

# TEACHING PRACTICES: A CLUSTER ANALYSIS OF STUDENTS IN HONG KONG

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## ABSTRACT

*This paper continues to report the findings in the survey study of Hong Kong university student expectations of classroom teaching practices in developing and presenting course information. 622 usable questionnaires were analyzed through Cluster Analysis in addition to Principal Component extraction method and Varimax rotation method. Three Clusters are identified within the respondents in the study and subsequently named as Traditional Teaching Group, Student Activity Group, and All Low Group. These three groups were to be used in examining Hong Kong Students' characteristics such as age group, year of study etc.*

*Keywords: multimedia, student expectation, classroom teaching practices*

## INTRODUCTION

As students are getting exposed to the use of multimedia, their expectations of classroom teaching practices will tend to vary. Snyder and Vaughan (1998) in their previous study on student expectations on multimedia indicated that students that had used multimedia before would prefer to have such included in their ideals of the optimal classroom teaching practices.

As discussed by other researchers (Kuehn, 1994, Ramarapu, Cites & Overby, 1996, Snyder & Vaughan 1998), programs based on computer-assisted instruction and multimedia are popular in education. The importance of multimedia is used in information presentation and the coordination of all these audio-visual technologies combined to apply in the medium of multimedia (Bruder, 1991, Synder, 1996, Snyder & Vaughan, 1996, Snyder & Vaughan, 1998). In a current Hong Kong study by Chang, et al (2004), three major independent factors - information technology; student activity/work; and traditional teaching factor were identified as principal dimensions of teaching methods perceived by Hong Kong students. Following this lead, the authors wish to use the

same data to examine if there are actually different clusters of students existed and can be identified using cluster analysis.

## DATA COLLECTION

The authors used a modified survey questionnaire in Multimedia and Student Expectations by Snyder and Vaughan (1998) and Chang et al (2004) to conduct with undergraduate degree and postgraduate students who enrolled in two faculties in The Hong Kong Polytechnic University. A total of 722 questionnaires were administered to these students studying in the two faculties. Of the responses received, 662 usable questionnaires were analyzed. 440 students were recorded from the Faculty of Applied Science & Textiles and 222 from the Faculty of Business and Information System.

The survey questionnaire consists of 36 questions on the subject of current classroom teaching practice and student ideal classroom teaching practice as well as 6 demographic and general questions. Each question was to be answered with a five-point Likert scale - (5) Extensively, (4) Periodically, (3) Occasionally, (2) Rarely, and (1) None at all. Please see the survey questionnaire in the appendix.

## RESULTS & DISCUSSION

In previous study on student expectations on classroom teaching practices in developing and presenting course information in Hong Kong by Chang, Choi, Moon, Chan and Chan (2004), three independent factors were extracted from the different variables of teaching methods, namely *information technology*; *student activity/work*; and *traditional teaching factor* using the Principal Component extraction method and Varimax rotation method. These three factors represent the principle dimensions of teaching method in Hong Kong. Table 1 shows the result.

The factors extracted from the variables of *current teaching practices* were used to classify the students into groups with similar characteristics in their preferences of

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teaching methods.

The sample here consists of a mix of respondents with different preferences for teaching practices from their lecturers. The authors wish to cluster individuals by their preferences for each of the different teaching practices. Three clusters were identified and Table 2 shows the cluster centres in factor score unit. A high score of 1.01280 was recorded in Traditional Teaching Factor in Cluster 1 as well as 0.81561 in Student Activity Factor in Cluster 2 while there were low scores existed in all three factors in Cluster 3.

Clusters 1, 2, and 3 are named as *Traditional Teaching Group*, *Student Activity Group* and *All Low*

*Group* respectively. Using the factors extracted from the *ideal teaching variables* as classifying variables, the authors categorized the students into three clusters. In cluster 1, the score was also high in Traditional Teaching Factor (1.15626) as it was in current teaching practices. In cluster 2, the score here was high in Information Technology Factor (0.70513) instead of in Student Activity Factor (0.81561). This is somewhat different from the responses from the current teaching practice. This reflects that students would prefer to have Information Technology in their ideal teaching practice. Cluster 3 had all low scores in all three factors and indeed was an All Low Group.

**Table 1: Result of Student Survey Data - Factor Analysis**

**Table 1a: Current Classroom Teaching Practice**

	Rotated Component Matrix <sup>a</sup>		
	Component		
	1	2	3
c Lecture			.672
c Written handouts			.639
c Class discussion		.699	
c In-class exercises		.665	
c Outside classrm assign		.666	
c Group activities in class		.742	
c Student presentations		.684	
c Overhd proj and transp			.674
c Videos	.572		
c Computer presn software	.590		.457
c Electronic-mail	.720		
c Computer projects	.768		
c Computer simulations	.781		
c Computer act in class	.770		
c Internet Resources	.793		
c World Wide Web	.803		
c Teleconferencing	.756		
c Distance Learning	.629		

