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**Environmental attitudes and behaviors
of secondary school students in Hong Kong**

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Abstract

A postal survey on 992 secondary students in Hong Kong was conducted to investigate environmental attitudes, using Weigel and Weigel (1978)'s environmental concern scale and readiness to engage in various pro-environmental behaviors including paper recycling at school and at home, using less tissues and less plastic bags. Results indicated that students' expressed great concern about the environment and exhibited strong willingness to participate in various pro-environmental behaviors. However, students' over-optimism toward technological development and perceived importance of benefits of modern consumer goods were the two major factors that contradicted concern for the environment. Environmental attitudes demonstrated a high predictive power of willingness to participated in pro-environmental behaviors. Pearson correlation coefficient between environmental concern scale and comprehensive behavioral intention was high and positive (0.52). Television and school were cited as major sources of environmental information. Mass media were more important than personal media in the dissemination of environmental information. Female students, students from higher forms and students living in private housing held more positive environmental attitudes and were more willing to engage in pro-environmental behaviors. Factor analysis indicated that the environmental concern scale was composed of two factors, named 'personal sacrifice' and 'optimism/issue'.

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1. Introduction

Hong Kong, like many other well-developed cities in the world, suffers from environmental problems. Industrial, commercial and domestic activities produce a wide variety of wastes of varying quantities. These activities lead to different environmental pollution problems such as water pollution, disposal of solid and chemical wastes, undesirable levels of air pollutants and noise. In a survey on indicators of social development of Hong Kong conducted in 1988, it was found that 'environmental protection' was cited as the fifth most serious social problem that should be solved immediately (Lau and Wong, 1990).

As the world population continues to expand, the role of conservation is becoming critical. Conservationists have concentrated their efforts on technological or biological solutions to environmental problems. Despite the advances in technology, there is a growing recognition that technology alone cannot solve environmental problems. Maloney and Ward (1973) described the ecological crisis not as a technical problem but as a crisis of mal-adaptive behavior and the root of environmental problems is human behavior.

The problem of environmental pollution needs to be solved or reduced by a tighter control through legislation of commercial and industrial activities that create pollutants as well as through education and mass communication campaigns in order that more environmentally responsible behaviors on the part of the general public are adopted.

The Hong Kong Government has played an important role in enhancing the environmental awareness of the Hong Kong community. The government's White Paper (statements of policies) entitled Pollution in Hong Kong: A Time to Act was published on

June 5, World Environment Day in 1989 (Hong Kong Government 1989). It discussed the existing status of the environment and detailed of an ambitious HK\$256 million 10-year plan to combat pollution problems. The Environmental Campaign Committee was established by the Government in 1990 to organize environmental events and activities aimed at the promotion of public awareness of environmental issues.

Environment issues have now become a political, economic and social issue. Wide media coverage of issues such as global warming, destruction of the ozone layer and specific events such as Chernobyl nuclear facility incident, as well as Hong Kong government's waste control policy have contributed to a focus on attention of environmental perception and attitude.

In a recent survey of community attitudes to the environment, over 98% of the Hong Kong people agreed that 'individuals have a responsibility to protect the environment' (Environmental Campaign Committee, 1993). However, when they were asked whether they had actually practiced environmental protection behaviors, such as refusal to use plastic bags and separating waste paper for recycling, the percentage of positive responses dropped to only 30 to 60% (Environmental Campaign Committee, 1993). The results indicated that there was a significant discrepancy between people's attitudes and their actual behaviors.

Understanding the complexities of the inter-relationships between the natural environment and human activity is said to be a necessary condition to the maintenance and improvement of environmental quality. One of the primary goal of environmental education is to develop responsible environmental behavior (Ramsey and Hungerford, 1989).

To understand how to encourage environmentally responsible behavior, one must identify the factors that influence pro-environmental behavior. Attitude is considered one

of the most important influences on behavior by many social scientists. The current study attempts to investigate the environmental attitude of students in Hong Kong and their readiness to engage in a variety of pro-environmental behaviors that involve some change in personal lifestyle. The findings are of particular interest to the government, environmental groups, social organizations and business companies incorporating environmental themes and other concerned individuals.

2. Literature review

Attitude is considered one of the most important influences on behavior. In this context, environmental attitude could be considered an relatively enduring positive or negative feeling toward a particular aspect of an environmental object or issue.

