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GEOG2012: Survey and Statistical Techniques in Geography
End-of-semester Report: Analyzing Survey Report

I. Publication details

(Question 1 of the assignment)

I have selected "*Environmental education survey on schools in 1999/2000: final report submitted to the Environmental Campaign Committee*" as the survey that I am going to analyze in my end-of-semester report. It is a survey done by Dr. Wong Koon Kwai about the possibility of launching environmental education in primary and secondary school. The reason I choose this survey because it is a geographical survey by HKBU in 1999 so it is easier to identify the twelve stages of the report. In the other words, I choose it because (i) it is a survey; (ii) it is conducted in Hong Kong; (iii) most importantly, it contains questionnaires for analysis.

II. The Twelve stages

(Question 2, 3 & 4 of the assignment)

Stage 1: Problem identification & definition

The Chief Executive of HKSAR, Mr. Tung Chee-hwa has focused on education reforms and environmental protection in this third policy address as to transform Hong Kong into a global city in the 21st century. To achieve this goal, environmental education is critical to transform the youngster in Hong Kong, into an environmentally friendly generation.

Therefore the Guidelines on Environmental Education in Schools (or the 99 Guidelines) was issued in 1999 by the Education Department to set formula for the above goals. It was to turn the students to become environmental citizens and urged to follow an environmental education model towards sustainable development. Environmental programs were encouraged to establish in schools. Therefore there is a pressing need to gauge the attitude of the teachers towards environmental education as well as finding out the constraints encountered. By doing a survey, it is hoped to find out a more effectively plan to develop befitting programs to enhance the quality of environmental education in future.

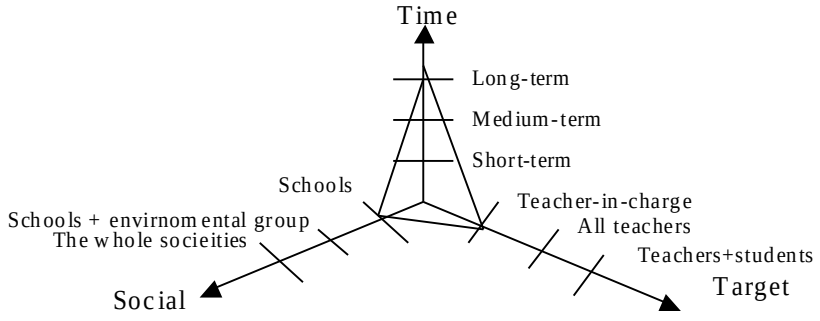
Therefore the purpose of the survey is to understand whether primary and secondary schools are already to conduct environmental education. The survey is to gauge the attitude of teachers towards environmental education in schools and to find out the constraints encountered by them while implementing environmental education at present, since environmental education is relatively new in schools.

Sub Models	Variables Required
Attitude of teachers towards environmental education in schools	❙ Awareness of the 92 and 99 Guidelines on Environmental Education in School
Constraints encountered by school	❙ Reasons for not implementing formal environmental education ❙ Situation in implementing formal environmental education ❙ Environmental worldview

Advantage of setting up objective before survey is it can give clear framework and guidance for designing questionnaire. Therefore questionnaires can be set up according to the objectives.

Stage 2: Scope of analysis

The scope of the survey is restricted to: the target-surveyed population consists of all primary and secondary school in Hong Kong in the 1999/2000 academic year. The list of school targeted for survey was downloaded from the Education Department Homepage from internet. Each school was assigned a code number. In the other words, it is (1) time: the situation in 1999/2000 academic year in short term and future situation in long term; (2) Social: All primary and secondary school found in the Education Department Homepage; (3) And the target is the teacher-in-charge.



There are totally 452 secondary and 826 primary schools constitute the survey sample of this study.

The merit of the slope of study in the survey is that it covers long time impact, making the survey valuable for reference. However, since the survey only cover schools and the teacher-in-charge, it seems to be too narrow to understand the problem of educational education. Environmental education not only limit to school but also some environmental groups. The survey is also too "teacher-oriented" as no students are interviewed. The survey may not comprehensive enough to understand the problem, and therefore doubts in achieving its objective.

Stage 3: Exploration on the existing data resources

There are no main existing data used in this survey. The report is mainly conducted from the response of the questionnaires. However, in measuring the environmental worldview of the teachers, the New Environmental Paradigm (NEP) scale developed by Dunlap and Van Liere has been applied to assess the environmental worldview of teachers. It is a scale with a possible range of 1.0 to 4.0 score, with 1.0 the strongest anti-environmental worldview and 4.0 the strongest pro-environmental worldview.

