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Accomplishment and Challenges of Hong Kong Education System: What We Have Learned from PISA

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Developed by the Organisation for Economic Co-operation and Development (OECD), the Programme for International Student Assessment (PISA) is a regular survey to assess the preparedness of 15-year-olds for adult life in over 40 countries/regions. Hong Kong joined PISA in 2000. This article introduces the background and framework of PISA and compares it with other international assessments that Hong Kong participated before. Then the accomplishment and challenges are identified.

Overall, Hong Kong emerges as one of the top performing regions among 43 countries/regions in PISA. The performance of Hong Kong students ranks first in mathematics, third in science, and sixth in reading. Students, regardless of their socio-economic background, benefit from the education system. The achievement gap between the high achievers and low achievers is relatively low when compared to the OECD average. On the other hand, Hong Kong needs to address a number of challenges, including low self-concept, poor school climate, and low teacher participation in school governance. Implications for these accomplishment and challenges will be discussed.

Introduction to PISA

The Organisation for Economic Co-operation and Development (OECD) initiated and organized the Programme for International Student Assessment (PISA) in 2000. This international study compares and

evaluates the effectiveness of the education system in each participating region or country. OECD collects data every three years, and derives educational indicators to help governments and policy-makers evaluate and monitor the effectiveness of their education systems at the national level. Specifically, the study assesses how well 15-year-olds approaching the end of compulsory education have acquired the knowledge and skills essential for participation in society. PISA addresses the following issues (OECD, 2001):

- How well are young adults prepared to meet the challenges of the future?
- Can they analyze, reason, and communicate their ideas effectively?
- Can they continue learning throughout their lives?

The first cycle of PISA was conducted in 2000 with 32 participating OECD countries/regions. Other 11 non-OECD countries/regions joined the scheme (PISA+) in 2000 (see Table 1). Both PISA 2000 and PISA+ focused on reading literacy. Hong Kong joined PISA+ and collected the data in February 2002. PISA 2003 focused on mathematical literacy. PISA 2003 introduced another subject domain in the test — Problem-solving. PISA 2006 will focus on scientific literacy. In each cycle, a country/region invites about 5,000 students from at least 150 schools to participate. Over 200,000 students from over 6,000 schools in 43 countries/regions participated in the first cycle of the study.

Table 1. Countries/regions Participating in PISA 2000 and PISA+

PISA 2000			PISA+
Australia	Hungary	New Zealand	Albania
Austria	Iceland	Norway	Argentina
Belgium	Ireland	Poland	Bulgaria
Brazil	Italy	Portugal	Chile
Canada	Japan	Russian Federation	Hong Kong, China
Czech Republic	Korea	Spain	Indonesia
Denmark	Latvia	Sweden	Israel
Finland	Liechtenstein	Switzerland	Macedonia
France	Luxembourg	United Kingdom	Peru
Germany	Mexico	United States	Romania
Greece	Netherlands*		Thailand

* The response rate was too low in the Netherlands for appropriate comparison.

Conceptual Framework of PISA

The curricula of countries participating in PISA differ greatly. Attempts to compare curriculum-focused learning outcomes inevitably limit the scope of assessment to the lowest common denominator of national curricula. Rather than evaluating curricular implementation, PISA assesses students' competences in applying knowledge and skills essential to their future. PISA tests literacy in broad concepts and skills and their applications. OECD believes that the ability to apply knowledge and skills helps students adapt to future life and support life-long learning.

According to the goals of PISA, the OECD/PISA Consortium[1] has developed a framework describing the scope and dimensions of the assessment (Table 2). Each domain has three dimensions: the *content* or *structure* of knowledge that students should acquire; a range of *processes* to be performed; and the *situation* or *context* in which knowledge and skills are applied or drawn. PISA assesses students across a range of skills required for a variety of tasks that they may encounter.