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

**Table 1b: Ideal Classroom Teaching Practice**

	Rotated Component Matrix		
	Component		
	1	2	3
i Lecture			.760
i Written handouts			.728
i Class discussion		.780	
i In-class exercises		.761	
i Outside classrm assign		.708	
i Group activities in class		.788	
i Student presentation		.678	
i Overhead proj and transp			.664
i Videos	.522		
i Computer presn software	.662		
i Electronic-mail	.769		
i Computer projects	.797		
i Computer simulations	.796		
i Computer act in class	.806		
i Internet Resources	.793		
i World Wide Web	.804		
i Teleconferencing	.749		
i Distance Learning	.633		

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

**Table 2 Final Cluster Centers**

	Cluster		
	1	2	3
c IT factor	.39913	.38996	-.74198
c Class act factor	-.26910	.81561	-.59640
c Trad teaching factor	1.01280	-.45950	-.40941

**Table 3 Final Cluster Centers**

	Cluster		
	1	2	3
i IT factor	.03378	.70513	-.94348
i Class act factor	.00940	.32324	-.42661
i Trad teaching factor	1.15625	-.54390	-.41715

**Number of Cases in each Cluster**

Cluster	1	206
	2	242
	3	238
Valid		686
Missing		36

**Number of Cases in each Cluster**

Cluster	1	209
	2	279
	3	216
Valid		704
Missing		18

After the classification of students using the factor scores of the three dimensions of the teaching methods, each of the students was assigned a membership number. Further study of the characteristics of the students in each of the three groups - *Traditional Teaching Group*, *Student Activity Group* and *All Low Group* were carried out to examine whether the members from a particular group are from certain class size, age group, and year of study using contingency table with Chi-square test.

In table 4, the Chi-square tests for independence between Class Size and Cluster Membership of *current* and *ideal teaching practices* are both significant at 0.001 level. In large and very large classes, the proportion of All Low Group members was far more than expected (as calculated with the assumption of no association between

Class Size and different groups). This reflects that students in large classes did not feel the effect (or actually not satisfied with) of all the teaching techniques used by their lecturers in presenting course information (Teaching techniques listed in appendix).

As for the students in the medium large classes, they seemed to appreciate the Information Technology Teaching methods in the current teaching practice and regarded Information Technology Teaching methods should be in the ideal teaching practices by their lectures as well. A larger proportional of students than expected in the small to medium size class actually preferred traditional teaching methods both in the current and ideal teaching practices (Please see table 5).

Table 4

c Cluster member \* Class Size Crosstabulation

			Class Size					Total
			small (<20)	medium (20-40)	med big (41-60)	big (61-100)	very big (>100)	
c Cluster member	Trad teach then IT gp	Count	27	50	50	39	40	206
		Exp Count	18.6	48.6	56.8	44.4	37.5	206.0
	Class act then IT gp	Count	21	54	86	52	29	242
		Exp Count	21.9	57.1	66.7	52.2	44.1	242.0
	All low gp	Count	14	58	53	57	56	238
		Exp Count	21.5	56.2	65.6	51.3	43.4	238.0
	Total	Count	62	162	189	148	125	686
		Exp Count	62.0	162.0	189.0	148.0	125.0	686.0

#### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	26.470 <sup>a</sup>	8	.001
N of Valid Cases	679		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.42.

Table 5

i Cluster member \* Class Size Crosstabulation

			Class Size					Total
			small (<20)	medium (20-40)	med big (41-60)	big (61-100)	very big (>100)	
i Cluster member	Trad teach gp	Count	18	61	48	41	41	209
		Exp Count	18.1	52.0	55.5	45.7	37.7	209.0
	IT then class act gp	Count	27	65	94	63	30	279
		Exp Count	24.2	69.4	74.1	61.0	50.3	279.0
	All low gp	Count	16	49	45	50	56	216
		Exp Count	18.7	53.7	57.4	47.3	39.0	216.0
	Total	Count	61	175	187	154	127	704
		Exp Count	61.0	175.0	187.0	154.0	127.0	704.0

#### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	28.667 <sup>a</sup>	8	.000
N of Valid Cases	704		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.11.

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In table 6 and table 7, the Chi-square tests for independence between Student Age and Cluster Membership of current and ideal teaching practices are both significant at 0.001 level. Younger students tend to be members of the All Low group. It seems that some of them may just come out from high school and still have problems in adjusting and adapting themselves to the

university setting. On the other hand, a larger proportion of older students preferred more class activities for them to interact and to share views and opinions among themselves. As for another group of students whose age are in the middle actually would prefer more on the traditional teaching practices.

