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經濟合作與發展組織

The Third HKPISA Report

PISA 2006 Executive Summary

From PISA 2000

To PISA 2006

MONITORING THE QUALITY AND EQUALITY OF EDUCATION IN HONG KONG FROM AN INTERNATIONAL PERSPECTIVE

從國際視野鑑察香港教育的質素與均等

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OVERVIEW OF PISA

1. The Programme for International Student Assessment (PISA) is a project initiated and coordinated by the Organisation for Economic Co-operation and Development (OECD). The primary goal of this international study is to assess how well youths at age 15, near the completion of compulsory education, have acquired the knowledge and skills essential for meeting the challenges of our society. It then develops educational indicators to help governmental bodies and policy makers examine, evaluate, and monitor the effectiveness of the educational system at both national and school levels.

2. The PISA assessment takes place every three years starting from 2000, covering the three domains of scientific, reading, and mathematical literacy. PISA 2006 is the third cycle of this assessment, with a major focus on scientific literacy.

3. In PISA 2006, about 400,000 students from over 14,000 schools in 57 countries/regions took part in a two-hour test.

Table 1 Participating countries/regions in PISA 2006

OECD Countries			**Partner Countries (Non-OECD Countries / Regions)**		
Australia	Hungary	Norway	Argentina	Indonesia	Romania
Austria	Iceland	Poland	Azerbaijan	Israel	Russian Federation
Belgium	Ireland	Portugal	Brazil	Jordan	Serbia
Canada	Italy	Slovak Republic	Bulgaria	Kyrgyzstan	Slovenia
Czech Republic	Japan	Spain	Chile	Latvia	Thailand
Denmark	Korea	Sweden	Chinese Taipei	Liechtenstein	Tunisia
Finland	Luxembourg	Switzerland	Colombia	Lithuania	Uruguay
France	Mexico	Turkey	Croatia	Macao-China	
Germany	Netherlands	United Kingdom	Estonia	Montenegro	
Greece	New Zealand	United States	Hong Kong-China	Qatar	

4. PISA has developed a framework describing the scope and dimensions of the assessment in each of the three domains of literacy. Each domain has three dimensions: the *knowledge* that students should acquire; the *processes* that need to be performed; and the *situation* in which knowledge and skills are applied or drawn. In addition to the assessment of the three domains, PISA 2006 requires students and school principals to complete background questionnaires. In Hong Kong, PISA also complemented the perspectives of students and school principals by including an additional parent questionnaire. These data provide an outlook on parental involvement in children's education, as well as students' cognitive and non-cognitive performances.

MAIN STUDY OF PISA 2006

5. The main study of PISA 2006 in Hong Kong was conducted from May to July 2006. A two-stage stratified sampling design was used. In the first stage, schools were stratified based on the type of school (government, aided and independent – international and DSS) and student academic intake[1] (high, medium and low ability). Schools from each stratum were systematically sampled with probabilities proportional to their enrollment size. The resulting school participation rate was 93.6% which met the OECD standard. The distribution of schools is shown in Table 2.

Table 2 Number of participating schools in PISA 2006 Main Study in Hong Kong

Type of School	Student Academic Intake	Total Number of Schools	Number of Schools Participated
Government	High Ability	17	6
	Medium Ability	7	2
	Low Ability	10	3
	N/A	2	0
Aided	High Ability	128	46
	Medium Ability	125	46
	Low Ability	126	35
	N/A	1	0
Independent#	Local/DSS*	43	7
	International	27	1
Total		**486**	**146**

#There is no student intake information for independent schools.

*DSS refers to schools under the Direct Subsidy Scheme.

6. In the second stage, 35 students of age 15 were randomly selected from each sampled school. A total of 4,645 students from 146 schools were accepted for final analysis according to OECD sampling standard. The sample, covering 5.7% of the 15-year-old student population, represents the target population well. Table 3 shows the grade distribution of the sampled students in Hong Kong.

Table 3 Distribution of participating students of PISA 2006 Main Study in Hong Kong

	Number of Participating Students	Proportion (%)
Grade/Form		
7/S1	107	2.3
8/S2	421	9.1
9/S3	1134	24.4
10/S4	2978	64.1
11/S5	5	0.1
Total	**4645**	**100**

[1] Academic intake denotes the ability of admitted Secondary 1 students.

MAJOR FINDINGS

Quality and Equality

7. The findings derived from PISA 2006 sheds light on both the ***quality*** and ***equality*** of Hong Kong's educational system. Quality refers to the effectiveness of the educational system in fostering students' literacy skills. Equality refers to the benefit from education received by all students regardless of their socioeconomic background.

8. In terms of overall quality, Hong Kong students performed well in the three assessment domains. From PISA 2000+[2], PISA 2003 to PISA 2006, Hong Kong continues to rank among the top 10 in the three literacy domains. In PISA 2006, Hong Kong ranked second in Science, third in Mathematics, and also third in Reading. Hong Kong's mean performance was significantly above the OECD average.[3] Taking statistical significance into account, Hong Kong's science score of 542 is lower than Finland, but higher than all other participating countries/regions. In Mathematics, Hong Kong's score of 547 remained in the top rank as in the previous cycles with the score not differing significantly from Korea, Finland, and Chinese Taipei. In reading, Hong Kong's score of 536 is significantly lower than Finland and Korean, but significantly higher than all other participating countries/ regions (see Appendix I).

9. As far as equality in the education system of Hong Kong is concerned, in PISA 2006, the disparities between high (95th percentile) and low (5th percentile) achievers in the science and reading domains are relatively small (i.e. smaller than the OECD averages). Whereas, the disparity between high and low achievers in mathematics is slightly greater than the OECD average. It suggests that most Hong Kong students have similar access to schooling and they can benefit from education in Hong Kong. Furthermore, economic, social and cultural background has only a relatively small impact on the literacy performance of Hong Kong students. The impact of socio-economic background on academic performance is expressed as "socio-economic gradient" in PISA[4]. The slope of the gradient line is an indication of the extent of inequality in student performance attributable to socio-economic background. The modest slope of Hong Kong suggests that Hong Kong students perform equally well regardless of their socio-economic background. With similar socio-economic background, Hong Kong's 15-year-olds also scored higher than students of many other countries/regions (illustration in Appendix II). One reason could be that Hong Kong educators and parents are doing well in helping the disadvantaged students.