Sub Models	Variables Required	Source
Attitude of teachers towards environmental education in schools	❙ Awareness of the 92 and 99 Guidelines on Environmental Education in School	❙ Questionnaires
Constraints encountered by school	❙ Reasons for not implementing formal environmental education ❙ Situation in implementing formal environmental education ❙ Environmental worldview of the teachers	❙ Questionnaires ❙ Questionnaires using the New Environmental Paradigm (NEP) scale developed by Dunlap and Van Liere

Advantage of having no prior existing resource is that there is no risk of borrowing outdated, inappropriate source. Nevertheless additional human

and time resource has to be spent to carry out the survey.

Stage 4: Determination of survey resources

There is no direct mention of the money, time and personnel resource of conducting the survey, but since it is a survey conducted by the geography department of the Hong Kong Baptist University from the Environmental Campaign Committee (ECC), limited resource will be expected in term of money and personnel. Time budget is also tight as respondents are only allowed to return their questionnaires by about 1 month. Subject to these difficulties, the postal questionnaires survey is adopted.

Advantage of limited resource is that the overall cost of conducting the survey is low. The cost is low in term of payment to field workers and other costs. Tight time budget may also adversely affect the quality of answers and the response rate.

Stage 5: Selection of survey methods

The postal questionnaire survey method has been used in the survey. The questionnaires were started to send to secondary schools on 26th November 1999 and primary schools on 30th November 1999. They began to receive the first batch of the returned questionnaire from secondary schools on 2nd December 1999 and from primary schools on 6th December 1999. In order to increase the response rate, a reminder letter has also addressed to school heads by fax from 10th December 1999 onwards. The investigation decided to end all responses on 6th January 2000 and all questionnaires received after that date were counted in response rate, but will be excluded in the data analysis.

Therefore the survey method is (i) indirect observational surveys as there are no direct contact between the investigators and the targeted population. The survey is conducted in form of postal questionnaire; (ii) self-administered surveys as the person being surveyed do their survey by their own and is not administered with aids from investigators.

Advantage of using this survey method is that it can minimize the amount of personnel being employed and therefore lower the cost involved. Nevertheless it has its disadvantage too. The response rate of the survey

will be low (47% secondary school and 40% primary school responses) though it was carried out by in place where respondents worked (In theory if survey is carried out at work there should be higher response rate.). Respondents may also have difficulties to understand the meaning of some questions. Nevertheless, based on the fact that there are insufficient personnel and the questionnaire consists of 15 pages in length, the best way to conduct this questionnaire is to use postal questionnaire, as it provides more time for the respondents to answer the questions.

Stage 6: Selection of sampling methods

No sampling methods were applied in the survey as it covered all schools in Hong Kong, including all primary and secondary school in the 1999/2000 academic year which is obtainable from the list downloadable from the Education Department Homepage on the internet. The questionnaires were sent by postal and will be answered by teacher who was familiar with environmental education. There are no special inclusion and exclusion of the targeted population. There are totally 452 secondary and 826 primary schools involved in the survey.

Nevertheless, subject to limited human resource to carry out the survey, why no sampling method is adopted to get a clearer understanding of situation in the selected school? The survey, as mentioned before, requires understanding of real situation. Sampling then an in-depth interview with selected school definitely does much better than postal questionnaires of the entire pollution. It only results in low response rate, and there are doubts in the answer quality.

Stage 7: Setting the hypothesis

There is no direct mention of the hypothesis adopted in the survey in the final report. Nevertheless, as launching environmental education is a new policy proposed in the 1999 policy address, schools are expected to encounter shortage of resource and constraints in carrying out the policy. And this is the purpose of the survey, i.e., to understand problems and enhance environmental education programs in future. Therefore the basic hypothesis of the survey is that (i) environmental education is carried out in school and (ii) problems are encountered in environmental education. Only with this hypothesis the survey is done to realize what problems they encountered and its severity.

Advantage of using this hypothesis is that it can easily set the question in the questionnaires and therefore express the purpose of the survey clearly. But embarrassment may happen if environmental education is not launched in one school. Together with its academic nature and there are no legal obligation to answer the questionnaires, schools without environmental education may be omitted in the survey, as they do not reply the questionnaires. And this is what the survey want to know, i.e. the problems in carrying out environmental education. The survey may fail to reflect their problems, which the survey mostly interests in. If it really happens it fails to achieve the aim of the survey.