Environmental attitude studies have served an important psychological function in that they have helped people to make decisions involving the use and care of the physical environment, such as decisions to put litter into waste recycling receptacles, join environmental organizations, use public transportation to school or work, or sign petitions calling for greater protection of natural scenic beauty and against environmental destruction. Environmental attitudes constitute an important focus of environmental studies and their studies is guided by the assumption that environmental attitudes can be meaningfully related to future behavior. The potential benefits to society from the application of environmental attitude studies include considerations in the enactment of environmental law and preparation of environmental impact statements. Research on environmental attitudes can also be applied to programs to change public behavior in respect to conservation and the preservation of the natural environment.

One valuable tool in environmental studies would be an attitude measure capable of assessing an individual's relatively enduring beliefs and feelings about ecology. Most researchers have adopted a 'verbal-response' approach by asking respondents to express

their knowledge, feeling, and evaluation of selected contemporary environmental issues, both general and specific. Several scales to measure environmental attitudes will be reviewed in this section.

Michael Maloney and his associates (Maloney and Ward, 1973; Maloney, [Ward and Braucht, 1975](#)) developed a set of three 10-item scales to measure aspect of environmental concern. Maloney and Ward (1973) named the scales 'affect', 'verbal commitment' and 'actual commitment'. The 'affect' scale was used in common with earlier theories in placed of the cognition and behavioral intention and the 'actual commitment' scale was, in fact, a measure of self-reported environmentally responsible behaviors. The alpha coefficients for 'affect', 'verbal commitment' and 'actual commitment' were 0.85, 0.81 and 0.89 respectively on a sample of 127 respondents. The environmental attitude scale developed by Maloney and Ward (1973) was very similar to the classic multi-component model of attitude used in social psychology, except that it included the actual environmentally responsible behavior rather than the readiness to engage in behavior (or the behavioral intention).

Maloney and Ward's (1973) environmental attitudes had a drawback that it included a measure of actual pro-environmental behaviors. This resulted in an overlapping domain between the concepts of attitudes and behaviors which would inevitably increase the correlation between the two measurements. In fact, the actual commitment scale has been used as a measure of behavior in many subsequent studies ([Scott and Willits, 1994](#); Hamid and Cheng, in print). [Scott and Willits \(1994\)](#) also conducted a principal component analysis on the behavior scale and obtained two factors: one dealing with 'consumer behaviors' and the other focusing on 'political behaviors'.

Russell Weigel and his associates ([Weigel and Newman, 1976](#)) developed a general attitude measure to assess people's attitude toward the environment, called the

environmental concern scale. It consisted of 16 items that measured respondents' attitudes toward a variety of ecological issues, such as pollution, conservation of natural resources and wild-life preservation.

The environmental concern scale was first tested with a random sample of 141 respondents in 1970 and achieved adequate internal consistency, with Cronbach's alpha coefficient of 0.88 and Scott's homogeneity ratio of 0.26 (Weigel, Tognacci and Vernon, 1974). Later on, four studies were conducted by Weigel and Weigel (1978) to assess its validity. The environmental concern scale was found to exhibit satisfactory internal consistency in a second random sample of 162 respondents in 1974 and 1976 (reported alpha coefficient of 0.85 and homogeneity ratio of 0.26) . The test-retest correlation of the scale after a six week interval was 0.83. The results of both the known-groups comparison of Sierra Club members and the prediction of environmentally relevant behaviors including participation in the petitioning, litter pick-up and recycling projects supported the validity of the measure (Weigel and Weigel, 1978).

Shanahan (1993) updated Weigel and Weigel (1978)'s environmental concern scale to measure more contemporary issues. The updated version consisted of 17 items under four sub-scales including environmental optimism, relative importance of environmental issues compared to economic and technological progress, attitudes towards specific environmental issues and personal impact. Shanahan (1993) obtained high alpha coefficients (0.83 to 0.85) in four separate studies conducted in 1988 to 1992. The average alpha coefficients obtained for the four sub-scales on optimism, relative importance, specific issues and personal impact were 0.73, 0.63, 0.69 and 0.46 respectively. The classification of items into different sub-scales were said to be based on conceptual decisions and exploratory factor analysis.

Arbuthnot (1977) developed an environmental attitude scale that consisted of 24 items that measured respondents' attitudes toward ecological issues on economic orientation, legalism, environmental powerlessness, technology orientation and future orientation. The environmental attitude scale obtained some validity as the user of recycling centres scored significantly higher than that of church members. The recyclers were also found to be better informed in general as well as specific environmental issues. In addition, recyclers were less bound to past ways of believing and acting, and had a relatively strong sense of the capability to act in control of their own lives.

