future human society and protecting the environment (World Commission on the Environment and Development, 1987). In general, individuals' awareness, views, and behaviors toward the environment are influenced by political ideology, economical settings, and social structures within certain cultures (Huang & Yore, 2003). However, these factors are also grouped in school settings. Schools have always been viewed as an institution for the transfer of knowledge and culture to the future generation. Children obtain knowledge and develop attitudes toward the environment mostly from general school curricula (Michail, Stamou, & Stamou, 2006). Schools can also become a place that generates or produces knowledge on the solution and management of local environmental problems (Meinardi & Revel-Chion, 2005). Hence, education is a crucial agent for achieving sustainable development and creating an environmentally literate society that is motivated and equipped to influence decision-making (Orr, 1994; UNESCO-UNEP, 1990) and '*the ultimate aim of environmental education (EE) is to enable people to understand the complexities of the environment and the need for nationals to adapt their activities and pursue their development in ways which are harmonious with the environment*' (p.12) (UNESCO, 1978). The study of ecological worldviews and concerns is fundamental to protect and improve the natural environment's condition (Cordano, Welcomer & Scherer, 2003). In recent decades, educators have become more aware of the role they have to play in conceptualizing environmental issues and developing cognition concerning the environment in the future generations (Petegem, Blicke, & Pauw, 2007), since they are relatively accessible, active, and influential (UNESCO, 1988). Teachers' beliefs and conceptions of environment influence children's environmental conception, especially in the elementary and secondary schools, where teachers directly teach the domain knowledge of science and nature. Therefore, knowing secondary school teachers' ecological worldview and their local environmental concerns can shed some light as to how to make the environmental education easier and capture the needs to protect the environment. Opinions from teachers can provide worthy reference for education policymakers to empower teachers' environmental endorsement and foster public environmental concerns and behaviors.

Taiwan underwent industrialization and urbanization when it experienced rapid economic growth. However, economic development without much environmental consideration has dramatically changed its natural environment (Hsu, & Roth, 1996; López, 2017). Economic progress in Taiwan has also led to greater public awareness of environmental protection affairs. More and more people are becoming aware of the severity of the environmental problem in Taiwan. Several studies have also pointed to the same conclusions (Hsu, & Roth, 1996; Huang & Yore, 2003). Taiwan's population density is ranked as the second highest in the world and has caused a shortage of living space and low quality of living standards. Most people in Taiwan feel that the environment quality in the area they live is unsatisfactory. Environmental education has been an urgent concern since the 1980s. Both the government and all levels of schools have initiated many efforts to promote EE in the past decade. Curriculum reform that took place in the 1990s has defined infusing EE into the curriculum of every level of school. Moreover, the government issued the Environmental Education Act in 2010 to advance citizens' understanding of the interdependent relationship between individuals, society and the environment, to raise the nation's environmental ethics and responsibility, so as to maintain the ecological balance of the environment, respect life, and foster social justice, and cultivate environmentally aware citizens and environmental studies communities to achieve sustainable development (Executive Yuan, 2010). On the whole, almost all the teachers have begun to take a note and engage themselves in the EE. However, only a handful of teachers had received formal EE or training. For the most part, many teachers' environmental perspectives and beliefs are still unknown.

Therefore, the problem area of the research concerns the lack of current empirical evidence about secondary teachers' ecological worldview and their local environmental concerns. It is important to survey ecological worldview and their local environmental concerns of secondary school teachers in Taiwan. The significance of the research has two folds. First, the research reveals current teachers' ecological worldviews that are recognized as the foundation of teachers' cognition, attitudes, and behavior toward EE. Second, the research is to determine the local environment concerns and opinions, which secondary teachers have.

#### *New Ecological Paradigm Scale Development and Trend*

During the spring and summer of 1976, Dunlap and Van Liere (1978) surveyed two samples (general public sample, GPS, and environmental organization sample, EOS) of Washington State residents, and found that a set of 12 items could measure three facets of the new social paradigm or worldview (limits to growth, balance of nature, anti-anthropocentrism). The NEP scale exhibited a good deal of internal consistency (coefficient  $\alpha$  of 0.813



for GPS and 0.758 for EOS), and strongly discriminated between environmentalists and the general public. The initial work of Dunlap and Van Liere (1978) was widely accepted by many researchers, and numerous studies used the NEP scale as a measure of general ecological worldview in various populations and contexts. It has become a valuable research instrument employed in hundreds of studies in dozens of nations (Dunlap, 2008; Dunlap, Van Liere, Merting, and Jones, 2000; Harrway, Broughton-Ansin, Deaker, Jowett and Shephard, 2012; Bozzolasco, 2017).

The 12-item scale has been used mostly often with samples of the general public, but it has also been used with samples of specific sectors such as farmers (Albrecht, Bultena, Hoiberg, & Nowak, 1982) and members of interest groups. Arcury and Christianson (1990) compared the 1984 and 1988 Kentucky statewide environmental worldviews in response to environmental problem and water shortage and found it was obvious that the local environmental events could change people's worldview. Noe & Snow (1990) evaluated the degree to park visitors who support an ecological view of man and nature, as opposed to those who favor anthropocentric view of man controlling nature more. Schultz, Unipan, and Gamba (2000) examined the environmental attitudes of foreign-born Latino American high school students and their findings suggested that culture is an important determinant of environmental attitudes.