Stage 8: Questionnaire design

The questionnaire is made of 15 pages. Most of the questions are closed question and the rest are partially-closed and open questions. Question wordings are clear and are in Chinese and English using appropriate language, making the questionnaire an academic-like survey. Most of the closed questions are asking the opinion of the respondent on some items. These kinds of 4-category questions are in the New Environmental Paradigm (NEP) scale developed by Dunlap and Van Liere. It is a scale with a possible range of 1.0 to 4.0 score, with 1.0 the strongest anti-environmental worldview and 4.0 the strongest pro-environmental worldview.

Inverted funnel approach is also applied in which open question like “states your reasons for your choices” (page 12 of the questionnaire) are found at the end of some question. Questions may also be skipped, for example, if one schools does not have any green clubs, respondents are not required to answer their activities. (page 5 of the questionnaire)

Advantage of using this questionnaire design is that it allows easy answering. Respondents just need to tick the correct boxes when answering all answer even when expressing their view. Processing of the data is also easy (further details will be given in the following paragraphs). Respondents can also save time that they need not to express their feeling in words. Especially the questionnaire is as long as 15 pages. Open questions are also given at the end of each question, providing flexibility for respondents in answering.

Nevertheless the questionnaire seems too lengthy. Shortening of the questionnaire is expected. Questions like teacher's view on environmental problems can be omitted since the main purpose of the survey is to understand the situation in carrying out environmental education.

Stage 9: Pilot surveys & survey administration

Pilot survey is done to test the survey before the questionnaires were distributed.

It is claimed in the final report that "the questionnaire was jointly designed by the ECC and the Project Supervisor of this study to elicit accurate responses from the respondents, and consisted of five parts in its final version." Therefore a pilot survey has been tested many times before the survey is carried out.

The reason for carrying out a pilot survey is that there are no former studies of similar type. The survey is designed in response to the policy address of the Chief Executive at that time. ECC can also provide enough resource to support pilot survey, making the questionnaires prefect and up-to-date. Nevertheless it will increase the total cost and delay the date starting the survey.

Concerning survey administration, the ECC commissioned the Geography Department of Hong Kong Baptist University to administer the survey. Advantage of doing so is that ECC can rely on the academic knowledge and experience to carry out the survey. The department also works independently to avoid prejudice from ECC in processing the data. Workload and cost of ECC can also be shared. However, close cooperation has to be maintained throughout the survey.

Stage 10: Data processing

Data coding is used to process the responses.

Most the questions in the questionnaires are closed question in Likert scale and few of them are open and partially closed questions. Few of the closed questions are simply processed by comparing the percentage. For

most of the closed questions in the questionnaires, direct comparison of percentage may not be effective and reliable way to understand the situation. Instead methodology has been developed to this problem

For example, the questionnaires list some possible problems encountered in launching environmental education. Respondents are required to answer the severity of the problems. (Page 8 of the questionnaires)

6.3 What are the difficulties you might encounter while launching environmental education programs or activities in your school.
貴校在推行環境教育活動時要面對那些困難?

Problems encountered 面對困難	Severity of the problem 問題嚴重性			
	No problem 沒有	*Some 少許*	*Serious 嚴重*	*Very serious 非常嚴重*
	1❑	2❑	3❑	4❑
6.31 Lack of support from school administrators 學校管理階層支援不足	1❑	2❑	3❑	4❑
6.32 Lack of materials 缺乏材料	1❑	2❑	3❑	4❑
6.33 Lack of knowledge/expertise of teachers 教師環保知識不足	1❑	2❑	3❑	4❑
6.34 Lack of funds 缺乏經費	1❑	2❑	3❑	4❑
6.35 Lack of time 時間不足	1❑	2❑	3❑	4❑
6.36 Lack of space in school to carry out activities 沒有舉辦環境教育活動的空間	1❑	2❑	3❑	4❑
6.37 Lack of interest of students 學生不感興趣	1❑	2❑	3❑	4❑
6.38 Lack of support from teachers 老師支持不足	1❑	2❑	3❑	4❑
6.39 Lack of support from parents 家長支持不足	1❑	2❑	3❑	4❑
6.310 Others (Please specify:_____) 其他(請註明：_____)	1❑	2❑	3❑	4❑

The answers are pre-coded in the questionnaire. For example, the surveyor analyze the survey by coding “no problem” as “1”, “some” as “2”, “serious” as “3” and “very serious” as “4”. The coding depends on the severity of the problem, with “1” as “least serious” and “4” as “most serious”.