The assessment consists of various types of items, ranging from *closed* items to *open-ended* problems. PISA assesses students' higher-order thinking skills with many open-ended items which require more elaborate responses. To assess a variety of knowledge and skills, PISA uses several items in different formats linked to a common text. This method helps assess students' competences in depth. PISA aims to identify both high performing education systems and their causal processes. Moreover, it uses context questionnaires to gather information about the processes of learning, school climate, and student social background. This range of information provides a solid base for policy-oriented analysis of the assessment results.

Conceptual Framework of Previous International Assessments

Apart from PISA, Hong Kong has participated in three international assessment studies initiated by the International Association for the Evaluation of Educational Achievement (IEA). These are: (1) the Reading Literacy Study in 1991, which involved 9-year-olds and

Table 2. Conceptual Framework of PISA

Domain	Reading literacy	Mathematical literacy	Scientific literacy
Definition	Understanding, using and reflecting on written texts to achieve one's goals, to develop one's knowledge and potential, and to participate in society.	Identifying, understanding and engaging in mathematics and making well-founded mathematical judgments about the role for an individual's current and future life as a constructive, concerned and reflective citizen.	Combining scientific knowledge with the drawing of evidence-based conclusions and developing hypotheses to understand and make decisions about the natural world and the changes made to it through human activity.
Components/ dimensions of the domain	Reading different kinds of *text*: continuous prose sub-classified by type (e.g., description, narration) and documents sub-classified by structure.	Mathematical *content* — primarily mathematical "big ideas." The first cycle includes change and growth, and space and shape. Future cycles will include chance, quantitative reasoning, uncertainty, and dependency relationships.	*Scientific concepts* — e.g., energy conservation, adaptation, decomposition — chosen from the major fields of physics, biology, chemistry, etc. applied to energy use, maintenance of species, and use of materials.
	Performing different kinds of reading tasks, such as retrieving specific information, developing an interpretation, or reflecting on the content or form of the text.	Mathematical *competences*, e.g., modeling, problem-solving; divided into three classes: (i) executing procedures, (ii) making connections, and (iii) mathematical thinking and generalization.	*Process skills*, e.g., identifying evidence, drawing, evaluating and communicating conclusions. These do not depend on a pre-set body of scientific knowledge, but must be applied with scientific content.
	Reading texts written for different *situations*, e.g., for personal interest, or for meeting work requirements.	Using mathematics in different situations, e.g., problems that affect individuals, communities, or the whole world.	Using science in different situations, e.g., problems that affect individuals, communities, or the whole world.

Source: Adapted from OECD (2001).

14-year-olds (Johnson & Cheung, 1995); (2) the Second International Mathematics and Science Studies (SIMSS) in 1991, the Third International Mathematics and Science Studies (TIMSS) in 1995, and the TIMSS Repeat (TIMSS-R) in 1999, which involved students from Grades 3–4 and Grades 7–8 (Martin et al., 2000; Mullis, Martin, Gonzalez et al., 2000; Mullis, Martin, Smith et al., 2001); and (3) the Progress in International Reading Literacy Study (PIRLS) in 2001.

Like PISA, these studies assess students from a similar age group in similar subject domains. TIMSS assesses Grades 4 and 8 students whereas PISA assesses the reading, mathematical, and scientific literacy of 15-year-olds.

TIMSS has been renamed Trends in International Mathematics and Science Study. According to Mullis, Martin, Smith et al. (2001):

> TIMSS uses the curriculum, broadly defined, as the major organizing concept in considering how educational opportunities are provided to students and the factors that influence how students use these opportunities. The TIMSS model has three aspects: the intended curriculum, the implemented curriculum and the achieved curriculum. These represent, respectively, the mathematics and science that society intends for students to learn and how the education system should be organized to facilitate this learning; what is actually taught in classrooms, who teaches it, and how it is taught; and, finally, what is that students have learned, and what they think about these subjects. (p. 3)

TIMSS's framework emphasizes the "inclusion of the content in the curricula of a significant number of participating countries" (Mullis, Martin, Smith et al., 2001, p. 5). Following this model, TIMSS uses questionnaires to gather information about the structure and content of the intended curriculum, teachers' experiences and attitudes, the instructional approaches used and so on. Nohara (2001) aptly summarizes these features of TIMSS: the content-related dimensions are highly detailed and serve as primary considerations in item development (p. 7).