The scale has also been used as the basic instrument in the international and cross-cultural researches. Corral-Verdugo and Amendariz (2000) measured Mexicans on their beliefs about human-environment relations by the NEP-HEP scale. The results pointed to a more holistic view of human relations with the environment, in contrast to the dualistic vision of some western countries. Gooch (1995) compared the environmental beliefs and attitudes in Estonia, Latvia, and Sweden. The results showed that the expected correlations between support for NEP, distrust of science and technology, post-material values, and concern for environmental conditions were only partially supported by the results of the Swedish study, and were not supported at all in case of the Baltic samples. LaLonde and Jackson (2002) conducted an international survey via the Internet in which respondents not only completed the NEP scale, but also commented critically and in-depth on the scale items. They distributed questionnaires using e-mail. The survey was completed by 222 respondents from people living in 23 countries. The authors included respondents' characteristics, such as occupation and income to demonstrate the respondents' diversity. However, religion was considered as a significant characteristic in their study. Bostrom et al. (2006) conducted three surveys in Bulgaria in 1998, 1999, and 2000 to provide evidence of high environmental concern, and that proximity to a major petrochemical plant is associated with greater concerns. Their findings showed that the risk perceptions of specific environmental problems are high. Bechtel, Asai, Corral-Verdugo, and Riesle (2006) compared the worldviews in four different countries. Responses of 1358 undergraduates from USA, Japan, Mexico, and Peru to the HEP and the NEP scale were analyzed. Results of this study produced a finding regarding the diversity of the environmental belief structures among different national groups.

Dunlap, Van Liere, Merting, and Jones (2000) revised their NEP scale design to improve upon the original one in several respects: (1) to tap a wider range of facets of ecological worldview, (2) offer a balanced set of pro- and anti-NEP items, and (3) avoid outmoded terminology. The new scale was renamed as New Ecological Paradigm and consisted of 15 items, since they tried to update and broaden the scale's content. Since the production of Dunlap and Van Liere's (1978) original NEP scale, new issues have become increasing important within the environmental debate, in particular, the biotech rights, intrinsic value of nature, and moral obligations to future organisms (Trobe & Acott, 2000). Dunlap argued that his NEP scale would capture the change in public opinion towards an orientation that people should live in harmony with nature rather than use nature as a resource solely for human purpose (Bostrom, Barke, Turaga, & O'Connor, 2006). Survey participants rated each of the NEP items on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The eight odd-numbered items were worded so that agreement indicated a pro-ecological view and the seven even-numbered ones were worded so that disagreement indicated a pro-ecological worldview.

After a pre-test with college students, the new set of NEP items was used in 1990 mail survey of a representative sample of Washington State residents and 676 completed questionnaires. Dunlap, Van Liere, Merting, and Jones (2000) examined the degree of internal consistency of the 15-item scale. The coefficient  $\alpha$  was very good, with a value of 0.83. They suggested that future research would be to compare the degree to which the NEP beliefs are organized coherently across different populations, including comparison of patterns of multidimensionality when distinct dimensions emerge, as well as the degree to which the resulting worldviews influence a range of environmental attitudes, beliefs, and behaviors. After factor analysis, they indicated that it would "*be more appropriate to treat the NEP as multidimensional*" (p. 436). The questions relate to five hypothesis facets: Balance of Nature (items 3,8,13), Eco-crisis (items 5,10,15), Anti-Exemptionalism (items 4, 9,14), Limit to Growth (items 1,6,11) and



Anti-anthropocentrism (items 2,7,12). They also claimed that the NEP possesses predictive, content, and construct validities in some evidence (Cordano, Welcomer, and Scherer, 2003; Shephard, Mann, Smith, and Deaker, 2009).

The revised scale is still widely used by many researchers on environmental or ecological worldviews around the world. Sherburn and Devlin (2004) investigated the relationships between academic major, environmental concern, and the presence of a campus arboretum. Seventy college students completed a series of surveys including the Environmental Preference Questionnaire, the Environmental Concern Scale, and the New Ecological Paradigm Scale. They found that environmental studies majors were significantly more likely to value and use the arboretum than were the other groups. Rideout, Hushen, McGinty, Perkins, and Tate (2005) conducted a longitudinal study of environmental perspective among college students, resident-student opinion using New Ecological Paradigm scale. Their sample subjects were taken through systematic alphabetic sampling ( $N=305$ ) and a blanket e-mail distribution of survey for voluntary response ( $N=659$ ). The results were found to be positive with 54.4% and 61.1% agreement with each NEP viewpoint, respectively. A two-way ANOVA indicated that this effect of sampling method was significantly a gender effect ( $F(1, 960)=14.955, p<0.001$ ). Mean values for women, 52.9 (systematic) and 55.3 (e-mail), were higher than those for men, 49.5 (systematic) and 51.6 (e-mail), indicating greater support for NEP beliefs among the female respondents.

Manoli, Johnson, and Dunlap (2007) revised and validated the New Ecological Paradigm Scale for use with upper elementary students. They interviewed 5-grade students to revise the NEP Scale for use with children. After two-year validation and modification with large numbers of students, they suggested that a 3-dimensional modified NEP Scale for children with 10 instead of 15 items and revised wording was appropriate for use with children aged 10-12 years.