Advantage of doing so is that it allows easy answering from respondents. Disadvantage is that, however, respondents fail to express their opinion in words if they have further to say.

Stage 11: Data analysis and hypothesis testing

The survey is a descriptive statistics. Indices are used to describe the data

obtained. Using the example in stage 10, indices are used to calculate the severity of the problems. Through the indices we can understand severity of one problem. However the indices are figures representing severity only. We cannot make any inferences further.

Table 6.3 Problems encountered while launching environmental education programs
表 6.3 推行環境教育活動時所要面對的困難

Problem encountered 面對困難		Severity of the problem 問題嚴重性				Severity Index 嚴重性指數
		No problem 沒有 1❑	*Some* 少許 2❑	*Serious* 嚴重 3❑	*Very serious* 非常嚴重 4❑	
Lack of support from school administrators 學校管理階層支援不足	PS	14.9% (48)	51.7% (167)	25.4% (82)	8.0% (26)	2.27
	SS	15.9% (32)	46.8% (94)	26.9% (54)	10.4% (21)	2.32
Lack of materials 缺乏材料	PS	6.2% (20)	38.9% (125)	44.9% (144)	10.0% (32)	2.59
	SS	8.5% (17)	44.8% (90)	40.3% (81)	6.5% (13)	2.45
Lack of knowledge/expertise of teachers 教師環保知識不足	PS	7.9% (25)	45.6% (144)	34.5% (109)	12.0% (38)	2.51
	SS	9.5% (19)	45.7% (91)	39.2% (78)	5.5% (11)	2.41
Lack of funds 缺乏經費	PS	9.0% (29)	37.6% (121)	40.4% (130)	13.0% (42)	2.57
	SS	10.1% (20)	43.2% (86)	32.7% (65)	14.1% (28)	2.51
Lack of time 時間不足	PS	1.5% (5)	13.0% (42)	36.4% (118)	49.1% (159)	3.33
	SS	1.5% (3)	6.4% (13)	35.1% (71)	56.9% (115)	3.48
Lack of space in school to carry out activities 學校沒有舉辦環境教育活動的場地	PS	5.9% (19)	31.5% (102)	39.5% (128)	23.1% (75)	2.80
	SS	6.5% (13)	30.3% (61)	38.3% (77)	24.9% (50)	2.82
Lack of interest of students 學生不感興趣	PS	32.4% (105)	54.0% (175)	10.8% (35)	2.8% (9)	1.84
	SS	7.4% (15)	44.1% (89)	33.2% (67)	15.3% (31)	2.56
Lack of support from teachers 老師支持不足	PS	16.3% (53)	49.8% (162)	25.5% (83)	8.3% (27)	2.26
	SS	7.4% (15)	43.6% (88)	37.6% (76)	11.4% (23)	2.53
Lack of support from parents 家長支持不足	PS	11.9% (38)	56.0% (178)	26.1% (83)	6.0% (19)	2.26
	SS	13.9% (27)	45.9% (89)	32.5% (63)	7.7% (15)	2.34
Others (specify): 其他(請註明): (a) 老師缺乏興趣 PS (0), SS (1) (b) 學生缺乏時間 PS (0), SS (1)	PS	63.6% (7)	9.1% (1)	18.2% (2)	9.1% (1)	1.73
	SS	33.3% (2)	0.0% (0)	50.0% (3)	16.7% (1)	2.50

* Severity Index is on a four-point scale with "1" indicates no problem and "4" very serious.
* 嚴重程度指數是一個四分指標，"1" 分代表沒有問題，而 "4" 分表示問題嚴重

To calculate the severity index for "lack of support from school administrators", the surveyors multiply the number of respondents with their choice code. The severity index is then = sum of (number of respondents of that choice x their choice code) / total number of respondents. I.e. for PS, the severity index is = (48x1) + (167x2) + (82x3) + (26x4) / 323 = 2.27. By this severity index with "1" indicates no problem and "4" very serious, we can understand the severity of one problem. Moreover, we can compare the severity of one problem with the others. By using the "index" method we can rank which problem is most serious, which is the second and which is least serious. We can also calculate the average severity of problem in carrying out environmental education by calculating the mean of the severity index. The disadvantage, however, is that it only shows figures representing the severity of the problems. No further details such as examples in one reason in deterring environmental education can be observed. It over-generalizes the situation and fails to understand the real situation of

individual cases.