In contrast, PISA focuses on the skills and competences in different domains, which are not necessarily tied to curriculum topics. PISA's central concern is the effectiveness of compulsory education in preparing students for adult life, not curriculum topics. Hence, items used in PISA involve more diverse contexts and require multi-step reasoning often found in daily life (Nohara, 2001).

Moreover, learning outcomes are broadly defined in PISA. They include affective elements and skills such as interest in learning and learning strategies. PISA questionnaires collect information about student learning processes as well as family and school background rather than details of curriculum implementation. The comparisons of PISA and TIMSS frameworks for mathematics and science are summarized in Tables 3 and 4.

In 1991, Hong Kong took part in IEA's Reading Literacy Study, from which PIRLS is derived. PIRLS is IEA's newly developed assessment of students' reading achievement at fourth grade (9- and 10-year-olds). Thirty-five countries/regions, including Hong Kong, participated in PIRLS 2001. PIRLS focuses on three aspects of reading literacy: (1) processes of comprehension, (2) purposes for reading, and (3) reading behaviors and attitudes. Comprehension processes and reading purposes form the PIRLS written assessment. The comprehension processes section has four components, each with two types of reading purposes: (1) literacy experience, and (2) acquire and use information. Literacy experience, which is unique to PIRLS, assesses Grade 4 students' early reading experiences. As reading allows students to explore their feelings and experience imaginative situations, information about early reading experiences indicates their potential to become habitual readers. To assess a student's literacy experience, PIRLS uses primarily narrative fiction. Table 5 shows the allocation of marks to each of these processes and purposes.

Lastly, student questionnaires collect information on student reading behaviors and attitudes. Parents, teachers, and principals respond to questionnaires regarding students' home and school experiences while developing reading literacy. This background information helps make sense of the reading differences among the participating countries/regions.

A comparison between PIRLS's processes of comprehension and PISA's major aspects of understanding text is shown in Table 6. They are quite similar in their model of text comprehension despite the different terms. However, they differ in two ways. First, PISA focuses on applying knowledge and skills, so it uses texts involving diverse contexts appropriate to assessing 15-year-olds. In contrast, PIRLS uses mostly narrative fiction. Targeting early readers (Grade 4 students), PIRLS also asks students to infer a story's mood, describe how an author devises a

Table 3. Comparison of PISA and TIMSS Frameworks for Mathematics

PISA	TIMSS
Mathematical "big ideas"	***Content***
Chance	Numbers
Change and growth	Measurement
Space and shape	Geometry: position, visualization, and shape
Quantitative reasoning	
Uncertainty	Geometry: symmetry, congruence, and similarity
Dependency and relationship	Proportionality
Mathematical curricular strands	Functions, relations, and equations
Number	Data representation, probability, and statistics
Measurement	
Estimation	Elementary analysis
Algebra	Validation and structure
Functions	Other content
Geometry	
Probability	***Performance expectation***
Statistics	Knowing
Discrete mathematics	Using routine procedures
	Investigating and problem-solving
Mathematical competence classes	Mathematical reasoning
Class 1: reproduction, definitions, and computations	Proportionality
	Communicating
Class 2: connection and integration for problem-solving	
Class 3: mathematical thinking, generalization, and insight	
Situations	
Personal	
Educational	
Occupational	
Public	
Scientific	

Note: The TIMSS "perspectives" concerning students' attitudes toward science and mathematics etc. are omitted.

Source: Adapted from Nohara (2001).