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[2] The first cycle of PISA, PISA 2000, was conducted in 2000. 32 countries/regions participated. Hong Kong and 10 other countries/regions joined in PISA 2000+ which was conducted in February 2002.

[3] In PISA 2006, the OECD average is 500 in science, 498 in mathematics, and 492 in reading, with standard deviation of 100.

[4] Steeper gradients indicate a greater impact of socio-economic background on student performance, which suggests more inequality.

10. Results from PISA 2006 suggest that there is vast variation in terms of academic performance among secondary schools in Hong Kong. This between-school variation is significantly related to the difference in academic intake and social segregation among schools. Despite this segregation, on average, Hong Kong's low achievers performed better in all three domains when compared to the OECD countries. It can be posited tentatively that schools and teachers in Hong Kong are catering effectively for the learning needs of low achievers.

Student Achievement in Scientific Literacy

11. Hong Kong students continue to rank among the top in science across the three PISA cycles. In PISA 2006, Hong Kong students obtained a combined scientific literacy score of 542, while their scores on scientific competencies are 528 in identifying scientific issues, 549 in explaining phenomena scientifically, and 542 in using scientific evidence. These scores are much higher than the corresponding OECD averages of 499, 500, and 499.

12. Moreover, both low and high achievers in Hong Kong perform better than their international counterparts. There are altogether 15.9% of our students achieving high proficiency levels of Level 5 and Level 6. Hong Kong is one of the few regions with the highest proportions of top scientifically literate students.

13. Gender difference in the overall scientific literacy score is not statistically significant; however, girls and boys show differential performance in various competencies in the scientific literacy framework. Boys perform better than girls in *explaining phenomena scientifically* and *using scientific evidence*, but less well in *identifying scientific issues*.

14. In PISA 2006, students' self-related cognition in science, value of science, and engagement in environmental issues were assessed to provide a better understanding of how various students' affective outcomes relate to their science performance. Self-related cognition includes four indices: self-efficacy, self-concept, enjoyment in science, and instrumental motivation. Students who reported higher levels of these self-related cognition indices were found to perform better in science. On the other hand, students' value of science and engagement in environmental issues also include four indices: general value, personal value, environmental awareness and responsibility. Students who scored higher levels on these indices were also found to perform better in science.

Student Achievement in Reading Literacy

15. Hong Kong students achieve a mean score of 536 in reading literacy in PISA 2006, which is significantly higher than the scores in PISA 2003 (510) and PISA 2000+ (525), and ranks 3rd among the 57 participating countries/regions in PISA 2006. The better reading performance in the current cycle can be explained by the raise in performance among students at all levels of proficiency, especially among the low achievers at the 5th percentile and high achievers at the 95th percentile.

Student Achievement in Mathematical Literacy

16. In mathematical literacy, Hong Kong continues to rank top in all three cycles of PISA with mean scores of 547, 550 and 560 in the 2006, 2003 and 2000+ assessments respectively. There is no significant difference in scores between the 2006 and 2003 assessments. It should be noted that the mean scores respectively in 2003 and 2006 cannot be fairly compared with that of 2000+ assessment since the full mathematical literacy assessment framework (and thus the full coverage of test items) was only constructed in PISA 2003.

17. Regarding gender difference among Hong Kong students, boys perform significantly better than girls. The 16-point gender gap is higher than the OECD average gender gap (11 points). The gender gap in mathematical literacy has increased substantially from the 4-point gap in PISA 2003, but it is comparable to the 18-point gap in PISA 2000+.

Parental Involvement, Investment and Perception

18. Parents' involvement in their children's education is important to student achievement. Hong Kong explored the influence of four types of parental involvement on students' science performance in PISA 2006. Consistent with the findings of the previous two cycles, home-based involvement (namely, cultural, social, and educational communication) appears to be more commonly practiced than school-based involvement (namely, communication with school, and participation in school) among the 15-year-olds' parents. Students who have higher levels of social and educational communication at home performed better in reading but neither in science nor mathematics. However, communications with school and participation in school both have significant negative association with performance in science, mathematics, and reading.

19. As for parental investment, Hong Kong appears to be under-invested in cultural and material resources compared with the OECD countries, but the investment of educational resources is comparable to the OECD average. Cultural and educational resources were found to have significant effect on reading and science performance.

20. In PISA 2006, two new indices of parental perception were constructed: parental perception of school quality and parental enrichment of student activities. In general, Hong Kong parents' evaluation of schools is lower than the OECD average. However, their perception of arranging science activities when their children were at 10 year old is slightly higher than the OECD average. Both of the factors show strong positive association with student's performance. Parents who reported higher level of school quality tend to have children who perform better in science, mathematics, and reading. Students whose parents arranged more early enrichment activities also performed much better in all literacy domains.

IMPLICATIONS AND RECOMMENDATIONS

For Policy Makers

21. Overall, Hong Kong students consistently perform quite well in all three domains of literacy. It can be posited tentatively that our educational system is effective in developing students' literacy without sacrificing equality. All students, regardless of their socio-economic background, can benefit from our educational system. However, the academic segregation among schools in Hong Kong remains high. Such segregation might have negative effect on students' self-concept. This is particularly unfavorable to the nurturing of positive attitude toward life-long learning among young people. To alleviate the problem, related policies including the *Secondary School Places Allocation System* and the *Medium of Instruction Grouping* should be reviewed with the goal to reduce academic segregation among schools.

22. It is worth capitalizing on parental practices that have positive influence on student learning. Although the analysis of PISA 2006 is centered on scientific literacy, the positive relationship can be translated to other literacy domains. The government should further and sustain support for parent education especially at children's early age, and schools should provide more opportunity for parents to participate in Parent Teacher Association and volunteering. The home and the school should collaborate more comprehensively especially at the secondary school level.

23. The impressive improvement of Hong Kong students in their reading performance is indisputable. However, the considerable gender difference with boys performing at the inferior end is persistent and alarming. Therefore, helping boys to do better in reading and to enjoy the process of reading should be on the next agenda for further improvement in reading literacy.

For Educators & Parents

24. The survey on student engagement in science indicates that a wide array of students' non-cognitive factors, such as value, interest, self-efficacy and self-confidence, awareness of environmental issues, and responsibility to sustainable development, are positively associated with science performance. We contend that the cognitive and the affective domains are inter-related and interacting with each other; both are important elements in nurturing scientifically literate citizens.