The measurement of attitudes as paradigms necessitates the identification and definition of two mutually exclusive positions, for which Dunlap and Van Liere (1978) named as 'dominant social paradigm' (DSP). The DSP was characterised by the dominate societal culture that valued faith in science and technology, material abundance and future prosperity, and support for economic growth, individual rights, laissez faire government and the status quo. On the other hand, the NEP was a new set of attitudes that valued concepts such as steady-state, limits to growth, balance of nature and spaceship earth. The NEP scale consisted of 12 items that measured respondents' attitudes toward ecological issues on human influence on the balance of nature, limits to growth on human population size and whether humans should have rightful dominion over nature. It was based on an extensive theory of environmental world view formulated by Catton and Dunlap (Catton and Dunlap, 1978, 1980, Dunlap, 1980). The basic assumption of the NEP was that humans were equal members of the natural world rather than being distinct from nature and exempt from natural laws. As a result, the beliefs of inevitable human domination of nature through the use of technology were being replaced by an understanding of the limits imposed by nature and the need to live in harmony with nature.

Dunlap and Van Liere (1978) tested the NEP on a sample of 806 respondents and another sample of 407 members of an environmental organization. The alpha coefficients

for the general public and environmental group samples were 0.81 and 0.76 respectively. The results suggested that the NEP scale was internally consistent, uni-dimensional and constituted a more or less integrated world view. The NEP scale also demonstrated predictive and construct validity. The scale was used by Dunlap and Van Liere ([Dunlap and Van Liere, 1984](#)), as well as by many others (Albrecht, Bultena, Hoiberg and Nowak, 1982; Arcury, Johnson and Scollay, 1986; Bultena, Hoibery, Albrecht and Nowak, 1982; [Arcury 1990](#); Ng, 1991; [Chan and Wong, 1994](#); and Scott and Willits, 1994).

In the Arcury, Johnson and Scollay (1986) and Arcury (1990) studies, the NEP scale was positively correlated with people's stated environmental knowledge. This was in line with the prediction that as environmental world view changes, greater attempts would be made to know and understand the limits of nature and the place of humans within these limits. In the Scott and Willits (1994) study, correlation analysis revealed that the NEP scale demonstrated validity in predicting pro-environmental behavior. However, the linkage was not strong.

To summarize, high alpha coefficients for NEP were obtained in majority of the studies. Most of the results suggested that the NEP consisted of two or three dimensions: the need to preserve the balance of nature, the belief that growth should be limited, and the notion that humans are part of rather than the rulers of nature.

[Kuhn and Jackson \(1989\)](#) developed the New environmental paradigm Growth and Technology scale that employed 21 items to measure respondents' attitude toward ecological issues on economic growth and technology. Some of the these items were same as that included in the new environmental paradigm scale developed by Dunlap and Van Liere (1978). The alpha coefficients obtained for two separate studies on 662 and 403 Canadian residents were very high (0.82 and 0.84).

In a telephone survey on 680 Kentucky residents, Arcury (1990) found that age had a substantial and significant inverse association with environmental attitude. Being female had a weak inverse association with environmental attitude. Education, family income and living in a metropolitan area demonstrated a significant positive correlation with environmental attitude. Environmental attitude also had a strong positive correlation with environmental knowledge.

To summarize, the normal approach to environmental attitude measurement has been the use of self-report scales on a number of local and global ecological issues and which concern with interactions between human activities and natural resources. The scales developed were generally found to be reliable, valid and have sufficient predictive power of environmentally responsible behavior. However, the predictive validity have often been weak. The author also noted that some of these environmental attitude measures were issue-specific. This implies that local adaptation to current environmental issues is required.

Environmental attitudes have generally been conceptualized as underlying dispositions to determine a variety of pro- and anti-environmental behaviors. As both the attitudes and behaviors can be measured in different degrees of specificity, Crespi (1971) suggested that attitude and behavior consistency would be enhanced when both measures were compatible in their degree of specificity.

Weigel, Tognacci and Vernon (1974) correlated behavioral commitment to a green organization, the Sierra Club, with three different attitude scales from low to high specificity. Results indicated that behavioral commitment exhibited a negligible correlation with the low specified attitude measure, a modest but significant correlation with the moderate specified attitude measure, and a strong correlation with the highly specified attitude measure. Weigel, Tognacci and Vernon (1974) concluded that

environmental attitude measures should be expected to predict only pro-environmental behaviors that were appropriate to or specified by the attitude under consideration. A similar study conducted by Heberlein and Black (1976) also concluded that specific environmental attitudes about lead-free gasoline was better than general environmental attitude in predicting specific environmental action of using lead-free gasoline.

