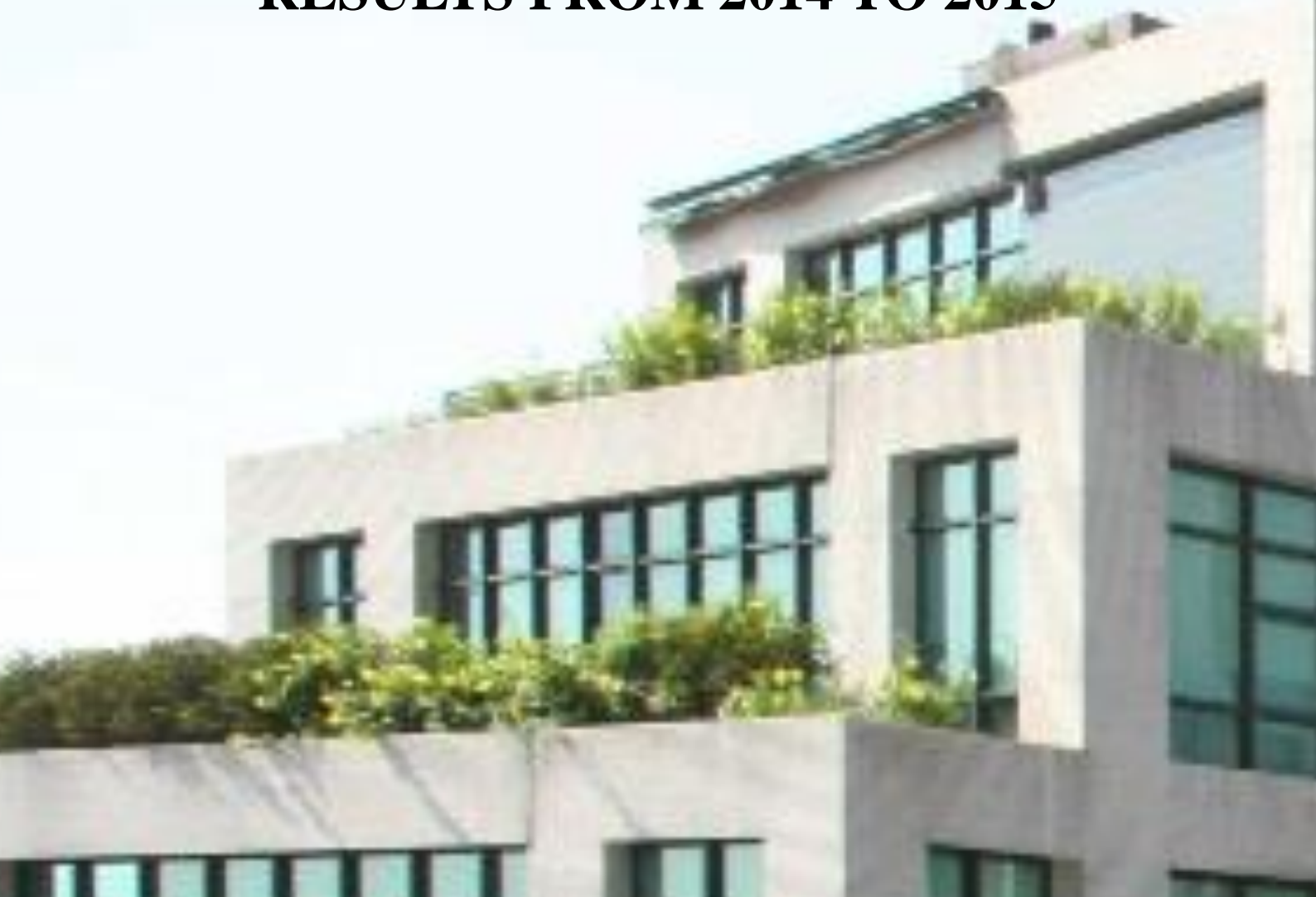




**EFFECTS OF LIBERAL STUDIES  
ON HONG KONG STUDENTS'  
ENVIRONMENTAL  
KNOWLEDGE AND BEHAVIOUR:  
RESULTS FROM 2014 TO 2015**



# **Effects of Liberal Studies on Hong Kong Students' Environmental Knowledge and Behaviour: Results from 2014 to 2015**

## **Report**

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## **Executive Summary**

This project collected data from the 2014-2015 first year cohort of HKIEd students in order to explore students' perceptions on the effects and impact of compulsory environmental education as a result of the introduction of Liberal Studies (LS) into the New Senior Secondary Curriculum in Hong Kong introduced in 2009. This study also included a comparison of survey data collected for 2013-2014 first year cohort of HKIEd students collected in March 2014 using the same questionnaire. This report consists of four parts: a detailed description of the purpose of this study, methods of data collection and the analysis procedures, results of data analysis and conclusions.

The survey indicated that the majority of 2014-2015 first year cohort students perceived that LS helped increase their environmental knowledge and change their environmental behaviour. This was consistent with the data for the students from cohort 2013/4. There was a significant difference between the two cohorts in the students' perceptions of the effect of LS on their environmental knowledge and environmental behaviour, with students from cohort 2014/5 having a greater perceived influence from the LS programme. There was also a significant difference between cohorts in terms of students' participation in environmental group activities, with Cohort 2014/5 showing greater perceived influence by the LS programme.

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## **1. Introduction**

This study on the Effects of Liberal Studies on Hong Kong Students' Environmental Knowledge and Behaviour: Results from 2014 to 2015 is the second project in an ongoing series of surveys of HKIEd first year students.