The interpretation of the data is in agreement with the hypothesis set. In the hypothesis setting it is believed that (i) environmental education is carried out in school and (ii) problems are encountered in environmental education. The first hypothesis is in reality as majority of respondents say that information environmental education is carried out. However, majority of the schools do not carry out formal environmental education. Nevertheless, it reflects the fact that in some degree environmental education is found in schools.

Table 1.21 Implementation of formal environmental education in school
表 1.21 在學校推行正規環境教育課程

Yes 有	PS 11.6% (38) SS 14.3% (29)
No 沒有	PS 88.4% (290) SS 85.7% (174)

Table 2.1 Implementation of informal environmental education in school
表 2.1 學校推行非正規環境教育的情況

Yes 有	PS 77.3% (245) SS 92.0% (185)
No 沒有	PS 22.7% (72) SS 8.0% (16)

The second hypothesis is also similar to fact. From table 6.3, the survey result shows there are some difficulties encountered by school in carrying out environmental education. According to the final report, “lack of time” is the most serious problem with score of 3.33 for PS (primary school) and 3.48 for SS (secondary school). “Lack of space in school to carry out activities” ranks second.

Stage 12: Writing a report & finalizing

After analyzing all the data collected the geography department of HKBU is responsible for writing the final report. Besides revealing major problems in environmental education, the final report also discovered that (i) no “green mission or policies” is carried out by school; (ii) teachers are untrained in environmental education; (iii) teachers in Hong Kong are aware of environmental issues locally and internationally. The report is then later passed to ECC in 2000 for them to make suggestion and improvement. It is a good reference for those interested parties. Nevertheless more resources are expected to conduct the survey.

III. Recommendations for improvement

(Question 5 of the assignment)

Though the survey had been launched and results were published, there are still some recommendations to make in order to improve the outcome:

Firstly, there should be better availability of resources. Since the survey was commissioned by a sub-group of the Education Department, why don't the government provide more resource to the Hong Kong Baptist University in order to improve the quality of the result? For example, the government can recruit some helpers to conduct the survey. The ECC has resource in carrying out pilot survey, there are no reasons for the department not spending more and resource could be available from the government.

As more personnel could be available with the aim of the government, why don't change the survey method? The use of the postal questionnaire method in this survey was also inappropriate. The response rate is low and the accuracy of the result is in doubt. Together with no legal obligation to answer the questionnaires, half of the respondents simply do not reply. Why don't send surveyors to collect the answered questionnaires just like what the Population Census did? By doing so, it can help to increase the response rate. It can also help to clarify uncertainty from respondents as well as increase the accuracy of the answer by face-to-face monitoring.

Most importantly, the survey method simply does not meet the aims of the survey. The survey primarily aimed at concerning the attitude of teachers towards environmental education in schools as well as the constraints faced by school. In the other words, the survey requires understand the attitude and opinion of the teachers in school and also to realize the factual circumstance of schools in carrying environmental education. Using postal questionnaire method does not meet its aims. It lacks factual observation of the real situation at schools as well as real understanding of opinions from the respondents.

Therefore I will suggest the "mixed types" survey method in order to reach a better outcome. It will be a combination of the postal questionnaire method with interviews with the targeted population. There may be two options depending on the availability of personnel as well as time budget. Firstly surveyors can be sent to every targeted school to collect the answered questionnaires. This option may deserve consideration if there is availability of personnel. Advantage of doing so

can be (i) higher response rate; (ii) improved accuracy of answers; (iii) better understanding of the factual situation in school.

If resources are still limited option 2 may go into consideration. Postal questionnaire will be carried out with deadline set. For those schools without response a telephone interview may be carried out to answer the questions. Probably an interview can be arranged if respondents prefer or they are busy. (Indeed I was surprised why the department refused to do so despite a fax urging for response before deadline.) Using telephone interview can do better than postal questionnaire, since it provides more accurate answers. Clarification can also be made if respondents encounter difficulties. Response rate can also be higher other than just only less than half of total respondents.