Weigel and Newman (1976) correlated measures of actual petitioning, roadside litter pick-up and recycling behaviors with scores on the environmental concern scale over a five-month period. While the correlation between environmental attitude and individual behaviors were weak (0.12 to 0.57), a strong correlation (0.62) between environmental attitude and the comprehensive behavioral index was reported. The correlation measure was considerably higher than that obtained from previous studies. This study also demonstrated the importance of adopting a wide range of behavioral measures.

In a longitudinal study of college students' willingness to give up 35 daily items, a strong relationship was recorded between personal sacrifice and a concern about environmental problems caused by national growth and development along with low faith in technological solutions as measured by the New environmental paradigm Growth and Technology Scale ([Thompson and Gasteiger, 1985](#); [Gigliotti 1992](#)).

In another study of general environmental attitude and an aggregate behavioral measure that included recycling and petition signing on two environmental issues, Kallgran and Wood (1986) found that attitudes and behaviors were strongly related for respondents with relatively high levels of accessibility to attitude-relevant information in memory. In contrast, for respondents with relatively low levels of accessibility, attitudes and actions were not closely related.

In a recent study of general environmental attitude using New Environment Paradigm scale developed by Dunlap and Van Liere (1978) and general environmental

behaviors using 10 items devised by Maloney, [Ward and Braucht \(1975\)](#), a weak but significant correlation was reported ([Scott and Willits, 1994](#)). [Scott and Willits \(1994\)](#) pointed out that low attitude-behavior linkage 'may be less a result of question wording or measurement error than a real disparity between words and deeds'. It was suggested that people may have learned the language of environmentalism without developing a simultaneous behavioral commitment or people may see it as a problem for 'someone else'.

The above studies indicate that environmental attitude does play a role in predicting environmentally responsible behavior. Some studies have shown a strong relationship between environmental attitudes and behaviors ([Heberlein and Black, 1976](#); [Weigel and Newman, 1976](#)) while some are significant but weak ([Scott and Willits, 1994](#)). The author therefore recommends to test on internal consistency of a general environmental attitude measure and measure its predictive power of pro-environmental behaviors in Hong Kong.

To conclude, in the search for a general environmental attitude, two measures, the environmental concern scale and the new environmental paradigm scale were demonstrated to exhibit adequate internal consistency and predictive validity. The NEP scale has been tested in Hong Kong (Ng, 1991) while the environmental concern scale has never been tested in Asian countries. The current study will investigate the application of the environmental concern scale and its application in predicting readiness to engage in different pro-environmental behaviors.

3. Research objectives

The current study attempts to investigate on Hong Kong students' environmental attitudes and their readiness to engage in a variety of pro-environmental behaviors. Although actual behavioral measures are to be preferred, pro-environmental behaviors are not very common in the local community. There has been little organizational effort to

facilitate waste recycling. Small-scale and short-term waste recycling programs in local districts have been initiated mainly by local community groups and can not contribute significantly to environmental protection (Chan, 1993). As a trade-off, behavioral intentions are measured to give an indication of the willingness to change personal life style for environmental reasons. This approach has been used by Thompson and Gasteigar (1985) and Gigliotti's (1992) studies to measure university students' willingness to give up a variety of consumer items.

The following research questions were addressed:

1. What are Hong Kong students' general environmental attitudes and how are they willing to contribute to environmental protection?
2. How do environmental attitudes relate to readiness to participate in pro-environmental behaviors?
3. What social characteristics are associated with differences in environmental attitudes and behaviors?

4. Research methodology

4.1 Sample

A list of 184 secondary schools arranged in district areas in New Territories was obtained. A systematic sample of 44 schools was selected so that the sample was evenly distributed among areas. A letter together with 40 copies of the questionnaire and pre-paid return envelop were mailed to the principals of the selected schools on June 20, 1994. The author personally contacted the school principals to solicit their co-operation. Survey documents were distributed to any one class of forms 3, 4 or 6 students in the ratio 2:2:1

to reflect a similar distribution of students among different forms. Forms 5 and 7 were excluded as they had already left the schools after the public examinations.