In addition to traditional and digital media such as websites and social networks (Cheung, Fok, Tsang, Fang, & Tsang, 2014), recent studies have emphasized the importance of environmental education for students' environmental knowledge and behaviour (e.g., Bofferding & Kloser, 2014; Breunig, Murtell, Russell, & Howard, 2014; Gottlieb, Vigoda-Gadot, & Haim, 2013; Liarakou, Kostelou, & Gavrilakis, 2011). While there are no conclusive results in the literature, studies have shown some significant effects of environmental education on students' environmental knowledge (Bofferding & Kloser, 2014), behaviour (Bofferding & Kloser, 2014; Liarakou et al., 2011) and behaviour intention (Breunig et al., 2014; Gottlieb et al., 2013). Non-significant effects of environmental education on environmental behaviour were also reported (Gottlieb et al., 2013). A study in Greece showed that only a few students considered environmental education influenced their environmental behaviour (Liarakou et al., 2011). The first study conducted by HKIEd in 2014 showed that more than half of the students perceived that environmental education provided in the Liberal Studies course was helpful for their environmental knowledge and behaviour (Zhu, Douglas, Savelyeva, & Maclean, 2014).

One of the contributors to the difference might be cultural. As suggested in Boyes et al.'s (2014) cross-national (UK, Australia, Brunei, Greece, India, Korea, Oman, Singapore, Spain, Turkey, and the USA) study, socio-culture characteristics might influence students' pro-environmental actions. Another factor might be the function of the facilitators that enable responsible environmental behaviour. Students' attitude or intentions relating to the environment may be changed by "real world" constraints (Breunig et al., 2014; Gottlieb et al., 2013).

This research was the second study on the effects and impact of a new compulsory environmental/sustainability content. The possible effects on students' perceptions after three years of implementation of the new curriculum in secondary schools is presented. This study, compares to the results from Zhu et al.'s study (2014) and illustrates differences between the two cohorts in students' behaviour relating to environmental group activities and their perceptions about the effects of the Liberal Studies on their environmental knowledge and behaviour.

## **2. Research Methods**

### **2.1 Procedures**

Two cohorts (enrolled in 2013 and 2014) of first year students at HKIEd who took the Hong Kong Diploma of Secondary Education (HKDSE) were invited to complete an anonymous questionnaire asking whether their attitudes and actions on environmental issues had been influenced by what they had been taught in the formal curriculum. Data were collected for the first study in March 2014 (the second semester of academic year 2013/4), and in for this second

study in October 2014 (the first semester of academic year 2014/5). The questionnaires were collected on paper, with the data input manually with independent error checking.

## 2.2 Sample

Seven hundred and eighty-seven students answered the questionnaire. Data from 3 returns were excluded because the respondents had not taken the HKDSE. Thirty eight returns were excluded because of illogical responses on participation in environmental activities. There were 395 valid questionnaires from first cohort (academic year 2013/4) and 351 valid responses from second cohort (academic year 2014/5). Table 1 presents the sample distribution by gender and cohort. There were 513 (68.8%) female students, 230 (30.8%) male students and 3 students did not indicate their gender. The male/female ratios for the two cohorts were similar, around 7 to 3 which matches the Institute average.

**Table 1 Sample Distribution by Gender and Cohort**

Cohort	Female (% by row)	Male (% by row)	Not Specified (% by row)	Total
2013/4	283 (71.6%)	109 (27.6%)	3 (0.8%)	395
2014/5	230 (65.5%)	121 (34.5%)	0 (0.0%)	351
Total	513 (68.8%)	230 (30.8%)	3 (0.4%)	746

## 2.3 Instruments

The questionnaire included five scales and a background question on gender. Three scales were designed to measure (1) students' perceptions of the effect of the Liberal Studies programme on their environmental knowledge (Knowledge Increase Scale with eight items and the Cronbach's Alpha of 0.939), (2) their perceptions of the effect of the Liberal Studies programme on their environmental behaviour (Behaviour Change Scale with nine items and the Cronbach's Alpha of 0.937) and (3) their perceptions of the effect of the Liberal Studies programme on their active participation in environmental group activities (Group Participation Decision Scale with three items and the Cronbach's Alpha of 0.949). Another scale measured students' participation in environmental group activities (Group Participation Scale with three items and the Cronbach's Alpha of 0.668), and the last scale measured students' perceptions of other influences that might affect their understanding of environmental issues (Other Influence Scale with six items and the Cronbach's Alpha of 0.749). A copy of the questionnaire can be found in Appendix 1.

## 2.4 Data Analysis

Descriptive analyses using SPSS (Version 21) were conducted to illustrate students' ratings on each item of each scale. Confirmatory Factor Analyses (CFA) with covariates (gender and cohort) was conducted using Mplus software (Muthén & Muthén, 2012) to examine any gender and cohort differences in the variables for this study. Five model-data fit indicators were used to evaluate the overall model fit: the Chi-squared statistic, the Comparative Fit Index (CFI; Bentler, 1990), the Tucker Lewis Index (TLI; Tucker & Lewis, 1973), the Root Mean Square

Error of Approximation (RMSEA; Steiger & Lind, 1980) and Standardized Root Mean Square Residual (SRMR; Bentler, 1995). CFI and TLI of more than 0.95, RMSEA of less than 0.05, and SRMR of less than 0.08 indicate a good model-data fit. A non-significant model Chi-squared statistic indicates a good model fit, while a significant model Chi-squared value might not mean that the model data difference is significant, especially when the sample size is large.