25. Traditionally, the science taught in school tends to focus on developing children's cognitive abilities and treats affective development as secondary, if not irrelevant. The current science curriculum has moved in the right direction by putting greater emphasis on societal and personal issues, as well as individual responsibility. However, the nurture of affective abilities is most effective through experiential learning or action in a real life context. Therefore, we recommend science educators and curriculum specialists to work towards a more action-oriented science curriculum, i.e. promoting active engagement in real life context as an essential component of students' learning experience. This action-oriented learning experience will be in line with the four key tasks[5] in our curriculum framework, in particular, *moral and civic education*, and *project learning*.

26. Regardless of parents' socio-economic status, the findings supported that parental involvement in children's education are promising venues to enhance students' academic success. Parents can support their children's learning by discussing with them about schoolwork and school life or spending time chatting with them. Parents can also arrange activities related to their school subjects when their children are at a young age. Home-school communication and school participation turned out to be negatively associated with student performance. Limited resources in terms of time, expertise, appropriate attitude and value might urge schools to limit their contact with parents only when dictated by a critical condition. This result has stigmatized an otherwise positive action in helping the student. That some schools initiated "sunshine calls" to parents is an example of effort to restore the proper role of home-school communication, which should facilitate partnership rather than confrontation. This partnership will lead to more thorough understanding of the children, which is essential for providing the latter with appropriate guidance and support.

27. Professional associations of teachers, governmental bodies, and HKPISA Centre should seek more collaboration to harvest the PISA research products for improving curriculum and instruction.

[5] Four key tasks: Moral and Civic Education, Project Learning, Reading to Learn, and Information Technology for Interactive Learning

For Future Research

28. Hong Kong students had made impressive improvement in the performance of reading. How this advancement comes about in recent years is worth investigating. The findings will be a valuable reference for future efforts targeting sustainable improvement in student learning.

29. Findings concerning the negative associations of home-school communication and school participation with student outcomes are similar to those of PISA 2003, suggesting that the undesirable condition persisted. Further research is needed to transform the nature of home-school interaction and parental participation. Also, the likely positive impact of parents' school-based involvement on the learning of low achievers over time can also be investigated through longitudinal studies.

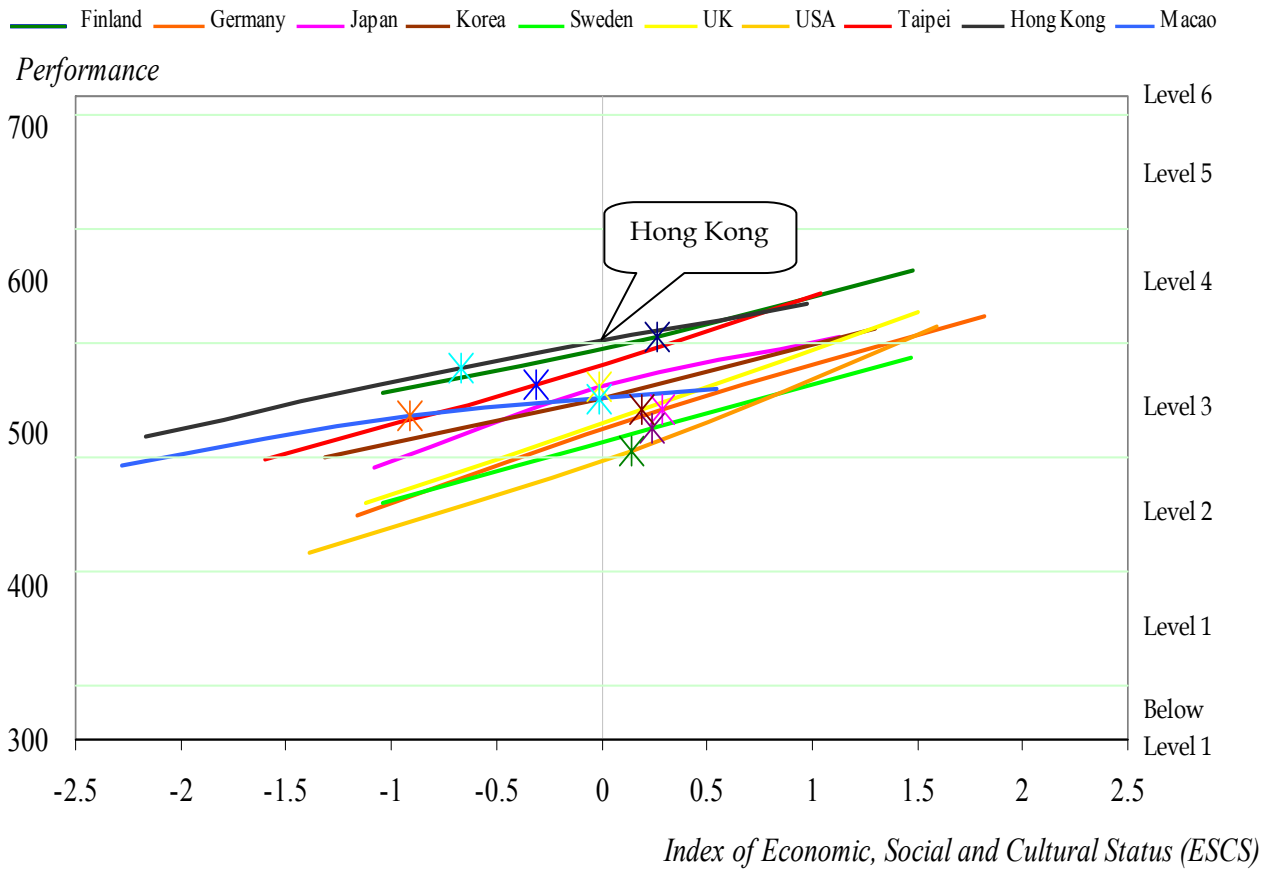
30. PISA 2006 also provides useful information about the relationship between students' immigration status and academic performance, supplementary tutoring in-school and out-of-school; gender differences in cognitive and affective outcomes; educational decentralization and shared decision making; teaching and learning strategies in science and so on. All these themes are worthy of further investigation, and the relative contribution of different individual, familial and school factors could be explored in future thematic reports.