By the end of July 1994, 28 schools sent back the completed questionnaires. The response rate was very high for postal survey (64%). The high response rate reflected that the schools were quite supportive in environmental attitude studies. Altogether, 992 valid questionnaires were received. The sample profile of the respondents were summarized in Table 1. There were roughly equal numbers of males and females. About 87% were in forms 3 and 4 and the rest were in form 6. The majority (60%) were living in public housing. Home ownership scheme housing and private housing contributed another one third of the sample and the rest were living in rental flats.

4.2 Procedure

The study was conducted using a structured questionnaire in Chinese. The questionnaire was designed to consist of three parts on general environmental attitudes, behavioral intentions and major sources of environmental information. Environmental attitude was measured by eleven items taken directly from the Weigel's (1978) environmental concern scale. Five items were dropped from the original study as they were found to be on issues unfamiliar in Hong Kong or not appropriate to students. Items excluded were attitudes on elimination of predators prey on crops, pollution due to energy production and willingness to abandon driving and accept increase in expenses for protection natural resources. The content of the scale ranged broadly across conservation and pollution issues and had evidence of reliability and validity in various studies in Western cities.

The Chinese translation was carried out by the author and cross-checked by the author. The scale was in 5-point format and attempted to measure attitudes on a general ecological and environmental issues like protecting of endangered animals, economic

development and pollution, contributions of environmental groups and environmental education. Scores for the eleven items after reversing to the same direction would be summed to give an overall environmental concern score.

Behavioral intentions were measured by having students rate on a 5-point scale (1=agreed strongly, 5=disagreed strongly) their willingness to participate in four pro-environmental behaviors. The behaviors were selected on the basis that (a) students would be familiar with and were within their capability to participate, (b) the behaviors were clearly related to environmental issues and (c) the behaviors were different from each other in nature and situations. The four behaviors selected included paper recycling at school and at home (remedial action), using less tissue papers and less plastic bags (preventive action). Scores for the four items after reversing were summed to give an overall behavioral intention score.

The last section of the questionnaire collected students' main source of environmental protection information. Both mass media and personal sources were included. Students' were allowed to check more than one source. Total number of sources checked were summed.

5. Results

5.1 Environmental attitudes, behavioral intentions and source of information

The frequency distribution, mean scores and standard deviations for each of the eleven items of the environmental concern scales were summarized in Table 2. Results indicated that respondents reported an overwhelmingly positive environmental attitudes. The mean scores ranged from 2.69 to 4.13 on a 5-point scale. Students reported a very strong attitude on conservation of wide animals and natural resources. They also strongly urged for government regulation for pollution. Students demonstrated high degree of

willingness of personal contribution to protect the environment and exhibited a favorable attitude toward contribution of environmental organizations. The two items with lowest mean scores were attitude on pollution brought by modern consumer products and development of anti-pollution technology of local industries. The low mean scores were mainly due to a high proportion (48%) of respondents giving neutral responses to these two items.

Scores for eleven items were summed to give an overall score on environmental attitudes. The mean and standard deviation of the environmental concern scale were 39.6 and 4.3 respectively. Students' strong and favorable environmental attitudes were demonstrated by the high overall mean score and the positively skewed distribution. Nearly 80% of the sample scored between 34 to 44 on a 55-point scale.

Students were asked about their willingness to participate in various pro-environmental behaviors, including recycling of paper and waste minimization actions. The frequency distribution, mean scores and standard deviations for four pro-environmental activities were summarized in Table 3. Results indicated that students were very willing to recycle paper at school and at home, as well as using less plastic bags and tissues. The mean scores ranged from 3.63 to 4.04 on a 5-point scale. They intended to participate in both remedial and preventive measures that protected the environment.

Scores for willingness to participate in four specific pro-environmental behaviors were summed to give an overall measure of pro-environmental behavioral intentions. The mean and standard deviation of the summed score on overall behavioral intention were 15.6 and 2.5 respectively. Students' strong willingness to participate in pro-environmental behaviors were demonstrated by the high overall mean score and the positively skewed distribution. Nearly 60% of the sample scored between 13 to 16 on a 20-point scale. The internal consistency of the behavioral intention score, as measured by the Cronbach alpha

coefficient was found to be very high (0.80). This indicated that the pro-environmental behaviors selected form a consistent set of behavioral indicators.

Main sources of environmental information reported by the respondents were summarized in Table 4. On average, each student reported three major sources of environmental information. Television was most frequently reported by students (87%) as the major source of information. About 58% and 54% of students reported schools and newspapers as their major sources of information. Magazines and radio were reported by 42% and 41% of the sample respectively. Only one sixth of the sample checked family as major source of information. About 3% of the students checked other means as major source of information which included exhibitions and video tapes. The study indicated mass media, especially television, was more important than personal media in the dissemination of environmental information.