Lee (2008) examined the environmental attitudes of African American college students by using the 15-item NEP Scale. The author also attempted to determine students' everyday environmental behaviors such as recycling and conservation and investigated major information sources for local, national, and international environmental issues. In general, African American students were modestly pro-environmental, as determined by the NEP Scale. Television and the Internet were the students' major sources of information on environmental news.

Shephard, Mann, Smith, and Deaker (2009) surveyed 539 students by NEP Scale and found that age ( $p<.05$ ), gender ( $p<.001$ ) and ethnicity ( $p<.001$ ) demonstrated significant differences and identified four factors and used their contributory NEP items to describe four consequential implied "tendencies" (to conserve, to recycle, to be cautious about the future and to support animal and plant rights) by factor analysis. Harrway, Broughton-Ansin, Deaker, Jowett and Shephard (2012) used the NEP to monitor changes in the ecological worldviews and contributory sustainability tendencies of first-year undergraduate students in New Zealand. Totally, 360 participants completed the surveys at three time points. They found women holding a stronger pro-ecological worldview than men and students undertaking a zoology program having stronger pro-ecological attitudes than those in the other four groups. Finally, they concluded that the NEP is a valuable research instrument for their study. However, their four-factor model identified from the NEP is quite a new interpretation of the ecological worldviews.

#### *Teachers' Environmental Knowledge and Beliefs*

The goal of EE and sustainability is 'to educate people to be environmentally responsible citizenship and to foster environmental literacy for all' (p. 571) (Shephard, Mann, Smith, and Deaker, 2009). Meinardi and Revel-Chion (2005) claimed that EE should aim at three main objectives: (1) increase the knowledge about the different environmental problems that affect different regions of the country, (2) promote changes as to how to teach science, by means of transformation of the scientific conceptions of teacher, in addition to their ideas and teaching practices, and (3) contribute to the raising teacher's awareness in the performance of his/her role as orienting agent or facilitator of the learning process, as well as in the strategies used, and the capability in handling students' difficulties.

Michail, Stamou, and Stamou (2006) examined 155 Greek primary school teachers' understanding of three current environmental issues (acid rain, ozone-layer depletion, and greenhouse effect) and the emerging images of nature. The study revealed that the teachers held several environmental knowledge gaps and misconceptions about the three phenomena. Using the media as the major environmental information source in which environmental issues were constructed as environmental risks, teachers became environmentally educated with respect to common lay terms instead of scientific terms. Moreover, the image of nature emerging from their ideas about the three environmental issues was that of the romantic archetype, which prevails in postindustrial societies. Such a view gives a conceptualization of nature as balance, under which the greenhouse effect and acid rain are



seen as exclusively human-induced “disturbances.” Hsu and Roth (1996) conducted a study to assess the teachers’ environmental literacy and analyzed the predictors of teachers’ responsible environmental behavior. About 300 secondary school teachers, in Hualien County of eastern Taiwan, were randomly selected, and 157 effective response data were analyzed. The results showed that secondary teachers in Hualien exhibited a relatively higher level of knowledge of environmental action strategies, skills in using environmental action strategies, and intention to act. They also found that a great majority of the teachers lived and taught in areas where they grew up, and teachers living in urban areas took more environmental action than those living in rural areas. Their study also found that the three most popular sources of teachers’ environmental information were newspapers (36.6%), TV (25.6%), and books and magazines (24.4%).

Fransson and Garling (1999) tried to determine: (1) the correlations between determinants, such as sociodemographic or psychological factors, and environmental concern, and (2) an impact of environmental concern on environmentally responsible behavior. After reviewing and analyzing previous research to determine whether environmental concern plays an important role in behavior changes, they reviewed five background factors of environmental concern, including age, social class, residence, political ideology, and gender. Their final summary was concluded as “it has been suggested that younger, more educated individuals with liberal political ideologies living in urban areas are most environmentally concerned.” However, such a statement must be made with great caution. The relationships between social-demographic factors and environmental concern are generally weak.

The teachers play increasingly important roles in EE and pro-environmentalism. However, most teachers may still have environmental knowledge gaps and misconceptions. The environmental concepts or ecological worldviews are influenced by a person’s background and training experience. Thus, knowing the teachers’ worldviews may provide good information for the policymakers or administrators to work on EE projects to increase endorsement of the NEP attitudes, beliefs, and even their behaviors.

## Methodology of Research

A survey was carried out or the collected data and interviews were conducted to comprehend their in-depth understanding in 2015.

### *General Background*

To measure whether people’s attitudes toward nature are actually changing, it is necessary to be able to validly and reliably measure people’s beliefs and value systems (Trobe & Acott, 2000). Although factual knowledge of environmental issues is not the sole determinant of worldview or behavior, it can have some influence over such broad perspectives in the individual. A large base of factual ecological data is, of course, essential in the initial scientific understanding leading to greater public awareness of ecological problems (Rideout, Hushen, McGinty, Perkins & Tate, 2005).

The six items of personal information on EE are gender, age, religion, pre-service major, subject taught, and training experience. Most of these items were cited from literature and the rest were considered to be the teachers’ special background, which may correlate to their worldview. All the items were checked by five experts, including three professors, who had taught environmental courses and two science teachers in middle schools. Dunlap, Van Liere, Merting, and Jones (2000) claimed that the NEP items primarily tap the “primitive beliefs” about the nature of earth and humanity’s relationship with it. All the 15 items were translated into Chinese by the authors. They were also checked by two English professors and three professors who had taught environmental courses in college level.