### **3. Results**

#### **3.1 Students' Perceptions of the Effect of Liberal Studies Programme on their Environmental Knowledge**

Students' perceptions of the influence of the Liberal Studies programme on their environmental knowledge was measured using the Knowledge Increase Scale. This scale had eight items, with a common item statement: "Has your knowledge of the following issues increased as a result of the Liberal Studies programme:". These items were "Climate change", "Air quality", "Waste disposal", "Biodiversity", "Nature conservation", "Industrial pollution", "Renewable energy" and "Ozone layer depletion". There were four response categories to indicate increase in knowledge: "No change", "Slightly more", "More" and "Much more". Results from students of the two cohorts (2013/4 and 2014/5) are presented in Table 2 (the percentage distribution for the items) and Figure 1 (the cumulative percentage bar charts).

Results from both cohorts showed that a large percentage of students perceived that their environmental knowledge had increased because of the Liberal Studies programme. Most of them indicated their knowledge of the following issues had increased as a result of the Liberal Studies programme as "Slightly more" or "More". The percentages of cohort 2014/5 students who perceived their knowledge has increased because of the Liberal Studies programme ("Slightly more", "More" or "Much more") were larger than those of cohort 2013/4 students.

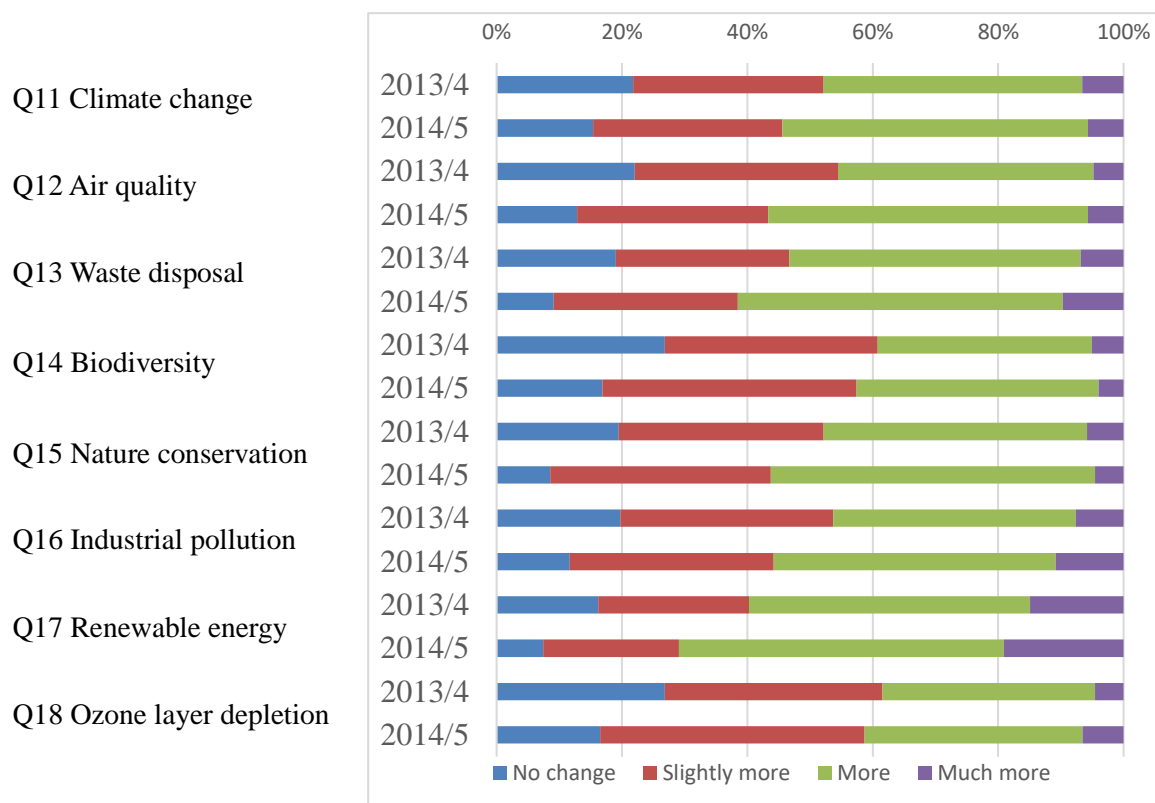


**Table 2 Percent Distribution of Knowledge Increase Scale**

Item	Cohort	No change	Slightly more	More	Much more
Q11 Climate change	2013/4	21.8%	30.4%	41.3%	6.6%
	2014/5	15.4%	30.2%	48.7%	5.7%
Q12 Air quality	2013/4	22.0%	32.4%	40.8%	4.8%
	2014/5	12.8%	30.5%	51.0%	5.7%
Q13 Waste disposal	2013/4	19.0%	27.7%	46.4%	6.9%
	2014/5	9.1%	29.3%	51.9%	9.7%
Q14 Biodiversity	2013/4	26.8%	33.9%	34.2%	5.1%
	2014/5	16.9%	40.6%	38.6%	4.0%
Q15 Nature conservation	2013/4	19.5%	32.7%	42.0%	5.8%
	2014/5	8.6%	35.1%	51.7%	4.6%
Q16 Industrial pollution	2013/4	19.7%	33.9%	38.7%	7.6%
	2014/5	11.7%	32.5%	45.0%	10.8%
Q17 Renewable energy	2013/4	16.2%	24.1%	44.8%	14.9%
	2014/5	7.4%	21.7%	51.9%	19.1%
Q18 Ozone layer depletion	2013/4	26.8%	34.7%	33.9%	4.6%
	2014/5	16.5%	42.2%	34.8%	6.6%

Note: Percentage within each item might not add up to 100% because of rounding error.