5.2 Internal consistency and dimensions of Environmental concern scale

The internal consistency of the environmental concern scale, measured by the Cronbach's alpha coefficient, was 0.64. It was a bit low in comparison with the alpha coefficients obtained in other studies, e.g. 0.88 in [Weigel and Newman \(1976\)](#)'s study, 0.88 and 0.85 in [Weigel and Weigel \(1978\)](#) study. The two statements that lowered the internal consistency were 'industry is trying its best to develop effective anti-pollution technology' and 'the benefits of modern consumer products are more important than the pollution that results from their production and use'. The study indicated students' over-optimism toward technological development and perceived importance of benefits of modern consumer goods were the major factors that contradicted to the concern for environment. The lower alpha coefficient may also be accounted for by the great variability in attitude measures for such a large sample.

Factor analysis (Principal Axis, R square in the diagonal, Varimax rotation) was conducted to explore the underlying dimension of the environmental concern scale. The results produced a two-factor solution with eigen values of 2.54 and 1.25, which together accounted for 35% of the standardized variance. The factor pattern for eleven items on the environmental concern scale was summarized in Table 5. Factor 1 consisted of five items including 'contribution of time or money' (0.69), 'make personal sacrifices' (0.64), 'courses on conservation of natural resources' (0.59), 'sacrificing some things' (0.51) and 'government regulation' (0.51). Factor 1 seemed best interpreted as reflecting a 'personal sacrifice' dimension.

Factor 2 consisted of six items including 'nature will purify contamination' (0.60), 'should not worry about killing wide animals' (0.57), 'benefits of consumer goods' (0.55), 'pollution not affecting me' (0.53), 'anti-pollution organization' (0.48) and 'industry is developing anti-pollution technology' (0.36). Factor 2 seemed to reflect a mix of 'environmental optimism' and 'specific issues'. The correlation between the two factors was 0.31. The summed scored over the respectively grouping of items would form the personal sacrifice sub-scale and the optimism/issue sub-scale.

The alpha coefficient for the personal sacrifice sub-scale was 0.61 and was quite similar to that of the overall environmental concern scale. The alpha coefficient for the environmental optimism/issue sub-scale was 0.48. The alpha coefficients obtained for these two sub-scales were slightly lowered than that obtained in Shanahan (1993)'s study of 0.46 to 0.73. The low internal consistency of this sub-scale pointed for further improvement in the phrasing of the wordings.

To conclude, the study illustrated that the internal consistency of environmental concern scale was marginally acceptable. The study indicated that some of the items

required re-writing to improve on the internal consistency, especially for items in the optimism/issue sub-scale.

5.3 Attitude-Behavior relationship

To what degree the environmental attitudes can be used to predict readiness to engage in various pro-environmental behaviors? The Pearson correlation coefficients between environmental attitudes and students' pro-environmental behavioral intentions were summarized in Table 6. All the correlation coefficients were found to be strong, positive and highly significant ($p < 0.0001$). The correlation coefficients between the environmental concern scale and readiness to participate in specific pro-environmental behavior ranged from 0.37 to 0.46. As the scope of the behavioral measure was broadened, the attitude-behavior correlation increased to 0.52. Personal sacrifice sub-scale exhibited a higher correlation with students' readiness to engage in pro-environmental behaviors than optimism/issue sub-scale.

To conclude, the study indicated a strong linear relationship between a general measure of environmental attitudes and a comprehensive behavioral intention measure of a wide domain of pro-environmental actions. The environmental concern scale consisted of two sub-scales with high predictive power of pro-environmental behaviors.

5.4 Social characteristics

Analysis of the relationship between social characteristics and environmental attitudes was carried out using bivariate and multiple correlation and regression procedures. Sex, education and housing types were all significantly related to the environmental concern scale. Female students, higher form students and those living in private housing exhibited a stronger concern about environment. Education and housing

type remained significant in the multiple equation, but the net effect of sex did not. The multiple R, while statistically significant at 0.05 level, was only 0.01 (see Table 7).

All three social characteristics variables were significantly related to the readiness to exhibit pro-environmental behaviors and all of them were net significant predictors of behavioral intention when the other characteristics were controlled (see Model 1 in Table 8). Female students, higher form students and those living in private housing were more willing to exhibit pro-environmental behaviors. The multiple R, while statistically significant at 0.05 level, was only 0.02.