### *Sample Selection*

A stratified random sample was taken to draw the participants with respect to the area and size of the schools. After selecting the schools, 270 teachers were randomly selected to answer the questionnaire. There are 817 secondary school teachers in Keelung and the rate of selection was over 33%. Of the 245 questionnaires returned, 240 were valid. The return rate was 90.7%, making up 29% of the population of secondary school teachers in Keelung. The distribution of teachers drawn by stratified sampling revealed more females than males, with the age range mostly between 30 and 49 years. Most of them had no religious belief or were Buddhists, and a majority of them had college degree, majored in social science, languages, or science. Most of the teachers had never taken any



environmental courses, and over half of them had participated in environmental conferences, and few had joined environmental groups or activities.

#### *Development of New Ecological Paradigm Scale*

With respect to the consistency and dimension of the scale, the internal consistency (Cronbach's  $\alpha$ ) of the scale in this study was 0.714 and was lower than that of Rieout et al. (2005) sampling of Ursinus college students by systematic survey (0.828) and e-mail (0.816); however, it is still acceptable. The Kaiser–Meyer–Olkin value of the present scale was 0.770 and was sufficient for analyzing the factors of the inventory. From Table 1, similar to the findings of other studies (Shephard, Mann, Smith, and Deaker, 2009; Harrway, Broughton-Ansin, Deaker, Jowett and Shephard, 2012) the analysis resulted in the 15 items loading into four factors where the eigenvalues were greater than 1.0. The four factors cumulatively explain 51.598% of the total variance for the present study.

**Table 1. Rotated component matrix.**

	Component			
	1	2	3	4
4	.707	-.159	.154	-.088
8	.637	.266	.033	.201
2	.630	.000	-.017	.084
12	.613	.230	.145	-.038
10	.529	.470	.026	.226
3	.005	.741	-.082	.157
7	.110	.714	.172	-.007
14	.082	-.031	-.703	.032
1	.080	-.103	.616	.170
9	.152	.145	.570	.074
5	.117	.423	.479	.222
11	.163	.411	.420	.315
13	-.008	.151	.196	.783
15	.034	.278	.194	.661
6	.450	-.312	-.129	.580

*Extraction method: Principal Component Analysis. Rotation method: Varimax with Kaiser Normalization.*

*A rotation converged in five iterations.*

The four factors showed in Table 2 were similar to Shephard et al. (2009), but still having a little difference in facets and items in each facet.

**Table 2. Comparisons of the distributions of items to factors with Dunlap et al. & Shepherd et al.**

Facets	Present study	Dunlap et al. 2000 study	Shepherd et al. 2009 study
1. The reality of limits to growth	1,5,9,11,14	1,6,11	1,6,11
2. Anti-anthropocentrism	2,4,8,10,12	2,7,12	4,8,14
3. The fragility of nature's balance	3,7	3,8,13	3,5,9,10,13,15
4. Rejection of exemptionalism		4,9,14	2,7,12
5. The possibility of an eco-crisis	6,13,15	5,10,15	



The third part of the inventory contained nine items about local environmental issues. The questions were collected according to the newspapers and other media, and were reviewed by five professors and 14 experts in the focus panel. After arriving at a consensus on every item, nine items were selected as important local environmental issues.

#### *Open-Ended Question and Interview Questions*

There was an open-ended question at the end of the questionnaire for extra comments on the worldview or environmental concerns. Semi-structured questions were used to learn about the teachers' deep concerns and perceptions on the worldview. The questions were also reviewed by seven experts, including three professors in education and environment, two elementary school principals and two mentor teachers, to construct its expert validity. The interviews took about one hour and were done at each teacher's respective schools. The whole process was recorded by digital recorder and transcribed into text.

### **Results of Research**

The main part of the analysis was twofold: first, to check the whole frequency distributions for the New Ecological Paradigm scale of teachers and the comparative analysis by the teachers' different variables in NEP; Second, to analyze the local environmental concerns.

#### *Data Analysis on Pro-Environment*

The first analysis was aimed at determining the agreement or disagreement on each item, and the means, deviations, and the percentage of pro-NEP. The total percentage of pro-NEP was calculated as the sum of "strongly agree" and "agree" in odd items and "strongly disagree" and "disagree" in even items. The results are shown in Table 3.

**Table 3. Frequency distributions for the New Ecological Paradigm Scale.**

Agreement or disagreement level and the Percentage	SAa N (%)	MA N (%)	U N (%)	MD N (%)	SD N (%)	M (SD)	% of Pro-NEP
1. We are reaching the threshold of the number of people that Earth can support	68 (28.3)	123 (51.3)	34 (14.2)	15 (6.3)	0 (0)	4.02 (.823)	79.6
2. Humans have the right to modify the natural environment to suit their needs	10 (4.2)	31 (12.9)	39 (16.3)	117 (48.8)	43 (17.9)	3.63 (1.050)	66.7
3. When humans interfere with nature, they often produce disastrous consequences	134 (55.8)	97 (40.4)	2 (0.8)	2 (0.8)	5 (2.1)	4.47 (.754)	96.2
4. Human ingenuity will ensure that we do not make Earth as an uninhabitable place	11 (4.6)	45 (18.8)	70 (29.2)	79 (32.9)	35 (14.6)	3.34 (1.082)	47.5
5. Humans are severely abusing the environment	136 (56.7)	97 (40.4)	5 (2.1)	1 (.4)	1 (.4)	4.53 (.606)	97.1
6. Earth has plenty of natural resources if we just learn how to develop them	18 (7.5)	94 (39.2)	41 (17.1)	69 (28.8)	18 (7.5)	2.90 (1.129)	36.3
7. Plants and animals have as much rights as human to exist	139 (57.9)	98 (40.8)	2 (.8)	0 (0)	1 (.4)	4.56 (.561)	98.7
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations	5 (2.1)	12 (5.0)	29 (12.1)	121 (50.4)	73 (30.4)	4.02 (.903)	80.8