Appendix I Performance of 15-year-old students in scientific, reading, and mathematical literacy in PISA 2006

Science			Reading			Mathematics		
	Mean	S.E.		Mean	S.E.		Mean	S.E.
Finland	563	(2.0)	Korea	556	(3.8)	Chinese Taipei	549	(4.1)
Hong Kong-China	**542**	**(2.5)**	Finland	547	(2.1)	Finland	548	(2.3)
Canada	534	(2.0)	**Hong Kong-China**	**536**	**(2.4)**	**Hong Kong-China**	**547**	**(2.7)**
Chinese Taipei	532	(3.6)	Canada	527	(2.4)	Korea	547	(3.8)
Estonia	531	(2.5)	New Zealand	521	(3.0)	Netherlands	531	(2.6)
Japan	531	(3.4)	Ireland	517	(3.5)	Switzerland	530	(3.2)
New Zealand	530	(2.7)	Australia	513	(2.1)	Canada	527	(2.0)
Australia	527	(2.3)	Liechtenstein	510	(3.9)	Macao-China	525	(1.3)
Netherlands	525	(2.7)	Poland	508	(2.8)	Liechtenstein	525	(4.2)
Liechtenstein	522	(4.1)	Sweden	507	(3.4)	Japan	523	(3.3)
Korea	522	(3.4)	Netherlands	507	(2.9)	New Zealand	522	(2.4)
Slovenia	519	(1.1)	Belgium	501	(3.0)	Belgium	520	(3.0)
Germany	516	(3.8)	Estonia	501	(2.9)	Australia	520	(2.2)
United Kingdom	515	(2.3)	Switzerland	499	(3.1)	Estonia	515	(2.7)
Czech Republic	513	(3.5)	Japan	498	(3.6)	Denmark	513	(2.6)
Switzerland	512	(3.2)	Chinese Taipei	496	(3.4)	Czech Republic	510	(3.6)
Macao-China	511	(1.1)	United Kingdom	495	(2.3)	Iceland	506	(1.8)
Austria	511	(3.9)	Germany	495	(4.4)	Austria	505	(3.7)
Belgium	510	(2.5)	Denmark	494	(3.2)	Slovenia	504	(1.0)
Ireland	508	(3.2)	Slovenia	494	(1.0)	Germany	504	(3.9)
Hungary	504	(2.7)	Macao-China	492	(1.1)	Sweden	502	(2.4)
Sweden	503	(2.4)	*OECD average*	492	(0.6)	Ireland	501	(2.8)
OECD average	500	(0.5)	Austria	490	(4.1)	*OECD average*	498	(0.5)
Poland	498	(2.3)	France	488	(4.1)	France	496	(3.2)
Denmark	496	(3.1)	Iceland	484	(1.9)	United Kingdom	495	(2.1)
France	495	(3.4)	Norway	484	(3.2)	Poland	495	(2.4)
Croatia	493	(2.4)	Czech Republic	483	(4.2)	Slovak Republic	492	(2.8)
Iceland	491	(1.6)	Hungary	482	(3.3)	Hungary	491	(2.9)
Latvia	490	(3.0)	Latvia	479	(3.7)	Luxembourg	490	(1.1)
United States	489	(4.2)	Luxembourg	479	(1.3)	Norway	490	(2.6)
Slovak Republic	488	(2.6)	Croatia	477	(2.8)	Lithuania	486	(2.9)
Spain	488	(2.6)	Portugal	472	(3.6)	Latvia	486	(3.0)
Lithuania	488	(2.8)	Lithuania	470	(3.0)	Spain	480	(2.3)
Norway	487	(3.1)	Italy	469	(2.4)	Azerbaijan	476	(2.3)
Luxembourg	486	(1.1)	Slovak Republic	466	(3.1)	Russian Federation	476	(3.9)
Russian Federation	479	(3.7)	Spain	461	(2.2)	United States	474	(4.0)
Italy	475	(2.0)	Greece	460	(4.0)	Croatia	467	(2.4)
Portugal	474	(3.0)	Turkey	447	(4.2)	Portugal	466	(3.1)
Greece	473	(3.2)	Chile	442	(5.0)	Italy	462	(2.3)
Israel	454	(3.7)	Russian Federation	440	(4.3)	Greece	459	(3.0)
Chile	438	(4.3)	Israel	439	(4.6)	Israel	442	(4.3)
Serbia	436	(3.0)	Thailand	417	(2.6)	Serbia	435	(3.5)
Bulgaria	434	(6.1)	Uruguay	413	(3.4)	Uruguay	427	(2.6)
Uruguay	428	(2.7)	Mexico	410	(3.1)	Turkey	424	(4.9)
Turkey	424	(3.8)	Bulgaria	402	(6.9)	Thailand	417	(2.3)
Jordan	422	(2.8)	Serbia	401	(3.5)	Romania	415	(4.2)
Thailand	421	(2.1)	Jordan	401	(3.3)	Bulgaria	413	(6.1)
Romania	418	(4.2)	Romania	396	(4.7)	Chile	411	(4.6)
Montenegro	412	(1.1)	Indonesia	393	(5.9)	Mexico	406	(2.9)
Mexico	410	(2.7)	Brazil	393	(3.7)	Montenegro	399	(1.4)
Indonesia	393	(5.7)	Montenegro	392	(1.2)	Indonesia	391	(5.6)
Argentina	391	(6.1)	Colombia	385	(5.1)	Jordan	384	(3.3)
Brazil	390	(2.8)	Tunisia	380	(4.0)	Argentina	381	(6.2)
Colombia	388	(3.4)	Argentina	374	(7.2)	Colombia	370	(3.8)
Tunisia	386	(3.0)	Azerbaijan	353	(3.1)	Brazil	370	(2.9)
Azerbaijan	382	(2.8)	Qatar	312	(1.2)	Tunisia	365	(4.0)
Qatar	349	(0.9)	Kyrgyzstan	285	(3.5)	Qatar	318	(1.0)
Kyrgyzstan	322	(2.9)	United States	m	m	Kyrgyzstan	311	(3.4)

Note: m represents missing data. Shaded area indicates scores significantly different from those of Hong Kong

Appendix II Relationship between student performance in science and ESCS in ten participating countries/regions