Table 4. Comparison of PISA and TIMSS Frameworks for Science

PISA	TIMSS
Scientific concepts	***Content***
Scientific themes	Earth sciences
Structure and properties of matter	Life sciences
Atmospheric change	Physical sciences
Chemical and physical changes	Science, technology, and mathematics
Energy transformations	History of science and technology
Forces and movement	Environmental and resources issues
Form and function	Nature of science
Human biology	Science and other disciplines
Physiological change	
Biodiversity	***Performance expectations***
Genetic control	Understanding
Ecosystems	Theorizing, analyzing, and solving problems
Earth and its place in the universe	Using tools, routine procedures, and science processes
Geological change	Investigating the natural world
Areas of Application	Communicating
Science in life and health	
Science in earth and environment	
Science in technology	
Scientific processes	
Recognizing scientifically investigable questions	
Identifying evidence needed in a scientific investigation	
Drawing or evaluating conclusions	
Communicating valid conclusions	
Demonstrating understanding of scientific concepts	
Situations	
Personal	
Community	
Global	
Historical	

Note: The TIMSS "perspectives" concerning students' attitudes toward science and mathematics etc. are omitted.

Source: Adapted from Nohara (2001).

Table 5. PIRLS's Reading Assessment and Marks Allocation

Comprehension process	Reading purpose	
	Literacy experience	Acquire and use information
Focus on and retrieve explicitly stated information	10%	10%
Make straightforward inferences	15%	15%
Interpret and integrate ideas and information	15%	15%
Examine and evaluate content, language, and textual elements	10%	10%

Source: Adapted from Campbell, Kelly, Mullis, Martin, & Sainsbury (2001).

Table 6. Comparison of Reading Tasks in PISA and PIRLS

PISA: Macro aspect of understanding text	PIRLS: Process of comprehension
Forming a broad general understanding — initial reading to determine whether text suits intended goals; consider texts as a whole, make predictions about text.	*Focus on and retrieve explicitly stated information* — locate and understand relevant information or ideas explicitly stated in the text.
Retrieving information — scan, search, locate, and select relevant information.	*Make straightforward inferences* — move beyond surface meaning to make straightforward, text-based inferences.
Developing an interpretation — develop more specific or complete understanding; understand interaction between local and global cohesion within text; use information and ideas activated during reading yet not explicitly stated in text.	*Interpret and integrate ideas* — draw on understanding of the world, one's experience, or other knowledge to link ideas and information in the text.
Reflecting on the content of a text — link information in text to knowledge from other sources; assess claims in text against own knowledge.	*Examine and evaluate content, language, and textual elements* — critical consideration of the text; reflect on and evaluate text content; consider and evaluate text structure, language use, literary devices, or author's perspective and craft.
Reflecting on the form of a text — consider text objectively; evaluate text's quality and appropriateness; understand text structure, genre, and register.	

surprise ending, explicate the relationship between two characters, and consider a character's alternative actions.

The quality and scope of international assessments have greatly improved over the years. The reading, science, and mathematics assessments and surveys conducted by the IEA reflect changes over the last 30 years. However, these surveys have concentrated on outcomes linked only to common parts of the curricula of participating countries/regions. Aspects of the curriculum unique to one region or a small number of regions are typically not assessed, regardless of their importance to those regions.

In short, the OECD/PISA approach has the following features:

1. Origin — Governments have taken the initiative and the survey is designed to serve their policy interests.
2. Regularity — The commitment to cover multiple assessment domains, with updates every three years, allows countries/regions to monitor regularly and predictably their progress in meeting key learning objectives.
3. Age group covered — Assessing young people with nine years of free schooling helps assess the education systems. At this stage, PISA can appropriately assess the acquired knowledge and skills amenable to future use.
4. Target knowledge and skills tested — PISA assesses skills deemed to be essential to future life, not a common denominator of school curricula. OECD/PISA tests for curricula-based knowledge in the form of broad concepts, skills, and their applications.