9. Despite our special abilities, humans are still subject to the laws of nature	123 (51.3)	106 (44.2)	6 (2.5)	2 (0.8)	3 (1.3)	4.43 (.705)	95.5
10. The so-called "ecological crisis" faced by mankind has been greatly exaggerated	6 (2.5)	17 (7.1)	19 (7.9)	124 (51.7)	74 (30.8)	4.01 (.948)	82.5
11. Earth is like a spaceship with very limited room and resources	134 (55.8)	102 (42.5)	1 (.4)	3 (1.3)	0 (0)	4.53 (.578)	98.6
12. Humans are meant to rule over the rest of nature	3 (1.3)	8 (3.3)	9 (3.8)	105 (43.8)	115 (47.9)	4.34 (.807)	91.7
13. The balance of nature is very delicate and can be easily upset	94 (39.2)	119 (49.6)	16 (6.7)	8 (3.3)	3 (1.3)	4.22 (.811)	88.8
14. Humans will eventually learn enough about how nature works to be able to control it	96 (40.0)	123 (51.3)	15 (6.3)	5 (2.1)	1 (.4)	1.72 (.711)	2.5
15. If things continue on their present course, we will soon experience a major ecological catastrophe	129 (53.8)	95 (39.6)	12 (5.0)	2 (.8)	2 (.8)	4.45 (.707)	93.4
Total						3.94	77.06

SA=Strongly Agree; MA=Mildly Agree; U=Unsure; MD=Mildly Disagree; and SD=Strongly Disagree

The total percentage of pro-NEP was 77.06, showing that most of the teachers have NEP worldview. They revealed high means and percentage in NEP items, especially in items 7, 11, and 5. Furthermore, most of the teachers' perceptions had low means in HEP, especially in items 14, 6, and 4. It is worth noting the lowest mean of item 14.

Among the five hypothesis facets which Dunlap, Van Liere, Merting, and Jones (2000) proposed, the highest facet was "The fragility of nature's balance" with a mean of 4.24 and the lowest one was the "Rejection of exemptionalism" with a mean of 3.16. The distribution on each facet is shown in Table 4.

**Table 4. Distribution on the five facets.**

Facets	Minimum	Maximum	Mean of facet	SD	Mean of item
1. The reality of limits to growth	6	15	11.44	1.67	3.82
2. Anti-anthropocentrism	7	15	12.53	1.69	4.18
3. The fragility of nature's balance	6	15	12.71	1.69	4.24
4. Rejection of exemptionalism	5	14	9.49	1.44	3.16
5. The possibility of an eco-crisis	8	15	12.98	1.64	4.33
Total mean	44	73	59.16	5.57	3.94

#### Comparison of Variables

While testing the different demographic variables on teachers' worldview, we found only one variable showing a significant difference, which is the teachers' subject taught. After Scheffé comparison, teachers who taught physical education revealed the lowest mean (Table 8). There were no differences among gender, age, educational background, religious belief, course taken, participation in environmental conference or activities, or joining various environmental groups. The statistical analysis by *t*-test and ANOVA is shown in Tables 5 and 6.





**Table 5. The t-test for gender, religious, course, conference, group, and activity.**

Variable	N	M	SD	F	t-value	p
Male	63	58.33	6.754	5.349	-1.200	.233
Female	177	59.45	5.068			
Without religious belief	104	59.17	5.336	1.146	.036	.971
With religious belief	136	59.15	5.756			
Haven't taken any course on EE	153	58.83	5.387	.401	-1.213	.226
Have taken course(s) on EE	87	59.74	5.856			
Haven't participated in any conference on EE	84	58.69	6.615	13.400	-.876	.383
Have participated in conference(s) on EE	156	59.41	4.916			
Haven't joined any environmental group	219	59.07	5.561	.061	-.766	.445
Have joined environment-related activity	21	60.05	5.687			
Haven't participated in any activity for the environment	173	59.01	5.655	.329	-.656	.513
Have participated in activity for the environment	67	59.54	5.355			

**Table 6. ANOVA for age, religious, degree, major, teaching area.**

Variable		SS	df	MS	F	p
Age	Between groups	109.621	4	27.405	.883	.475
	Within groups	7296.363	235	31.048		
	Total	7405.983	239			
Religion	Between groups	265.005	5	53.001	1.737	.127
	Within groups	7140.979	234	30.517		
	Total	7405.983	239			
Degree	Between groups	65.108	2	32.554	1.051	.351
	Within groups	7340.875	237	30.974		
	Total	7405.983	239			
Major	Between groups	5.747	4	1.437	.046	.996
	Within groups	7400.236	235	31.490		
	Total	7405.983	239			
Teaching area	Between groups	524.067	6	87.344	2.957	.008**
	Within groups	6881.917	233	29.536		
	Total	7405.983	239			