PISA 概述

1. 學生能力國際評估計劃(PISA)是由經濟合作與發展組織(OECD)發起及統籌的一項研究。這項國際研究的基本目的是評估接近完成普及教育的十五歲學童對應付社會挑戰所需的知識與技能有多掌握，從而建立一套教育指標，以協助政府有關部門及政策制訂者從本地與國際的層次去審視、評價和監察其教育系統的成效。

2. PISA 自 2000 年起每三年進行一次，評估涵蓋「科學」、「閱讀」和「數學」三方面的基礎能力。PISA 2006 是第三次評估週期，是次的重點評估範疇爲科學能力。

3. 在 PISA 2006，共有來自 57 個國家或地區中，超過 14,000 間學校的 400,000 多名學生參與歷時兩小時的測試。

表一　PISA 2006 的參與國家或地區

OECD 成員國家			夥伴國家／地區（非 OECD 成員國家／地區）		
澳洲	匈牙利	挪威	阿根廷	印度尼西亞	羅馬尼亞
奧地利	冰島	波蘭	阿塞拜疆	以色列	俄羅斯聯邦
比利時	愛爾蘭	葡萄牙	巴西	約旦	塞爾維亞共和國
加拿大	意大利	斯洛伐克共和國	保加利亞	吉爾吉斯共和國	斯洛文尼亞
捷克共和國	日本	西班牙	智利	拉脫維亞	泰國
丹麥	韓國	瑞典	中華台北	列支敦士登	突尼西亞
芬蘭	盧森堡	瑞士	哥倫比亞	立陶宛	烏拉圭
法國	墨西哥	土耳其	克羅地亞	中國澳門	
德國	荷蘭	英國	愛沙尼亞	黑山共和國	
希臘	新西蘭	美國	中國香港	卡塔爾	

4. PISA 構思了一個架構用以說明三個範疇的基礎能力中每項的範圍和維度，每個範疇有三個維度：學生須具備的知識；需要進行的「過程」；以及運用或取得知識與技能的「處境」。除了評估這三個範疇的基礎能力之外，PISA 2006 還要求學生和校長填寫問卷。而香港的 PISA 更以額外的家長問卷，收集有關的背景資料。這些背景資料有助了解家長對子女教育的參與、以及學生在認知與認知以外的表現。

PISA 2006 的正式測試

5. 在香港，PISA 2006 的正式測試於 2006 年 5 月至 7 月期間進行。這項研究採用二段分層抽樣，分別按學校類型（政府、資助和私立學校－包括國際學校和直資）和收生成績[1](高、中和低能力)把學校分組。在第一階段，以隨機抽樣的方式在每組抽取學校，抽中機率按學校的學生人數成正比例。得出的學校參與率爲 93.6%，達到 OECD 的標準。表二顯示學校在各組的分佈。

表二　香港參與 PISA 2006 正式測試的學校分佈

學校類型	收生成績	學校總數	參與學校數目
政府學校	高能力	17	6
	中能力	7	2
	低能力	10	3
	(不適用)	2	0
資助學校	高能力	128	46
	中能力	125	46
	低能力	126	35
	(不適用)	1	0
私立學校#	本地/直資	43	7
	國際學校	27	1
總數		486	146

私立學校沒有收生成績的資料。

6. 在第二階段，在參與的每所學校中以隨機方式選出 35 名十五歲學生。根據 OECD 的抽樣標準，共有來自 146 間中學的 4,645 名學生獲納入爲最後分析的樣本。這個樣本足以有效地代表目標學生人口。此樣本涵蓋十五歲學生人口的 5.7%，足以代表這目標人口。表三顯示樣本學生的年級分佈。

表三　香港參與 PISA 2006 的學生之年級分佈

年級	學生人數	百分比 (%)
中一	107	2.3
中二	421	9.1
中三	1134	24.4
中四	2978	64.1
中五	5	0.1
總數	**4645**	**100**

[1] 收生成績代表取錄的中一學生的成績。

重點研究發現

質素與均等

7. PISA 2006 的研究發現，在「質素」及「均等」兩方面給本港教育系統的成效帶來啓示。「質素」是指教育系統培育學生基礎能力的成效；「均等」是指系統能讓不同社經背景的學生均能從教育中獲益的情況。

8. 以整體質素來說，香港學生於三個評估範疇均表現良好。由 PISA 2000+[1]、 PISA 2003 至 PISA 2006，香港持續在三個範疇中排名首十名以內。在 PISA 2006，香港在科學排名第二、而在數學和閱讀均排名第三；香港的平均成績顯著地高於 OECD 的平均值[2]。若以統計學上的顯著度作準，香港在 2006 的科學分數的 542 分低於芬蘭，但比其他參與地都高；在數學方面，香港得 547 分，跟上兩屆般排名於榜首，與韓國、芬蘭和中華台北並無顯著的差距。在閱讀方面，只有芬蘭和韓國顯著地較香港表現出色，但香港的 536 分顯著地高於其餘的參與地（見附錄一）。

9. 就教育均等而言，在科學及閱讀範疇中的高分者(第 95 個百分位)和低分者(第 5 個百分位)之間的差距相對地較其他參與地的爲小(即較 OECD 的平均值爲小)。但是在數學範疇中高分者和低分者的差距則比 OECD 的平均值較大。這個結果意味著香港大部分學生都可以均等地從學校教育中獲益。此外，香港學生的社經背景(socio-economic status, SES)對他們的測試表現相對地只有較小的影響。在 PISA 的分析中，「社經坡度」(socio-economic gradient)是用來表達 SES 對學業成績的影響，顯示學生的表現有多大程度上可以歸因於 SES[3]。整體而言，香港適度的社經坡度意味著無論學生的社經背景如何，他們都能夠均等地表現出色，其中一個原因可能是香港的教育工作者和學生家長均能有效地協助弱勢社群學生。同時，香港十五歲學生的表現亦較其他相近社經背景的參與地爲佳（例子見附件二）。

10. PISA 2006 的研究結果顯示香港的中學之間出現明顯的成績差距，這差距與學校之間的收生成績差異和學校之間的社經地位差異有顯著關係。雖然如此，香港的低分者於三個評估範疇的表現仍較其他國家或地區的低分者爲佳，這暫可推論香港的學校和老師能夠有效地照顧到低分者的學習需要。