**Figure 1 Cumulative Percentage Bar Chart of Knowledge Increase Scale**



### 3.2 Students' Perceptions of the Effect of Liberal Studies Programme on their Environmental Behaviour

Students' perceptions of the influence of the Liberal Studies programme on their environmental behaviour was measured using the Behaviour Change Scale. This scale contained two sets of items, that is, "Recycle" and "Protection". The "Recycle" set had three items with a common theme of "As a result of what you learnt in the Liberal Studies Programme, do you recycle more". The items were "Recycle paper", "Recycle metals" and "Recycle plastic". There were four response categories: "No change", "Slightly more", "More" and "Much more". The "Protection" set had six items with a common theme of "As a result of what you learnt in the Liberal Studies Programme, do you do less of the following:". The items are "Use air conditioning", "Use water", "Waste food", "Use plastic bags", "Spend money on clothes" and "Spend money on electronic goods". The four response categories were: "No change", "Slightly less", "Less" and "Much less". Both the Chinese and English versions of the items were provided in the questionnaire and each corresponding response category for the two parts were the same in Chinese. Therefore, the same coding method was used for these two parts, that is, "No change" was coded as 1, "slight less" or "slight more" as 2, "More" or "Less" as 3, and "much less" or "much more" was coded as 4. The percentage distributions for the items of Behaviour Change Scale for both cohorts are presented in Table 3 and the cumulative percentage bar charts for them are presented in Figure 2.

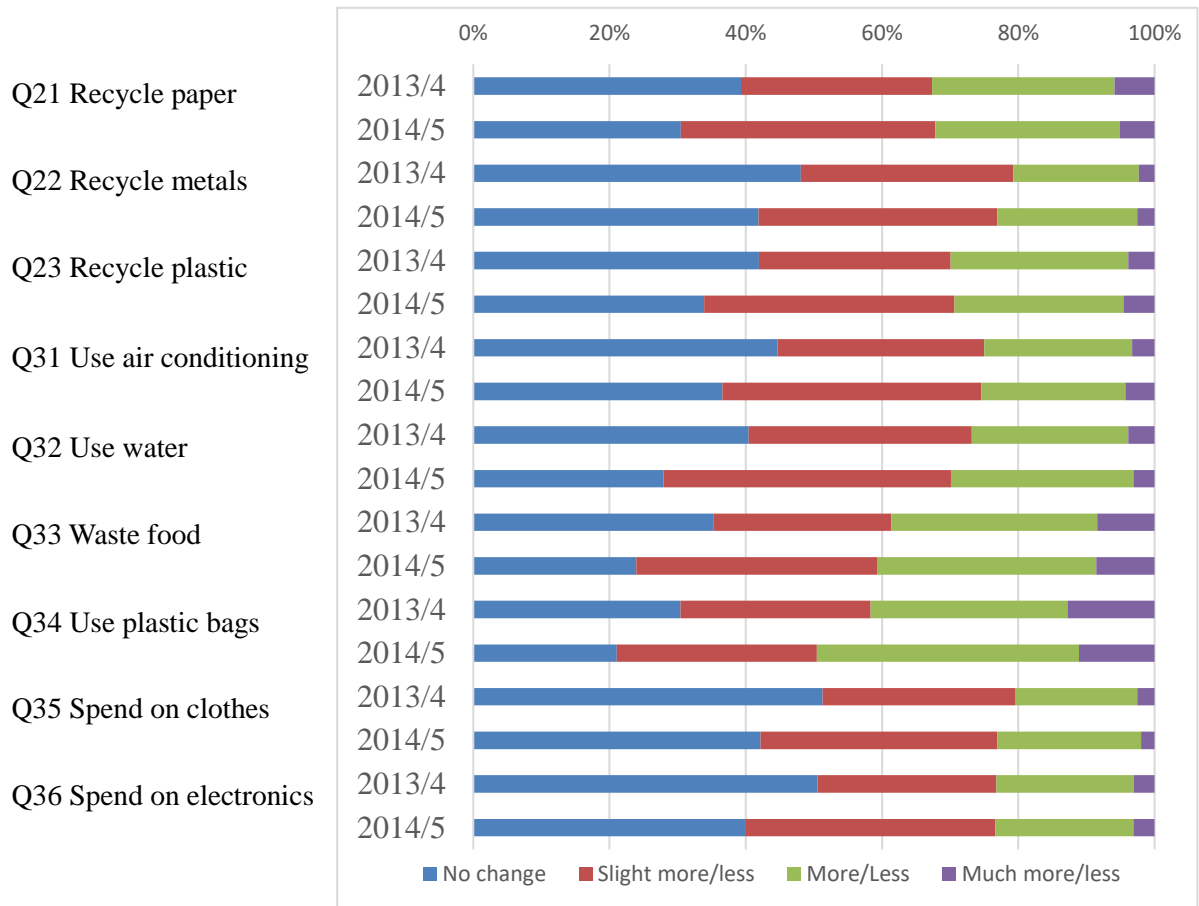
**Table 3 Percent Distribution of Behaviour Change Scale**

Item	Cohort	No change	Slight more/less	More/Less	Much more/less
Q21 Recycle paper	2013/4	39.29%	28.06%	26.79%	5.87%
	2014/5	30.48%	37.32%	27.07%	5.13%
Q22 Recycle metals	2013/4	48.08%	31.20%	18.41%	2.30%
	2014/5	41.88%	35.04%	20.51%	2.56%
Q23 Recycle plastic	2013/4	41.94%	28.13%	26.09%	3.84%
	2014/5	33.90%	36.75%	24.79%	4.56%
Q31 Use air conditioning	2013/4	44.64%	30.36%	21.68%	3.32%
	2014/5	36.57%	38.00%	21.14%	4.29%
Q32 Use water	2013/4	40.41%	32.74%	23.02%	3.84%
	2014/5	27.92%	42.17%	26.78%	3.13%
Q33 Waste food	2013/4	35.29%	26.09%	30.18%	8.44%
	2014/5	23.93%	35.33%	32.19%	8.55%
Q34 Use plastic bags	2013/4	30.43%	27.88%	28.90%	12.79%
	2014/5	21.08%	29.34%	38.46%	11.11%
Q35 Spend money on clothes	2013/4	51.28%	28.32%	17.86%	2.55%
	2014/5	42.17%	34.76%	21.08%	1.99%

Q36 Spend money on electronics goods	2013/4	50.51%	26.28%	20.15%	3.06%
	2014/5	39.89%	36.75%	20.23%	3.13%

Note: Percentage within each item might not add up to 100% because of rounding error.