\*\* $p < 0.01$ **Table 7. Scheffé comparison on teaching area.**

Teaching area	N	M	SD	LSD comparison
1 Language	93	59.98	4.943	1>6
2 Math	47	58.26	5.899	2>6
3 Social science	28	59.07	4.729	3>6
4 Nature science	36	60.28	5.740	4>6
5 Art and literacy	11	59.18	5.618	5>6
6 Physical Education	13	53.77	6.313	6>6
7 Comprehensive activities	12	59.00	6.620	7>6
Total	240	59.16	5.567	



*Local Environmental Concerns*

(1) When asked, "Do you care about our environmental issues and events?" the percentage of teachers who answered that they "Care" and "very much" was 89.6%. Only 10.4% of the teachers stated that they cared little about the environmental issues, and no one expressed that they never cared. The actual numbers and percentage distribution are shown in Table 8.

**Table 8. Number and percentage of care about environmental issues.**

Frequency	<i>N</i>	%
Very much	21	8.8
Care	194	80.8
Care little	25	10.4
Never care	0	0
Total	240	100.0

(2) When asked, "Where did you get your environmental information?" and instructed to rank the highest 3 by order, the top three sources were found to be newspaper (30.9%), TV (29.7%), and network (20.6%). The weighed values, percentage distribution, and the final rank are shown in Table 9.

**Table 9. Sources of environmental information.**

Sources	Ordered by first three ranks				% of after weighed <sup>b</sup>	Final rank
	Rank 1	Rank 2	Rank 3	Sum (weighed) <sup>a</sup>		
Newspaper	85	74	42	445	30.90	1
TV	84	64	48	428	29.72	2
Network	49	50	50	297	20.63	3
Books and Magazines	6	21	36	96	6.67	4
School	8	9	12	54	3.75	5
Tour or visiting	3	5	23	42	2.92	6
Government documents	3	7	11	34	2.36	7
Groups or Society	0	7	6	20	1.39	8
Broadcast	1	1	10	15	1.04	9
Friends	1	1	3	8	.56	10
Others	0	0	0	0	0	11
Total					100	

$$a = (R1*3+R2*2+R3), b = a / (n*6)*100$$

(3) When asked, "What are the most serious problems in Taiwan that need our efforts to solve?" and instructed to rank the highest 3 by order, the five most serious environmental problems were found to be air pollution (20%), major river pollution (16.5%), toxic waste (14.9%), trash pollution (13.68%), and shortage of resources (11.38%). The weighed values, percentage distribution, and final rank are shown in Table 10.



**Table 10. Most serious environmental problems in Taiwan.**

Problems	Ordered by first three ranks				% of after weighed <sup>b</sup>	Rank
	Rank 1	Rank 2	Rank 3	Sum (weighed) <sup>a</sup>		
Air pollution	57	39	40	289	20.0694	1
Major river pollution	20	69	40	238	16.5278	2
Toxic waste	40	29	37	215	14.9306	3
Trash pollution	38	23	37	197	13.6806	4
Shortage of resources	35	22	15	164	11.3889	5
Maintain drain	30	24	23	161	11.1806	6
Wild-animal extinction	8	8	15	55	3.8194	7
Soil-layer sink	2	14	19	53	3.6806	8
Over population	9	6	7	46	3.1944	9
Noise pollution	1	6	7	22	1.5278	10
Total					100	

$$a = (R1*3+R2*2+R1), b = a / (n*6)*100$$

(4) When asked, "Whether the highway between Ilan and Hualien need to be constructed?", 61.3% teachers disagreed or strongly disagreed. There was still a high percentage (25.8%, over a quarter) of teachers who were neutral when there was conflict between economic development and environment. The actual numbers and percentage distribution are shown in Table 11.

**Table 11. Agreement to construction of highway.**

Agreement	N	%
Strongly Agree	5	2.1
Mildly Agree	26	10.8
Neutral	62	25.8
Mildly Disagree	93	38.8
Strongly Disagree	54	22.5
Total	240	100.0

(5) When asked, "What do you think about the quality of everyday lives in Taiwan?", only 22.5% of the teachers were satisfied or strongly satisfied with the living quality. On the other hand, 63.4% of the teachers were unsatisfied or strongly unsatisfied. The actual numbers and percentage distribution are shown in Table 12.

**Table 12. Satisfaction on living quality.**

Satisfied	N	%
Very satisfied	1	0.4
Satisfied	53	22.1
Neutral	34	14.2
Unsatisfied	143	59.6
Strongly unsatisfied	9	3.8
Total	240	100.0

(6) When asked, "Did you ever talk about our environmental issues in your classroom?", 85% of the teachers



stated that they often or sometimes discussed environmental issues in their class. The actual numbers and percentage distribution are shown in Table 13.

**Table 13. Discussion of environmental issues in the classroom.**

Frequency	<i>N</i>	%
Often	46	19.2
Sometimes	158	65.8
Seldom	33	13.8
Never	3	1.3
Total	240	100.0

(7) When asked, "Do you think most teachers care about the protection of endangered animals?" 95% of the teachers agreed or strongly agreed that most teachers care about the protection of endangered animals. The actual numbers and percentage distribution are shown in Table 14.