Table 6  
**c Cluster member \* Age: Crosstabulation**

			Age:				Total
			18 - 20 years old	21 - 23 years old	24 - 29 years	30 years and older	
c Cluster member	Trad teach then IT g	Count	66	116	13	10	205
		Exp Count	65.5	109.6	20.8	9.1	205.0
	Class act then IT gp	Count	57	130	36	15	238
		Exp Count	76.1	127.2	24.2	10.5	238.0
	All low gp	Count	94	117	20	5	236
		Exp Count	75.4	126.2	24.0	10.4	236.0
	Total	Count	217	363	69	30	679
		Exp Count	217.0	363.0	69.0	30.0	679.0

### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.669 <sup>a</sup>	6	.000
N of Valid Cases	679		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.06.

Table 7  
**i Cluster member \* Age: Crosstabulation**

			Age:				Total
			18 - 20 years old	21 - 23 years old	24 - 29 years	30 years and older	
i Cluster member	Trad teach gp	Count	63	123	16	6	208
		Exp Count	66.5	110.9	21.8	8.9	208.0
	IT then class act gp	Count	72	147	37	20	276
		Exp Count	88.2	147.1	28.9	11.9	276.0
	All low gp	Count	88	102	20	4	214
		Exp Count	68.4	114.1	22.4	9.2	214.0
Total	Count	223	372	73	30	698	
	Exp Count	223.0	372.0	73.0	30.0	698.0	

### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.942 <sup>a</sup>	6	.000
N of Valid Cases	698		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.94.

## CONCLUSION

The study reported here is a continuation to examine Hong Kong student expectations of classroom teaching practices in developing and presenting course information and knowledge in Hong Kong. The authors used Cluster Analysis in addition to previous Principal Component extraction method and Varimax rotation method to analyze the collected data base. Three Clusters 1, 2, and 3 are identified within the respondents in the study and named as *Traditional Teaching Group*, *Student Activity Group*, and *All Low Group* respectively.

Further study of the characteristics of the students in each of the three groups - *Traditional Teaching Group*, *Student Activity Group* and *All Low Group* were carried out related to other factors such as class size, age group, and year of study based on contingency table with Chi-square test.

As a matter of fact, the continuation of this preliminary study is to explore more in depth on the issues of how all these new technology combined in multimedia could benefit the teaching and learning in the classroom setting as Townsend & Townsend opted for certain benefits of using multimedia in teaching in 1992.

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## Appendix One – Survey Questionnaire

*The questions 1 to 18 for current classroom teaching practice and questions 19 to 36 for ideal classroom teaching practice.*

	Extensively (Almost Daily)	Periodically (Once/Mk)	Occasionally (6-7 times/yr)	Rarely (1-2 times/yr)	None at all
I anticipate professors/lecturers in our university will use the following techniques to present course information:					
1. Lecture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Written handouts or outlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Class discussion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. In-class exercises	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Outside classroom assignments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Group activities in class	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Student presentations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Overhead projector and transparencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Videos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Computer presentation software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Electronic-mail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Computer projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Computer simulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Computer activities in class	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Internet Resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. World Wide Web	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Teleconferencing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Distance Learning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Extensively (Almost Daily)  
Periodically (Once/wk)  
Occasionally (6-7 times/qr)  
Rarely (1-2 times/qr)  
None at all

In my ideal classroom, professors/lecturers would use the following techniques to present course information:

19. Lecture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Written handouts or outlines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Class discussion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. In-class exercises	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Outside classroom assignments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Group activities in class	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Student presentations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Overhead projector and transparencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Videos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Computer presentation software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Electronic-mail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Computer projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Computer simulations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Computer activities in class	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Internet Resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. World Wide Web	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Teleconferencing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Distance Learning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

37. During the last calendar year, I used a computer an average of
- |   |  |
|---|--|
| <input type="checkbox"/> 3 hours or less per week | <input type="checkbox"/> 6 to 10 hours per week    |
| <input type="checkbox"/> 4 to 6 hours per week    | <input type="checkbox"/> more than 10 hrs per week |
38. Do you have a computer at home?
- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|
39. Gender:
- |                               |                                 |
|-------------------------------|---------------------------------|
| <input type="checkbox"/> Male | <input type="checkbox"/> Female |
|-------------------------------|---------------------------------|
40. Age:
- |   |  |   |
|---|--|---|
| <input type="checkbox"/> 17 years old and younger | <input type="checkbox"/> 21 - 23 years old | <input type="checkbox"/> 30 years old and older |
| <input type="checkbox"/> 18 - 20 years old        | <input type="checkbox"/> 24 - 29 years     |   |
41. Faculties:
- |  |  |
|--|--|
| <input type="checkbox"/> Faculty of Communication              | <input type="checkbox"/> Faculty of Construction & Land User       |
| <input type="checkbox"/> Faculty of Applied Science & Textiles | <input type="checkbox"/> Faculty of Business & Information Systems |
| <input type="checkbox"/> Faculty of Engineering                |  |
42. Classification:
- |                                 |                                       |
|---------------------------------|---------------------------------------|
| <input type="checkbox"/> Year 1 | <input type="checkbox"/> Year 3       |
| <input type="checkbox"/> Year 2 | <input type="checkbox"/> Postgraduate |

Thank you