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[2] 第一屆的 PISA，PISA 2000，於 2000 年進行，共有 32 個國家/地區參加。香港和其他 10 個國家/地區參加了於 2002 年 2 月進行的 PISA 2000+。

[3] OECD 的科學平均值是 500，數學平均值是 498，閱讀平均值是 492，而標準差爲 100。

[4] 坡度愈大，顯示社經背景對學生表現有較大的影響，即代表較爲不平等。

科學能力的表現

11. 在科學能力方面，香港學生繼續於三屆評核中名列前茅。在 PISA 2006，香港學生於科學的綜合表現中得到 542 分，而在各科學過程中，即「識別科學議題」(identifying scientific issues)、「解釋科學現象」(explaining phenomena scientifically) 和「運用科學證據」 (using scientific evidence)，香港學生則分別得到 528 分、549 分和 542 分。這些得分亦高於 OECD 的平均值 (分別是 499、500 和 499)。

12. 並且，香港的高分者和低分者皆比其他參與地的高分者和低分者爲強。在香港，成績達第五級和第六級的高分者共有 15.9%，是其中一個有最多高水平科學素養學生的地區。

13. 就科學能力總分上的性別差異而言，男女生的一般表現並無顯著的差距，但於各科學能力分項的表現則有不同。男生於「解釋科學現象」和「運用科學證據」的表現均比女生的較好，女生於「識別科學議題」的表現則比男生的較優異。

14. PISA 2006 亦評估了學生在科學方面的自我認知、科學的價值觀和其對環境事務的接觸，以了解這些情意表現與其科學能力的關係。自我認知包括四個指標：自我效能感、自我觀、喜愛科學和工具性動機。於各自我認知指標顯示出較高水平的學生，傾向有較佳的科學表現。另外，科學的價值觀及對環境事務的接觸也包括四個指標：一般價值觀、個人價值觀、環境意識和環境保護的責任感。於這些指標表現較高水平的學生，也傾向有較佳的科學成績。

閱讀能力的表現

15. 閱讀能力方面，在 PISA 2006 香港學生得 536 分，表現顯著地較 PISA 2000+ (510 分) 和 PISA 2003 (525 分) 出色，在 57 個參與地中名列第三。是次較佳的表現，實由於屬不同能力層級的學生表現均有所提升，尤以第 5 百分位數的低分者及第 95 百分位數的高分者的改進幅度爲甚。

數學能力的表現

16. 在綜合數學能力方面，香港學生的表現於三屆 PISA 中持續名列前茅，他們分別在 2006、2003 和 2000+ 的評估中得到 547 分、550 分及 560 分。在 2006 與 2003 兩次評估中的得分並無顯著差別，而由於完整的數學能力的評估架構在 PISA 2003 年才建構完成，故 2006 和 2003 兩次評估的得分未能與 2000+的得分作公平的比較。

17. 在性別差異方面，男生的表現在統計學上顯著地比女生爲佳。是次的性別差異 (16 分) 高於 OECD 的平均值 (11 分)，性別差異由 PISA 2003 的 4 分明顯地增加了，而與 PISA 2000+ 的差異 (18 分) 相若。

家長參與、資源投放與觀感

18. 家長參與子女的教育對於子女的學業成就影響很大，香港在 PISA 2006 探討了四類家長參與與子女在科學能力表現之間的關係。與之前的兩屆 PISA 結果吻合，十五歲學童的家長較多進行家庭爲本的參與（包括文化的、社會的、和教育的溝通），而較少進行學校爲本的參與（包括與學校溝通、在學校的參與）。在家裡有較高程度社會的和教育的溝通的學生，閱讀能力較佳，但科學和數學方面卻無影響。可是，與學校溝通及在學校的參與均與閱讀、科學和數學能力呈顯著的負相關。

19. 就家長的資源投放而言，香港投放在文化和物質的資源低於 OECD 的國家，但投放於教育的資源則與 OECD 的平均值相若。研究發現文化和教育資源對閱讀和科學的成績均有顯著影響。

20. PISA 2006 探討了兩項新的家長觀感指標：家長對學校質素的觀感，和家長對學生活動的增潤。一般來說，香港家長對學校的評價低於 OECD 的平均值，但他們表示在子女十歲時爲其安排較多科學活動，比 OECD 的平均值爲高。這兩項因素均與學生成績呈顯著正相關。認爲學校有高的質素的家長，其子女於閱讀、科學和數學的表現都較好。在子女年幼時安排較多科學活動的家長，子女亦於各能力範疇有較好的表現。

啓示及建議

給教育政策制訂者

21. 整體而言，香港學生在三個範疇上的基礎能力均持續地表現出色。這可以暫且推論香港的教育系統能夠提供優質而均等的教育機會，而在有效地發展學生的能力時，亦不會犧牲了弱勢群體的學習機會，無論學生的社經背景如何，他們大致均能在教育系統中獲益。儘管如此，香港的中學之間仍然存在著明顯的學能分隔現象。在香港高度競爭性的環境下，學能分隔可能導致的不良後果便是學生的低自我觀，這很不利於培養年輕人對終身學習積極的態度。要改善這方面的情況，教育當局宜以減低學校之間的學能分隔爲目標，檢討有關的政策，這包括「中一派位機制」，特別是其中的三個以能力爲基礎的派位組別；以及中學教學語言的學校分流政策。

22. 對子女的學習有正面影響的家長參與方式是十分值得推廣的，雖然 PISA 2006 的分析集中於科學能力，但些正面的影響應該也適用於其他的能力範疇。政府宜繼續推廣家長教育，特別要照顧年幼學童家長的需要；學校宜提供更多機會給家長去參與家長教師會和義務工作。家庭和學校應該更全面地合作，這在中學的階段尤其需要。

23. 香港學生在閱讀能力方面可觀的進步是無可置疑的；然而，男生在這方面長期地大大落後於女生的情況卻是令人憂慮的。因此，如何提升男生的閱讀能力和培養閱讀興趣，應放到進一步提升學生閱讀能力的議程。

給教育工作者及家長

24. 學生對科學的接觸方面的調查顯示，很多非認知的因素，例如：價值觀、興趣、自我效能感和自信心、環境意識和對環境保護的責任感都與學生的科學表現有正相關。我們認爲認知和情意的因素是相互關聯及相互影響的，兩者都是培育公民的科學素養所不可缺少的元素。