**Table 14. Attitude toward protection of endangered animals.**

Agreement	<i>N</i>	%
Strongly Agree	66	27.5
Mildly Agree	162	67.5
Mildly Disagree	12	5.0
Strongly Disagree	0	0
Total	240	100.0

(8) When asked, "Do you think most teachers know that whale sharks are protected animals?", only 6.7% of the teachers thought that most teachers know that whale sharks are protected animals and 52.5% teachers answered "a little." Over 40% of the teachers thought that most teachers "mostly do not know" or "have no idea." The actual numbers and percentage distribution are shown in Table 15.

**Table 15. Knowledge on the fact that whale sharks are protected animals.**

Known	<i>N</i>	%
Absolutely	16	6.7
A little	126	52.5
Mostly do not know	88	36.7
Have no idea	10	4.2
Total	240	100.0

(9) When asked, "Do you think if people know that whale sharks are protected animals, it may affect the behavior of eating whale sharks?", only 14.2% of the teachers thought that people would stop eating whale sharks if they know whale sharks are protected animals. Most teachers thought that knowing whale sharks are protected animals will slightly change or stop people from eating them. The actual numbers and percentage distribution are shown in Table 16.



**Table 16. Effect on the eating of whale sharks.**

Influence	N	%
Yes	34	14.2
A little	192	80.0
Absolutely not	14	5.8
Total	240	100.0

### *The Open-Ended Question and Interviews*

The last question was open to any answers or comments associated with the topic of worldview and environmental issues. Comments were coded as Q (questionnaire) and a number. The seven interviewees expressed their opinions and viewpoints on worldview and environmental issues. Their opinions were retyped and coded as W (interview) and a number. After that, three linked sub-processes (Huberman & Miles, 1994) for qualitative findings, data reduction, and data display, followed by conclusion drawing and verification, were employed. The most important points were drawn as follows:

#### *Recognition of Humans in Harmony with Nature*

Most of the teachers did not believe that humans should control everything just because they have the ability to process thoughts. Other species need to be respected as they have the same rights to live on Earth.

*"All animals have the same rights to live on Earth..." (Q160)*

*"Human being is only one of the many living organisms; if we think human is an exception from other species, we will easily come to neglect the rights of other species and the meaning of nature."(W01)*

*"Human is the only living thing with thought, but we still need to respect the existence of other species."(W04)*

*"I agree that only human can think; however, nature does not exist for human beings only."(W05)*

*"It is common sense that we have to protect and respect all life."(Q05)*

#### *Concerns for Shortage of Natural Resources and Support for Setting Limitations on Economic Development*

Most of the teachers understood the shortage of natural resources and agreed to set limitations on the economic development. While faced with the dilemma of economic development and protecting the environment, they agreed that the government should show its power and resolution to balance the needs of the people and protect the environment. Some of their statements include:

*"Natural resources are not unlimited; the needs for modernization have resulted in over exploitation."(W02)*

*"I personally hope to set limitations on economic development, though it is not easy." (W03)*

*"I agree that we should have laws to set limitations. In Taiwan, many people would look for loopholes to exploit resources, because they think nature can always recover from losses. But we have to enforce the laws, otherwise it is meaningless to have them."(W05)*

*"Our policies are still too conservatory, the environment assessment for construction is too lax, and the damage is getting worse."(Q74)*

*"Natural resources are not infinite, even if they were, we still can't waste them."(W06).*

#### *Living Environment in Taiwan is not satisfactory*

Teachers believed that low living quality was not only the public's problem but the government should bear the main responsibility. They considered that policies with long-term outlook that foster sustainable development need to be set up, and people need to know where the government stands on environment policy. The government also has to get people to back its policies on environment. Some of the teachers' comments are:

*"Damage to the environment is everyone's problem, people, or government. The government needs to have proper policies and the resolution to enforce those policies."(Q02)*



*"The population is so large and the land so over developed, and the government doesn't manage the resources effectively."(Q48)*

*"The living environment is not satisfactory due to air and water pollution, all main rivers are dirty, noise is loud in many places, mountains are exploited. If the government is determined to make a balance between economic development and protection of the environment, I think we will be fine."(W03)*

*"Taiwan is only a small island, but there are so many highways and roads."(Q62)*

*"Our government can set up more sites and utilities for environmental education, such as museums, reservation areas, and riverside parks."(T03)*

*"The government should improve the quality of drinking water and air, and garbage problem to make our living environment better."(Q44)*

*"More awareness events can be sponsored by government and non-government groups."(Q131).*

### *Changes in Behaviors toward the Environment*

Most of the teachers did not think that environmental knowledge can directly change people's behavior, as selfishness and habits are not easily removed or changed. However, many teachers believed that the knowledge will influence a person's behavior.

*"People care too much about their own benefits. Most are not concerned about public affair, therefore, policy on protection of environment is hard to execute."(Q45)*

*"Earth strikes back. If people do not pay more attention to the environment, someday we will destroy ourselves. The world is like a village, everyone is responsible for doing their part about global warming."(W01)*

*"Though many people are aware of the importance of environmental protection, but following policy is another issue. We need more environmental education to help make the policy works."(Q73)*

*"If people have awareness of the environment, they will accept the concepts of protecting the environment. I believe that more than half the people in Taiwan can change their dietary habits and not eat endangered animals."(Q121).*

### *The Need for EE*

Most teachers did not think EE in Taiwan is good enough. They expressed their concerns about the environment; however, they admitted that their knowledge on the environment and ecological systems are insufficient.