**Figure 2 Cumulative Percentage Bar Chart of Behaviour Change Scale**



Results from the two cohorts showed that just over 50% of students from the two cohorts believed that their environmental behaviour had changed as a result of what they had learnt in the Liberal Studies Programme. These percentages, however, were less than those of students who perceived that their environmental knowledge had changed. A larger percentage of cohort-2014/5 students perceived that their environmental knowledge had changed because of Liberal Studies Programme than cohort 2013/4 students. The percentage of cohort 2014/5 students who perceived that their environmental behaviour had changed because of Liberal Studies Programme was larger than those of cohort 2013/4 students.

### 3.3 Students' Environmental Group Activity Participation

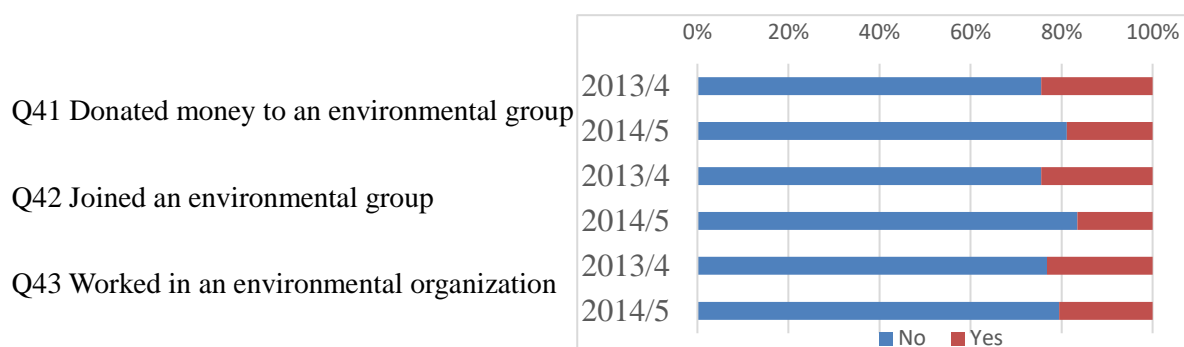
Students' environmental group activity participation was measured using Group Participation Scale. This scale includes three items with a common theme of "Have you done any of the following:" The items were "Donated money to an environmental group? (eg. Friends of the

Earth, Green Power etc.)”, “Joined an environmental group?” and “Volunteered or been paid for work in an environmental organization”. There were two response categories: “Yes” and “No”. The percentage distributions for the items of Group Participation Scale for both cohorts are presented in Table 4 and the cumulative percentage bar charts for them are presented in Figure 3.

**Table 4 Percent Distribution of Group Participation Scale**

Item	Cohort	No	Yes
Q41 Donated money to an environmental group	2013/4	75.51%	24.49%
	2014/5	81.14%	18.86%
Q42 Joined an environmental group	2013/4	75.51%	24.49%
	2014/5	83.48%	16.52%
Q43 Worked in an environmental organization	2013/4	76.79%	23.21%
	2014/5	79.49%	20.51%

**Figure 3 Cumulative Percentage Bar Chart of Group Participation Scale**



Results showed that between 23.21% and 24.49% of the students from cohort 2013/4 took part in the listed environmental-group activities and between 16.52% and 20.51% of the students from cohort 2014/5 took part in these activities. Compared to the students from cohort 2013/4, less students from cohort 2014/5 participated in the listed activities. These results, however, were not consistent with the results that the percentages of cohort 2014/5 students who perceived that their environmental knowledge and environmental behaviour had changed because of Liberal Studies Programme were larger than those of cohort 2013/4 students.

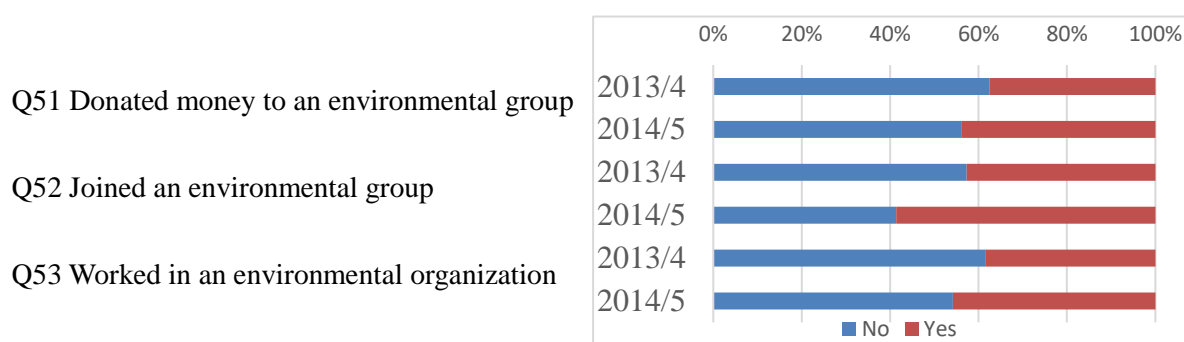
A following up question to each item of the Group Participation Scale asked whether the Liberal Studies programme had influenced students’ environmental group activities participation (Group Participation Decision Scale). The common theme for these questions was “If ‘yes’ to any of the above, was this decision as a result of the Liberal Studies programme you studied at school?” The response categories were “Yes” or “No”. The percentage distributions for the items of Group Participation Decision Scale for both cohorts are presented in Table 5 and cumulative percentage bar charts of group participation decision scale are presented in Figure 4.