To further explore the linkages between environmental attitudes and behavior, the environmental concern scale was incorporated as independent variables along with the social characteristics into the regression model (Model 2 in Table 8). The multiple correlation coefficient increase significantly from 0.02 to 0.33. Sex remained significant in the multiple equation, but the net effect of education and housing type did not.

6. Conclusion

Hong Kong students held a very positive environmental attitudes. They had a very strong attitude on conservation of wide animals and natural resources. They also strongly urged for government regulation for pollution. Students were willing to make personal contribution in the protection of the environment and exhibited a favorable attitude toward environmental organizations. Students reported that they were willing to participate in pro-environmental activities like waste recycling and waste minimization.

There was a strong, positive and significant relationship between students' environmental attitudes and their willingness to participate in various pro-environmental behaviors. The study also supported the hypothesis that a general environmental attitude

measure was more effective in predicting a comprehensive behavioral measure with a wide domain of actions.

Mass media and school were cited as major sources of environmental information. About 87% and 58% of the sample cited television and school as major sources of environmental information respectively.

There were significant differences in environmental attitudes and readiness to exhibit pro-environmental behaviors for respondents of different social characteristics. Female students, students from higher forms and students living in private housing held a more positive environmental attitudes and were more willing to engage in pro-environmental behaviors. When environmental attitudes and other variables were controlled, sex was the only one social characteristics that had net significance. For respondents with similar environmental concern scores and of same education and housing type, female students were more willing to participate in pro-environmental behaviors than male students.

The Cronbach alpha coefficient for the environmental concern scale was marginally acceptable at 0.64. Factor analysis indicated that it composed of two factors, personal sacrifice and optimism/issue. The study pointed to some modifications on items of the environmental concern scale in order to improve the internal consistency of the scale.

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Tables

Table 1 Demographic of respondents (N=992)

Demographic	No.	Percentage
Sex		
Female	508	51.9
Male	470	48.1
Education		
Form 3	348	35.4
Form 4	508	51.7
Form 6	126	12.8
Housing type		
Public housing	592	59.7
Private housing (owns)	203	20.5
Home Ownership Scheme housing	128	12.9
Private housing (rental)	36	3.6
Staff quarters	10	1.0
Temporary housing	8	0.8

Note: The cells may not sum up to total due to missing cases.

Table 2 Frequency distribution, mean and standard deviation of environmental attitudes of respondents (N=992)

Items on environmental concern scale	SA	A	N	D	SD	Mean*	Standard deviation
	%	%	%	%	%		
1. The government will have to introduce harsh measures to halt pollution, since few people will regulate themselves.	26.5	53.7	16.8	2.2	0.8	4.03	0.77
2. We should not worry about killing too many wide animals because in the long run, things will balance out.	1.7	3.0	13.3	44.4	37.5	4.13	0.88
3. I'd be willing to make personal sacrifices for the sake of slowing down pollution even though the immediate results may not seem significant.	9.9	42.6	38.3	6.7	2.5	3.51	0.86
4. Pollution is not personally affecting me.	2.3	6.4	18.2	48.2	24.9	3.87	0.94
5. The benefits of modern consumer products are more important than the pollution that results from their production and use.	4.5	19.4	47.8	22.3	6.1	3.06	0.91
6. We must prevent any type of animals from becoming extinct, even if it means sacrificing some things for ourselves.	30.9	45.0	19.2	2.7	2.2	4.00	0.90
7. Courses focusing on the conservation of natural resources should be taught in the schools.	15.5	46.5	31.6	3.7	2.6	3.69	0.87
8. Although there is continual contamination of our rivers, oceans and air, nature's purifying processes soon return them to normal.	1.1	4.0	17.1	52.2	25.6	3.97	0.83

Environmental attitudes and behaviors

Items on environmental concern scale	SA	A	N	D	SD	Mean*	Standard deviation
	%	%	%	%	%		
9. The currently active anti-pollution organizations are really more interested in disrupting society than they are in fighting pollution.	2.0	9.9	60.2	21.5	6.4	3.20	0.78
10. Industry is trying its best to develop effective anti-pollution technology.	8.6	30.0	47.4	12.0	2.1	2.69	0.87
11. If asked, I would contribute time or money to an organization that works to improve the quality of the environment.	2.9	4.8	48.8	39.6	3.9	3.37	0.76

SA=strongly agree A=agree N=neither agree nor disagree D=disagree SD=strongly disagree

* on 1-5 scale, mean scores for items 1,3,6,7,11 were reversed so that high score represents positive environmental attitudes