Results of Relevant International Studies

Apart from a description of the frameworks, the results of these international studies provide some background for interpreting PISA results and help local educators identify characteristics of effective education systems. Since both PIRLS and PISA are new, only the results from the IEA's Reading Literacy Study and TIMSS are discussed. Hong Kong participated in the Reading Literacy Study in 1991. The study collected data from 210,000 students and 10,000 teachers. Like most international studies, the scores were scaled to a mean of 500 and a standard deviation of 100. IEA tested two groups of students: Population

A (mostly students aged 9–10) and Population B (students aged 14–15). In Asia, only Hong Kong and Singapore participated. In both populations, Hong Kong students perform similarly to the Singaporean students. For Population A, the performance scores of Hong Kong and Singapore were 517 and 515, ranking 9th and 10th respectively. For Population B, the performance scores were 535 and 534, ranking 8th and 9th respectively. These results suggested that 14- to 15-year-olds in Hong Kong and Singapore were well above average but not among the top performers.

Eighth graders of East Asian performed best in the mathematics section of the 1995 TIMSS study. The best four performers in mathematics were Singapore, Korea, Japan, and Hong Kong.[2] Singapore performed significantly better than the other countries. In *TIMSS 1999 International Mathematics Report* (Mullis, Martin, Gonzalez et al., 2000), the top performers were the same except for some changes in ranking. Taipei, Hong Kong, and Japan were 3rd, 4th, and 5th respectively. Table 7 summarizes the trend in mathematical achievement of these countries/regions. The score of Hong Kong showed the second highest improvement.

Table 7. Trends in Mathematics Achievement

	TIMSS: 1995 average scale score	TIMSS-R: 1999 average scale score	1999 – 1995 difference
Singapore	609	604	–5
Korea	581	587	6
Taipei	—	585	—
Hong Kong	569	582	13
Japan	581	579	–2

Source: Adapted from Mullis, Martin, Smith et al. (2001).

East Asia also had the best TIMSS science scores among all participating countries/regions. As in mathematics, the top performers in science were Singapore, Korea, and Japan. Yet, Hong Kong ranked 16th in the 1995 study. In the *TIMSS 1999 International Science Report*, the top performers were the same except that Taipei was first and Hong Kong was 15th (Martin et al., 2000). Table 8 summarizes the trend in science achievement. Hong Kong showed the third best improvement.

In short, East Asian students are top performers in mathematics. Some researchers identify the similarity in the culture among these countries/regions as the Confucian Heritage Culture (Lam, Ho, & Wong,

Table 8. Trends in Science Achievement

	TIMSS: 1995 average scale score	TIMSS-R: 1999 average scale score	1999 – 1995 difference
Singapore	580	568	–12
Korea	546	549	3
Taipei	—	569	—
Hong Kong	510	530	20
Japan	554	550	–4

Source: Adapted from Mullis, Martin, Smith et al. (2001).

2002). Others attribute the good performance to teacher factors. Another possible interpretation of the outstanding performance of East Asian students in mathematics is due to the special emphasis on mathematics and science learning and teaching, which in turns induce the concentrated practice and possibly aptitudes of these students. No conclusive claim can be made (Leung, 2002). On the other hand, the performance of Hong Kong in TIMSS science ranked among the lowest for developed countries and fell far short of that of the other "Asian Dragons" participating in the study. PISA may help identify factors explaining the variation in quality among these education systems.

Previous international assessments in reading, mathematics, and science provide a foundation for understanding and interpreting the PISA results in Hong Kong (Ho, 2000; Johnson & Cheung, 1995; Law, 1996, 1997, 2002; Leung, 2002). East Asia has the four best countries/regions in both mid-primary and mid-secondary mathematics: Singapore, Korea, Japan, and Hong Kong (Ho, 2000; Law, 1996, 1997). In reading, Hong Kong students' performance was average at Primary 4 and above the international mean at Secondary 3. Hong Kong students did well on documentary texts but poorly on narrative texts in both populations. For Reading Assessment in English as a Second Language (a national option), students performed poorly at Primary 4 and at Secondary 3 compared to the international means (Johnson & Cheung, 1995). In science, Hong Kong did not perform well in 1995 but improved substantially in 1999. Hong Kong students were particularly good at multiple-choice items and items that tested simple information and routine procedures but weak on complex reasoning, application of knowledge, and items demanding verbal explanation. PISA may shed some light on and help us understand these issues.