As shown in the results, among the students who participated in the activities listed in the Group Participation Decision Scale, larger percentages of students from cohort 2014/5 perceived that their participation in these activities was as a result the Liberal Studies programme, compared to those of students from cohort 2013/4. However, these results are inconsistent with the results that less students from cohort 2014/5 participated in the activities listed in the Group Participation Scale than those from cohort 2013/4.

**Table 5 Percent Distribution of Effects of Liberal Studies on Group Activity Participation and Total Number of Students Who Participated**

Item	Cohort	No	Yes
Q51 Donated money to an environmental group	2013/4	62.50%	37.50%
	2014/5	56.06%	43.94%
Q52 Joined an environmental group	2013/4	57.29%	42.71%
	2014/5	41.38%	58.62%
Q53 Worked in an environmental organization	2013/4	61.54%	38.46%
	2014/5	54.17%	45.83%

**Figure 4 Cumulative Percentage Bar Chart of Group Participation Decision Scale**



### 3.4 Students' Perceptions of other Influences on their Environmental Understanding

Students' perceptions of other influences that had increased their understanding of environmental issues were tested using Other Influence Scale. This scale contained six items with a common theme of "Have other influences increased your understanding of environmental issues?". The items were "Other school lessons or activities", "TV", "Newspapers/magazines", "Internet", "Family" and "Friends". The response categories were "Yes" or "No". The percentage distribution for these items for both cohorts are presented in Table 6 and the cumulative percentage bar chart of Other Influence Scale are presented in Figure 5.

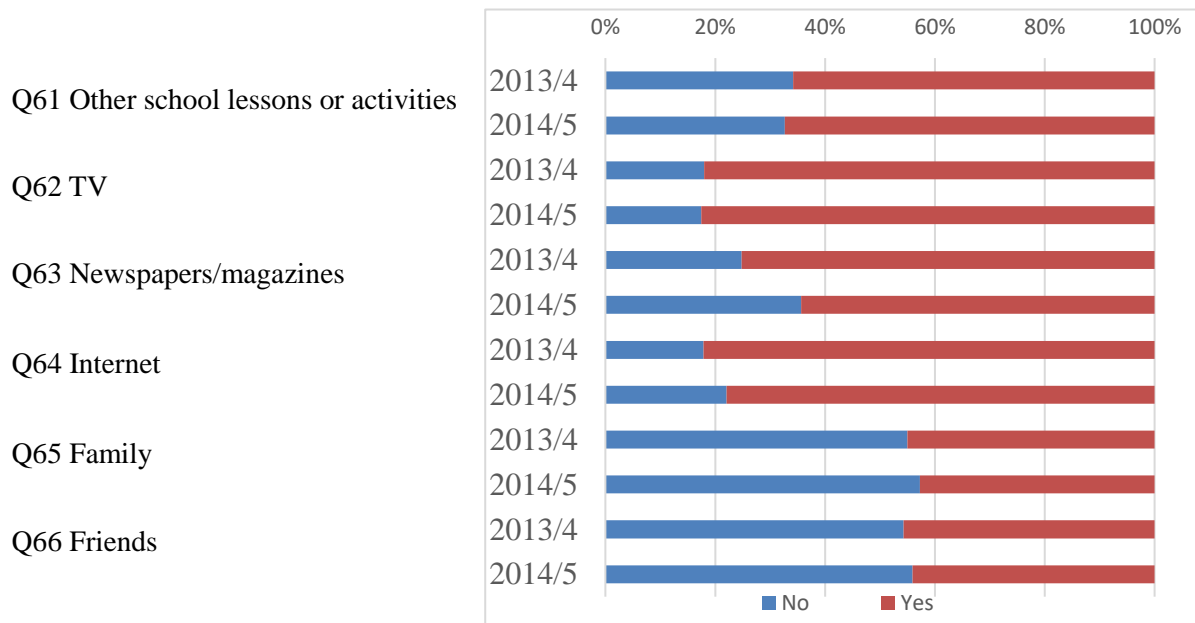
Results indicated that students from the different cohorts rated similarly in the Other Influence Scale. The exceptions were three items: "Other school lessons or activities", "Internet" and "Newspapers/magazines". Compared to students from cohort 2013/4, a larger percentage (1.44% more) of students from cohort 2014/5 believed that "Other school lessons or activities"

had increased their understanding of environmental issues, while a lower percentage of students from cohort 2014/5 indicated that “Internet” and “Newspapers/magazines” affected their understanding of environmental issues. The differences in the percentages were 4.23% and 10.86%, respectively.

**Table 6 Percent Distribution of Other Influence Scale**

Item	Cohort	No	Yes
Q61 Other school lessons or activities	2013/4	34.21%	65.79%
	2014/5	32.65%	67.35%
Q62 TV	2013/4	17.99%	82.01%
	2014/5	17.44%	82.56%
Q63 Newspapers/magazines	2013/4	24.81%	75.19%
	2014/5	35.67%	64.33%
Q64 Internet	2013/4	17.86%	82.14%
	2014/5	22.09%	77.91%
Q65 Family	2013/4	54.97%	45.03%
	2014/5	57.27%	42.73%
Q66 Friends	2013/4	54.28%	45.72%
	2014/5	55.95%	44.05%