Table 3 Frequency distribution, mean and standard deviation of students' readiness to participate in various pro-environmental behaviors

Item	SA	A	N	D	SD	Mean*	Standard deviation
	%	%	%	%	%		
1. If there is a paper recycling scheme in my school, I'll try my best to participate.	22.5	57.7	17.4	0.9	1.4	3.99	0.75
2. If there is a paper recycling receptacle in the building I am living, I'll try my best to use it.	26.9	54.6	15.3	2.2	0.9	4.04	0.77
3. If there is a "use less tissue" campaign in my school, I'll try my best to participate.	12.3	46.5	35.3	4.0	1.9	3.63	0.82
4. Now some shops and supermarkets are running a "use less plastic bags" campaign, I'll try my best to participate.	21.3	50.8	24.1	2.6	1.1	3.89	0.80

SA=strongly agree A=agree N=neither agree nor disagree D=disagree SD=strongly disagree

* on 1-5 scale, high score represents willingness to participate in pro-environmental behaviors

Table 4 Main sources of environmental information

Source	Number of response	%
Television	853	86.9
School	566	57.6
Newspapers	529	53.9
Magazines	408	41.5
Radio	405	41.2
Family	142	14.5
Others	29	3.0

Note: Respondents can check more than one source.

Table 5 Factor analysis on Environmental concern scale

Item	Loading for factor 1	Loading for factor 2
Factor 1 Personal sacrifice		
11. If asked, I would contribute time or money to an organization that works to improve the quality of the environment.	0.69	-0.01
3. I'd be willing to make personal sacrifices for the sake of slowing down pollution even though the immediate results may not seem significant.	0.64	0.09
7. Courses focusing on the conservation of natural resources should be taught in the schools.	0.59	-0.01
6. We must prevent any type of animals from becoming extinct, even if it means sacrificing some things for ourselves.	0.54	0.20
1. The government will have to introduce harsh measures to halt pollution, since few people will regulate themselves.	0.51	0.19
Factor 2 Optimism/issue		
8. Although there is continual contamination of our rivers, oceans and air, nature's purifying processes soon return them to normal.	0.26	0.60
2. We should not worry about killing too many wide animals because in the long run, things will balance out.	0.35	0.57
5. The benefits of modern consumer products are more important than the pollution that results from their production and use.	-0.07	0.55
4. Pollution is not personally affecting me.	0.19	0.53
9. The currently active anti-pollution organizations are really more interested in disrupting society than they are in fighting pollution.	0.08	0.48
10. Industry is trying its best to develop effective anti-pollution technology.	-0.24	0.36

Table 6 Correlation between environmental attitudes and behavioral intentions of pro-environmental behaviors

Behavioral intention	Pearson correlation coefficient with		
	Environmental concern scale	Personal sacrifice sub-scale	Optimism/issue sub-scale
Paper recycling at school	0.39***	0.45***	0.21***
Paper recycling at home	0.46***	0.48***	0.28***
Use less tissue papers	0.37***	0.39***	0.22***
Use less plastic bags	0.43***	0.45***	0.26***
Overall behavioral intention	0.52***	0.56***	0.31***

Note: *** = significant at 0.0001 level

Table 7 Bivariate and multiple correlation analysis of the relationship between selected social characteristics and the environmental concern scale

Independent variable	Environmental concern scale	
	Bivariate r	Partial correlation
Sex	0.06 *	0.07
Education	0.09**	0.09**
Housing type	0.09**	0.09**
Multiple R		0.01 *

Sex: 1= male, 2= female; Education: 1= form 3, 2= form 4, 3= form 7;
Housing type: 1= public housing; 2= private housing.

* significant at 0.05; ** significant at 0.01; *** significant at 0.001.

Table 8 Bivariate and multiple correlation analysis of the relationship between selected social characteristics (model 1) and social characteristics and the environmental concern scale (model 2)

Independent variable	Overall behavioral intention		
	Bivariate r	Partial correlation Model 1	Partial correlation Model 2
Sex	0.12***	0.12***	0.14 **
Education	0.08 *	0.08 *	0.09
Housing type	0.08 *	0.07 *	0.09
Environmental concern scale	0.52***	---	0.51***
Multiple R		0.02***	0.33***

Sex: 1= male, 2= female; Education: 1= form 3, 2= form 4, 3= form 7;
Housing type: 1= public housing; 2= private housing.

* significant at 0.05; ** significant at 0.01; *** significant at 0.001.