Sampling may also be considered when resources are limited. As the survey requires real situation, Sampling then an in-depth interview with selected school definitely does much better than postal questionnaires of the entire pollution. It only results in low response rate, and there are doubts in the answer quality.

Concerning the sampling methods, simple random sampling may be used. We can first number the school on the school list on the Educational Department Homepage and then use random number table to randomly select the sample.

The length of the questionnaire may also be a problem. The questionnaire consists of 15-page closed questions – which is a little bit too long for the respondents. Without supervision from interviewers, the respondents may not give actual answers, or they lose patience to answer. Therefore shorter questionnaires may be revised. For example, the attitude of teachers in environment problems can be omitted since it does not have direct connection with the purpose of the survey.

More open questions should be expected as to fulfil the aim of the survey. Since it is a survey requires understanding of the real situation, there should be open questions for respondents to express their opinion and the situation in their school. It is especially important as no direct interview is arranged in the survey.

More explanatory notes should also be provided along with the questionnaires. This is important to this survey, as it is a self-administered survey. Respondents may have difficulties in understanding the meaning of some terms, such as the

differences between formal and informal environmental education, respondents may have difficulties in distinguish them. Therefore an additional explanation sheet is important for explaining the terms in the questionnaires.

IV. Introducing spatial statistics in the survey

(Question 6 of the assignment)

Another recommendation is that surveyors can introduce spatial statistics in the survey.

Respondents are divided into two types according to the survey: they are PS (primary school) and SS (secondary school) respectively.

Nevertheless this type of classification lacks comprehensiveness and depth. It seems to assume that situation are similar in all primary schools, so as in the secondary schools. In fact the situation of schools varies differently from one place to another. School situation in Cheung Chau definitely differ from schools in Mongkok. School in Cheung Chau may have enough space to carry out environmental education but just lack of skilled teachers. Schools in Mongkok want to initiate environmental education but they just do not have enough space. Problems are varied spatially and over-generalization is resulted in the survey.

Therefore, the "quadrate analysis" may be applied to understand the spatial variability of problems faced by schools in Hong Kong. We can divide Hong Kong into certain quadrates of equal area, and then we count and label the quadrates. Then later we can use the information obtained in table 6.3 (page 9 of this report), draw points for schools (including PS and SS) answering "serious" and "very serious" in the "severity of the problem" for each questions. Ten quadrate analyses therefore are done for table 6.3. Then we can calculate the average number of points in the region and then the variability of the entire pattern. By doing so, we are finding the variability of severity of one problem in Hong Kong, as well as the location where one problem are severe if clustered pattern is found.

Furthermore, we can compare severity of two problems by calculating the variance-mean ratio (VMR). Then we can compare the VMR with the theoretical spatial arrangements, i.e. dispersed, random and clustered VMR. By doing so, we hope to find out which problems have the greatest variability. And then we can advise on the ECC to suggest what should be done first (in the problem

which greatest VMR among all problems), or where should be given priority (the area points mostly clustered) to enhance environmental education. By the end of this process, we may find out schools in Mongkok are the region in Hong Kong mostly lack of space in carrying out environmental education. And then ECC can formulate policies and find solution for additional space in Mongkok according to the findings.

V. Additional resources required

(Question 7 of the assignment)

In order to fulfil the needs of the above recommendations, the following additional resources are required. They are:

- Firstly additional personnel resources are required for field workers going to school to collect questionnaires as well as to understand the real situation. The ECC certainly have adequate resource as pilot survey is done. By doing so, of course more funds are required from the government to give incentives to the workers to enhance the reliability of the answers.

- Secondly, more survey professionals are required if the above recommendations are really to carry out. Questionnaires need to rewrite in order to improve the comprehensiveness of the survey. By doing so, survey professionals are required to rewrite the questionnaires, as well as adding some explanatory notes. Furthermore if spatial statistics are introduced in the survey, professionals are also required to handle those complicated formula.

- Thirdly, longer time budget is required. As the survey become more complicated after the above recommendations, more time are required for processing the data obtained. Field workers also need more time to visit the schools and collect the questionnaires, as well as understanding the factual situation of school in launching environmental education.

Actually the questionnaire design is in professional standard with joint effort from ECC and geography department of HKBU. Nevertheless since the ECC does not provide inadequate resource to the department, it greatly affects the quality of responses. By the above recommendations we only to enhance the quality of outcome, and the ECC can make suggestions upon the findings.