*"Most teachers are concerned about environmental issues. I, myself, know only a little about the policy on environmental protection. I hope our government can let us know more about the policy and hold more environmental conferences or activities."(W01)*

*"Teachers are intellectuals and they are always concerned about this issue."(W03)*

*"As an educator, I support the policy."(Q158)*

*"I don't think we have enough knowledge about the environment. The government can provide more information, courses, and pedagogical materials on environmental education for us."(W02)*

These comments reflect the teachers' worldviews and deep concerns about the environment. They hope to see the government manage the economic affair, but at the same time, give more considerations on the environment. They also hope to use their knowledge about the environment and ecological system, so as put their pro-environment attitudes into actions.

## **Discussions**

The percentage of agreement with NEP in this study is 77.06, which is higher than the percentage obtained by Dunlap et al. (2000) from Washington state residents in 1990 (66.5%) and that by Rieout et al. (2005), collected from the students of Ursinus College by systematic survey (54.4%) and by e-mail (61.1%). The result obtained from our study demonstrated the teachers' widespread concern for environmental issues in Taiwan.

The teachers' awareness of the possibility of an eco-crisis is the highest in the five facets, and the result revealed that there is a considerable anxiety for environmental problems in Taiwan. However, in the present study, after factor analysis, four facets within 15-item scale similar to Shephard et al. (2009); and in item 14, "Humans will eventually learn enough about how nature works to be able to control it", 91.3% of the teachers expressed "agree" or "strongly agree." Only 2.5% of the teachers agreed with the NEP side. This phenomenon is quite dif-



ferent from the earlier studies, and can be explained in two respects: 1) item 14 is a compound sentence, after translation into Chinese language, the weigh in the first part becomes the main focus, meaning more emphasis in "Humans will eventually learn enough about how nature works..." than "to be able to control it." Hence, it is quite reasonable that most teachers believe in human's knowledge and the potential of learning, and 2) culturally speaking, nearly all teachers in Taiwan were taught to strive for the best and that was what they have been doing since childhood. Teachers work hard every day and they encourage their students to do the same. It is acceptable to explain the teachers' beliefs in "work hard and learn" better than proposal by Dunlap, Van Liere, Merting, and Jones (2000) in HEP.

The demographic variables have almost no substantial explanatory value in explaining the worldview or environmental concerns. Our finding of no gender difference is consistent with that of the results of Steger and Witt (1989) and Gooch (1995); however, it contradicts those research findings that support the statement that women are more environmentally conscious than men are (Milbrath, 1984; Rieout et al, 2005; Scott & Willits, 1994). Theoretical explanations for gender differences involve the increased knowledge and tolerance for technological advances, support for economic growth, and lower perception of environmental risks among men (Blocker & Eckberg, 1997). In this study, the teachers' social status and the economic situation in Taiwan are only slightly influenced by the economic growth. Another phenomenon worth emphasizing is that most of the teachers in Taiwan keep their neutral positions in religious beliefs when they become teachers. Hence, the religious factor has little effect in their worldview and environmental concerns.

Teachers care about environmental issues and discuss environmental topics in their classroom, showing a high percentage (89.6% and 85.0%, respectively). Over half of the teachers (61.3%) disagreed with the construction of the highway between Ilan and Hualien, because there is a mountain range in the area and the construction may destroy the entire ecological system. Furthermore, the teachers are not satisfied with the quality of everyday lives in Taiwan. While they are aware that whale sharks are protected animals, they believe that most people would not stop eating whale sharks just by the fact that whale sharks are protected animals. Overall, teachers were found to be more concerned about the environmental ethics, and believe that educating people about the environmental ethics is still a long process.

## Conclusions and Recommendations

According to the finding for this research, that NEP which includes attitudes, beliefs, and behaviors got the percentage of agreement 77.06, which is a high percentage. It describes the teachers' widespread concern for environmental issues in Taiwan. The teachers' awareness of the possibility of an eco-crisis is the highest in the five facets. Factor analysis found that 91.3% of the teachers expressed "agree" or "strongly agree" with the NEP side. This phenomenon can be explained that most teachers believe in human's knowledge and the potential of learning, and culturally speaking are taught to strive for the best and that was what they have been doing since childhood. Teachers care about environmental issues and discuss environmental topics in their classroom, showing a high percentage (89.6% and 85.0%, respectively). Overall, teachers are found to be more concerned about the environmental ethics, and believe that educating people about the environmental ethics is still a long process. Teachers understand the shortage of natural resources and agree to set limitations on the economic development. They can suggest that the government should show its power and resolution to balance the needs of the people and protect the environment.

The research provides some implications for scholars who are concerned about the environment and EE. We believe that a long-term observation of teachers' or public's ecological beliefs and attitudes is worth discovering. Authors can also glean insights that can help us understand about environment and ecological systems become the most important part for teachers teaching students. So teachers can identify and care about environmental issues and discuss in their classroom. These insights can be used by teachers and researchers in future to support students' learning about environmental topics.

In the future, it is expected that further research can be conducted in different fields, and also that deeper analyses and interviews can continue to explore the environmental and ecological systems that influence educational system. We expect that in the following years there will be more research regarding ecological worldviews and local environmental concerns.



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