25. 過去學校裡的科學科教學，大都著重發展學生的認知方面，而情意發展在教學過程中要不是視爲毫不相干，就只屬次等考慮。現時的課程已向正確的方向發展，開始多著重社會和個人的議題及個人責任。可是，要培育情意方面的能力，最有效還是透過體驗學習，或在現實生活處境中的行動。所以我們建議科學教育工作者和課程專家共同發展一個更爲行動導向的課程，即推動學生主動接觸現實生活的情境和問題，作爲學習經歷的要素。此行動導向的學習經歷，會與現時課程架構中的四個關鍵項目[2]一致，特別是*德育及公民教育*與*專題研習*兩項。

26. 無論家長的社經地位如何，研究結果証明家庭爲本的參與是促進學業成功的有效途徑。家長可以透過善用時間與子女傾談、討論功課和學校生活，也可以在子女年幼時安排與學科有關的活動來促進他們的學習。研究發現家校溝通，以及在學校的參與，與學生成績呈負相關；相信是因爲學校在資源方面的限制，例如時間、專業知識、適當的態度和價值觀的不足，以至學校只有在事態較爲嚴重時才聯絡家長。結果使這本應是能幫助學生的積極的行爲蒙上污點。某些學校有所謂「陽光電話」(Sunshine calls）的做法，正是要還家校溝通以公道。適當的家校溝通應能促進家庭與學校之間的伙伴關係而非對抗，這伙伴關係會使雙方更全面了解孩子，而這是要能給予孩子恰當的輔導與支援所必需的。

27. 教師的專業組織、政府機構和本中心宜尋求更多的合作，以充分利用 PISA 的研究結果，改善課程與教學。

給將來研究的啓示

28. 香港學生在閱讀能力方面有可觀的進步，究竟近這些年來的進步是如何發生的，是值得研究的課題，研究的發現對日後旨在使學生學習持續進步的改革，很有參考價值。

29. 家校溝通和在學校的參與，與學生成績呈負相關，結果與 PISA 2003 的差不多，顯示這不理想的情況仍然持續。故此有需要進一步的研究去找出方法，改變現時家校溝通和家長參與的性質；並且，縱向研究亦能理清家長的學校爲本參與對改善成績較差學生的學習有何幫助。

30. PISA 2006 也提供了不少有關以下方面的資料：學生的移民身份與學業表現的關係、校外與校內的補充輔導教學、認知和情意學習的性別差異、教育的權力下放與共同決策、科學科的教與學等。這些主題都值得作進一步的研究，各項個人、家庭與學校的因素對學習成效的相對貢獻，也值得在將來的主題報告中作深入的探討。

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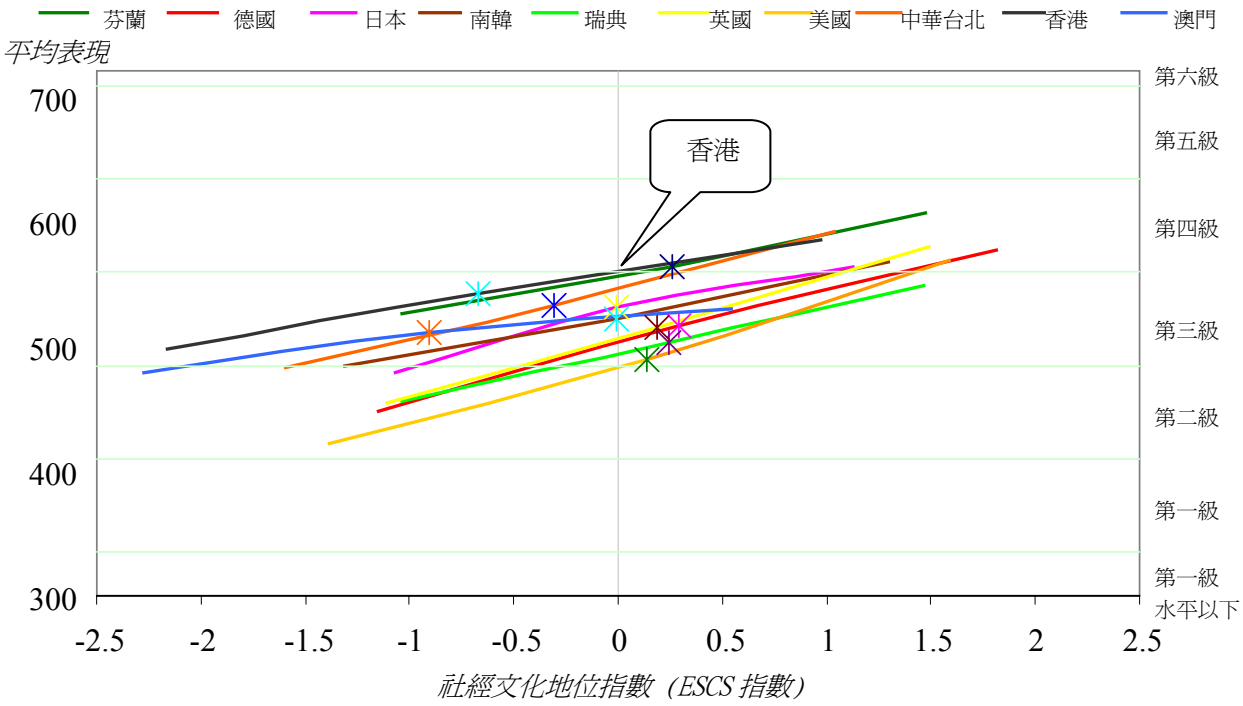
[5] 四個關鍵項目：德育及公民教育、專題研習、從閱讀中學習和運用資訊科技進行互動學習。