**Figure 5 Cumulative Percentage Bar Chart of Other Influence Scale**

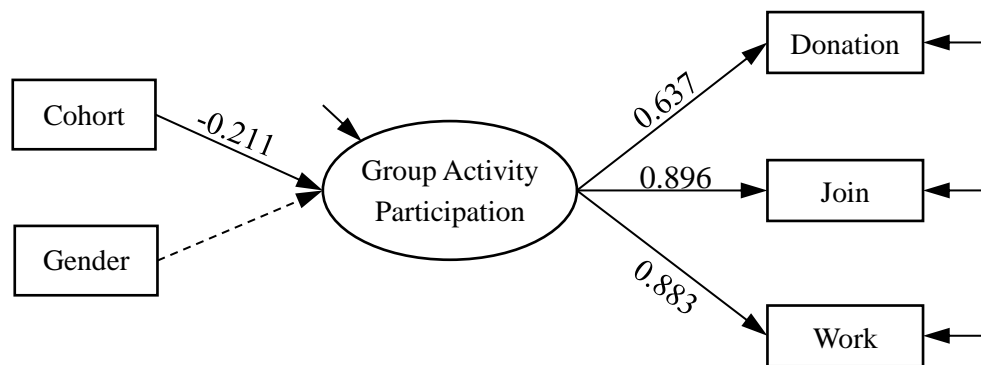


### 3.5 Gender and Cohort Differences in Students’ Environmental Group Activity Participation

Confirmatory Factor Analyses (CFA) with gender and cohort as covariates for Students’ Environmental Group Activity Participation fits the sample data well: CFI = 0.997, TLI = 0.993, RMSEA = 0.025 (90% C.I.: 0.000-0.065, P value of RMSEA  $\leq$  0.05 = 0.816), and Chi-Square

value for the finale model was 5.868 (d.f. = 4, P = 0.2092). Figure 6 shows the result of final CFA. There is no significant gender difference in students' environmental group activity participation. However, a significant cohort difference was found, with the standardized coefficient (STDY) of -0.211. This means that students of cohort 2014/5 performed 0.211 standard deviation lower than those of cohort 2013/4 in terms of group activity participation.

**Figure 6 CFA for Students' Environmental Group Activity Participation**



Note: All estimated parameters were standardized (The coefficient relating to cohort was standardized as STDY and others as STDYX). Significant effects are shown as an arrow with a solid line; non-significant effects are shown as an arrow with a dotted line. Female was coded as 0 and male as 1; cohort 2013/4 was coded as 0 and cohort 2014/5 was coded as 1. Donation = Donated money to an environmental group. Join = Joined an environmental group. Work = Volunteered or been paid for work in an environmental organization.

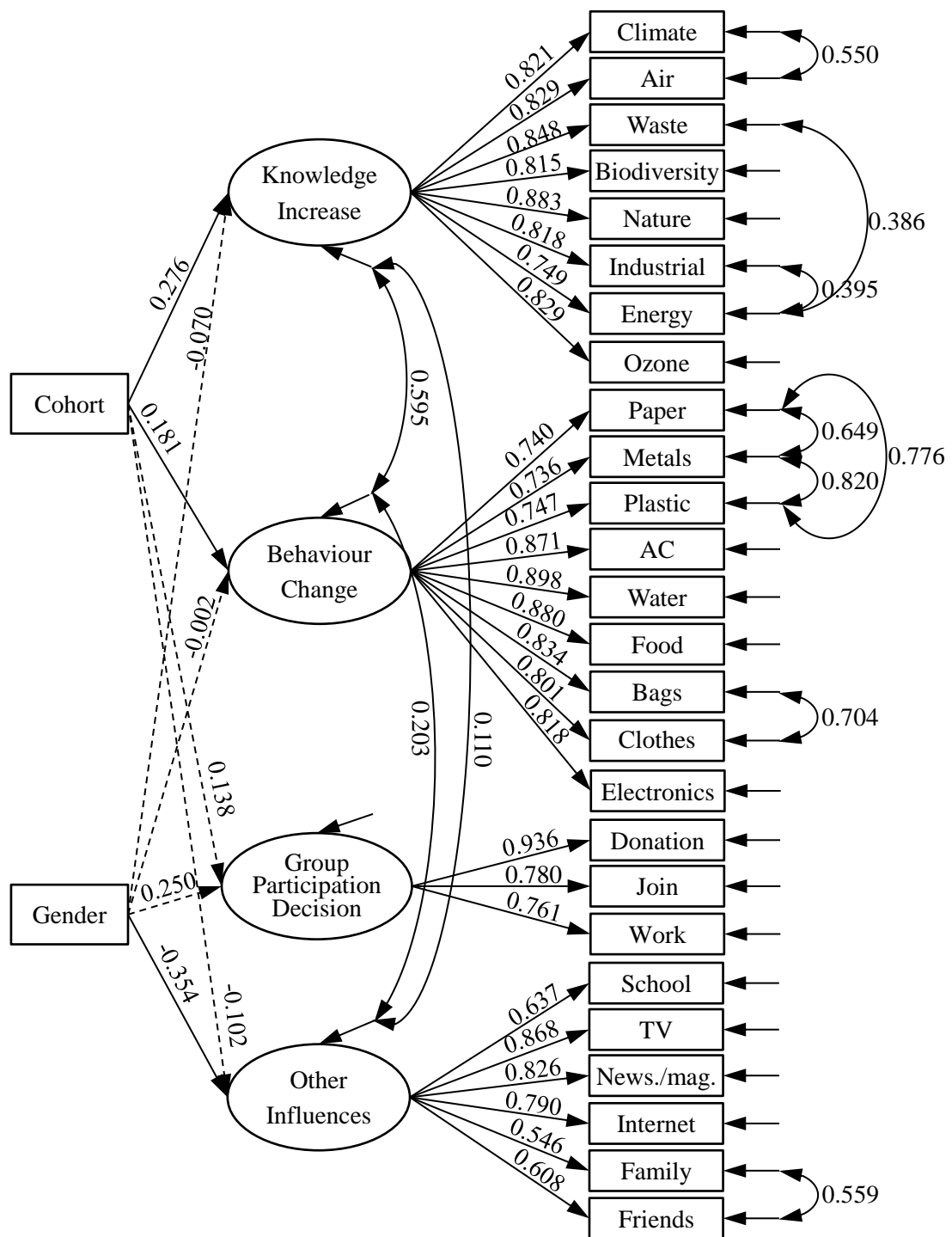
### 3.6 Gender and Cohort Differences in Students' Perceptions of the Influences on Environmental Issues