附件一　十五歲學生在 PISA 2006 的科學、閱讀和數學能力表現

科　學			閱　讀			數　學		
	平均值	標準差		平均值	標準差		平均值	標準差
芬蘭	563	(2.0)	韓國	556	(3.8)	中華台北	549	(4.1)
中國香港	**542**	**(2.5)**	芬蘭	547	(2.1)	芬蘭	548	(2.3)
加拿大	534	(2.0)	**中國香港**	**536**	**(2.4)**	**中國香港**	**547**	**(2.7)**
中華台北	532	(3.6)	加拿大	527	(2.4)	韓國	547	(3.8)
愛沙利亞	531	(2.5)	紐西蘭	521	(3.0)	荷蘭	531	(2.6)
日本	531	(3.4)	愛爾蘭	517	(3.5)	瑞士	530	(3.2)
紐西蘭	530	(2.7)	澳洲	513	(2.1)	加拿大	527	(2.0)
澳洲	527	(2.3)	列支敦士登	510	(3.9)	中國澳門	525	(1.3)
荷蘭	525	(2.7)	波蘭	508	(2.8)	列支敦士登	525	(4.2)
列支敦士登	522	(4.1)	瑞典	507	(3.4)	日本	523	(3.3)
韓國	522	(3.4)	荷蘭	507	(2.9)	紐西蘭	522	(2.4)
斯洛文尼亞	519	(1.1)	比利時	501	(3.0)	比利時	520	(3.0)
德國	516	(3.8)	愛沙利亞	501	(2.9)	澳洲	520	(2.2)
英國	515	(2.3)	瑞士	499	(3.1)	愛沙利亞	515	(2.7)
捷克共和國	513	(3.5)	日本	498	(3.6)	丹麥	513	(2.6)
瑞士	512	(3.2)	中華台北	496	(3.4)	捷克共和國	510	(3.6)
中國澳門	511	(1.1)	英國	495	(2.3)	冰島	506	(1.8)
奧地利	511	(3.9)	德國	495	(4.4)	奧地利	505	(3.7)
比利時	510	(2.5)	丹麥	494	(3.2)	斯洛文尼亞	504	(1.0)
愛爾蘭	508	(3.2)	斯洛文尼亞	494	(1.0)	德國	504	(3.9)
匈牙利	504	(2.7)	中國澳門	492	(1.1)	瑞典	502	(2.4)
瑞典	503	(2.4)	*OECD 平均值*	492	(0.6)	愛爾蘭	501	(2.8)
OECD 平均值	500	(0.5)	奧地利	490	(4.1)	*OECD 平均值*	498	(0.5)
波蘭	498	(2.3)	法國	488	(4.1)	法國	496	(3.2)
丹麥	496	(3.1)	冰島	484	(1.9)	英國	495	(2.1)
法國	495	(3.4)	挪威	484	(3.2)	波蘭	495	(2.4)
克羅地亞	493	(2.4)	捷克共和國	483	(4.2)	斯洛伐克共和國	492	(2.8)
冰島	491	(1.6)	匈牙利	482	(3.3)	匈牙利	491	(2.9)
拉脫維亞	490	(3.0)	拉脫維亞	479	(3.7)	盧森堡	490	(1.1)
美國	489	(4.2)	盧森堡	479	(1.3)	挪威	490	(2.6)
斯洛伐克共和國	488	(2.6)	克羅地亞	477	(2.8)	立陶宛	486	(2.9)
西班牙	488	(2.6)	葡萄牙	472	(3.6)	拉脫維亞	486	(3.0)
立陶宛	488	(2.8)	立陶宛	470	(3.0)	西班牙	480	(2.3)
挪威	487	(3.1)	意大利	469	(2.4)	阿塞拜疆	476	(2.3)
盧森堡	486	(1.1)	斯洛伐克共和國	466	(3.1)	俄羅斯聯邦	476	(3.9)
俄羅斯聯邦	479	(3.7)	西班牙	461	(2.2)	美國	474	(4.0)
意大利	475	(2.0)	希臘	460	(4.0)	克羅地亞	467	(2.4)
葡萄牙	474	(3.0)	土耳其	447	(4.2)	葡萄牙	466	(3.1)
希臘	473	(3.2)	智利	442	(5.0)	意大利	462	(2.3)
以色列	454	(3.7)	俄羅斯聯邦	440	(4.3)	希臘	459	(3.0)
智利	438	(4.3)	以色列	439	(4.6)	以色列	442	(4.3)
塞爾維亞共和國	436	(3.0)	泰國	417	(2.6)	塞爾維亞共和國	435	(3.5)
保加利亞	434	(6.1)	烏拉圭	413	(3.4)	烏拉圭	427	(2.6)
烏拉圭	428	(2.7)	墨西哥	410	(3.1)	土耳其	424	(4.9)
土耳其	424	(3.8)	保加利亞	402	(6.9)	泰國	417	(2.3)
約旦	422	(2.8)	塞爾維亞共和國	401	(3.5)	羅馬尼亞	415	(4.2)
泰國	421	(2.1)	約旦	401	(3.3)	保加利亞	413	(6.1)
羅馬尼亞	418	(4.2)	羅馬尼亞	396	(4.7)	智利	411	(4.6)
黑山共和國	412	(1.1)	印度尼西亞	393	(5.9)	墨西哥	406	(2.9)
墨西哥	410	(2.7)	巴西	393	(3.7)	黑山共和國	399	(1.4)
印度尼西亞	393	(5.7)	黑山共和國	392	(1.2)	印度尼西亞	391	(5.6)
阿根廷	391	(6.1)	哥倫比亞	385	(5.1)	約旦	384	(3.3)
巴西	390	(2.8)	突尼西亞	380	(4.0)	阿根廷	381	(6.2)
哥倫比亞	388	(3.4)	阿根廷	374	(7.2)	哥倫比亞	370	(3.8)
突尼西亞	386	(3.0)	阿塞拜疆	353	(3.1)	巴西	370	(2.9)
阿塞拜疆	382	(2.8)	卡塔爾	312	(1.2)	突尼西亞	365	(4.0)
卡塔爾	349	(0.9)	吉爾吉斯共和國	285	(3.5)	卡塔爾	318	(1.0)
吉爾吉斯共和國	322	(2.9)	美國	m	m	吉爾吉斯共和國	311	(3.4)

註：m 表示缺乏資料。有顏色部分顯示該國家／地區與香港有顯著分別。

附件二　十個參與國家或地區的學生科學表現與 ESCS 指數的關係



Acknowledgement

Aberdeen Technical School

Baptist Lui Ming Choi Secondary School

Baptist Wing Lung Secondary School

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Buddhist Hui Yuan College
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Buddhist Wai Yan Memorial College

Buddhist Yip Kei Nam Memorial College

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Caritas Yuen Long Chan Chun Ha Secondary School

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Carmel Pak U Secondary School

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Tung Wah Group of Hospitals Wong Fut Nam College

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