CFA with gender and cohort as covariates for students' perceptions of the effects of the influences on their environmental knowledge, environmental behaviour and participation in environmental group activities fits the sample data well: CFI = 0.986, TLI = 0.984, RMSEA = 0.046 (90% C.I.: 0.042-0.050, P value of RMSEA  $\leq$  0.05 = 0.966), and the Chi-Square value for the finale model was 840.952 (d.f. = 329, P < 0.001). Although the Chi-square values for the final model remained statistically significant, it was substantially lower than that for the baseline mode (36605.418, d.f. = 377); given the sensitivity of the Chi-square test to sample size (N = 743 in this study, three cases were excluded because of not indicating their gender), the model-data discrepancies are acceptable (Bryne, 2012). Figure 7 depicts the result of final CFA.

As shown in the Figure 7, there was no significant gender difference in students' perceptions of the effect of the Liberal Studies programme on their environmental knowledge, environmental behaviour or their decisions regarding environmental group activity participation. Significant gender differences were only found in students' perceptions of the effect the other influences on their understanding of environmental issues, with female students

outperformed male students. This means that female students rated lower in the Other Influences Scale. These results were similar to the results of from Zhu et al.'s (2014) study. The exception was the gender difference in students' perceptions of the effect of the Liberal Studies programme on their environmental group activity participation, which is significant in the report of 2014 (Zhu et al.).

**Figure 7. CFA for Students' Environmental Group Activity Participation**





Note: All estimated parameters were standardized (The coefficients relating to cohort and Gender were standardized as STDY and others as STDYX). Significant effects were shown as arrow with solid line and non-significant effects as arrow with dotted line. Non-significant correlations between the latent variables were not shown. Female was coded as 0 and male as 1; cohort 2013/4 was coded as 0 and cohort 2014/5 as 1. AC = Use air conditioning. Donation = Donated money to an environmental group. Join = Joined an environmental group. Work = Volunteered or been paid for work in an environmental organization. School = Other school lessons or activities. News./Mag. = Newspapers/magazines.

The cohort differences in students' perceptions of the effects of the Liberal Studies programme on their environmental knowledge and environmental behaviour were significant in favour of students from cohort 2014/5. However, the cohort difference in students' perceptions of the effect of the Liberal Studies programme on their environmental group activity participation decision making was not significant. The correlations between students' perceptions of the effect of Liberal Studies on their environmental knowledge and environmental behaviour and other influences increased their understanding of environmental issues were all significant, with the correlation coefficients ranging from 0.110 to 0.595. Nonetheless, their decision to participate in environmental group activities was not correlated to other variables. Finally, the R-squared of Knowledge Increase, Behaviour Change, Group Participation Decision and Other Influences is 0.019, 0.008, 0.019 and 0.031, respectively. **These mean that the predictive power of the predictors was low.**

#### **4. Conclusions**

This study focuses on the cohort differences regarding impact of compulsory environmental education following the introduction of the New Senior Secondary Curriculum in Hong Kong. The results of this study showed that, compared to those of students from cohort 2013/4, a larger proportion of students from cohort 2014/5 held the view that the Liberal Studies Programme had affected their environmental knowledge, environmental behaviour and participation in environmental group activities, while lower proportion of the students from cohort 2014/5 held the view that other factors increased their understanding of environmental issues. However, only the differences in their perceptions of the effects of Liberal Studies Programme on their environmental knowledge and environmental behaviour were significant. Significant cohort difference was also found in students' participation in environmental group activities. A larger proportion of students from cohort 2014/5 participated in the environmental group activities, including donating money to an environmental group and joining an environmental group, compared to those of students from cohort 2014/5. Another finding from the descriptive analysis of this study was that, for students from both cohorts, more students believed that their knowledge increased because of Liberal Studies Programme than those who believed that their environmental behaviour was changed because of Liberal Studies Programme.

The results of this study indicated that, from students' perceptions, Liberal Studies Programme affects their environmental knowledge and behaviour. The percentage of the students who believed that Liberal Studies Programme affected their environmental knowledge and

behaviour increased from cohort 2013/4 to 2014/5; however, compared to cohort 2013/4 students, fewer cohort 2014/5 students perceived that other influences increased their understanding of environmental issues. Although a larger number of cohort 2014/5 students who participated in environmental group activities held that they decided to participate in these activities because of the Liberal Studies Programme than cohort 2013/4 students, fewer students from cohort 2014/5 participated in the environmental group activities than those from cohort 2013/4. This indicated that Liberal Studies Programme might not be a significant factor in determining environmental behaviour. The results of this study are in line with those of studies conducted in Western countries. Environmental knowledge and behaviour might be affected through environmental education (Levy & Marans, 2012). Nonetheless, students' behaviour might be constrained by other factors (Breunig et al., 2014; Gottlieb et al., 2013).

One limitation of this study is that the effects of environmental education on their environmental knowledge and behaviour were measured using a self-reported questionnaire. Experimental studies can be conducted regarding the effects of environmental education on students' environmental knowledge and behaviour, in which measures reflecting students' environmental knowledge and behaviour can be used to assess their environmental knowledge and behaviour directly.

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