Sampling in PISA

PISA uses an age-based definition for its target population. The target population is students who were aged between 15 years and 3 months and 16 years and 2 months at the beginning of the assessment period and who were enrolled in an educational institution.

Most PISA samples were designed as two-stage stratified samples. The first stage consists of sampling individual schools in which 15-year-old students were enrolled. Schools were sampled systematically with probabilities proportional to size, the measure of size being a function of the estimated number of eligible students enrolled. A minimum of 150 schools were selected in each country/region. The second stage of the selection process sampled students within sampled schools. Once schools were selected, a list of each sampled school's 15-year-old students was prepared, from which 35 students were then selected with equal probability.

Assessment Instruments

Guided and monitored by the Board of Participating Countries, all participating countries/regions collaborated to develop PISA assessment tasks. Countries/regions submitted stimulus materials and items that were typical of assessments used in their countries/regions. Subject matter expert groups and assessment specialists reviewed these materials and developed further items as needed to adequately cover each component of the framework. The National Project Manager or subject experts of participating countries/regions rated all the items according to cultural appropriateness, interest to 15-year-olds, curricular and extracurricular relevance, and difficulty level.

To provide an in-depth coverage of each domain, there were 141 items for reading literacy, 32 for mathematical literacy, and 35 for scientific literacy. These items were organized into nine clusters of reading questions, four clusters of mathematics questions, and four clusters of science questions. Booklets were formed with different combinations of clusters. The booklets were strictly assigned to students according to a rotated design that ensured random coverage of the students. Each student answered only a subset of the total pool of

questions used for the assessment. As each cluster of questions appeared in more than one booklet, item linkage allows for scaling of scores across different booklets (OECD, 2002; Willms, 2003).

In addition to the rigorous design, PISA has other procedures to ensure the integrity and comparability of the data collected. Specifically, there are standard procedures for participating countries/regions to adapt PISA instruments. All instruments for PISA were developed in both English and French. Countries/regions whose testing languages are other than English or French translated the materials and submitted them to the OECD/PISA Consortium for verification. This procedure ensures that all data are collected with the same instruments.

Sampling in HKPISA

Schools were stratified based on the following criteria: type of school (government, aided, and private) and student intake (high, medium, and low ability) according to the information provided by the Education and Manpower Bureau of the Hong Kong Government. The stratified sampling method ensures the appropriate proportion of each type of school in the sample (see Table 9). A total of 4,405 students from 140 schools were accepted for final analysis according to OECD sampling

Table 9. Selected and Participating Schools for Each Sampling Stratum

Explicit strata	Implicit strata	Total number of schools	Number of schools accepted by OECD
Government	High ability	18	7
	Medium ability	8	2
	Low ability	10	4
Aided	High ability	127	46
	Medium ability	130	44
	Low ability	101	29
Independent[#]	Local (DSS*)	23	6
	International	23	2
		440	140

There is no intake classification for independent schools.

* DSS refers to schools under the Direct Subsidy Scheme.

standard. In this report, we focus our analyses on these 140 schools. For our national option, we invited EMI (English as the medium of instruction) schools to take both Chinese and English versions of the test whereas CMI (Chinese as the medium of instruction) schools took only the Chinese version. The results of English versions from EMI schools are not included in the OECD international report.[3]

Assessment of Students in Hong Kong

In Hong Kong, 4,405 students born between October 1, 1985 and September 30, 1986 participated in PISA+. Table 10 shows the grade distribution of the sampled students. The 15-year-olds in Hong Kong were spread across six grades but most of them (61.2%) were from Secondary 4 (i.e., Grade 10); 17.4% were from Secondary 5 (i.e., Grade 11); and 21.4% from lower secondary (i.e., Grades 7 to 9). The sample had approximately the same proportion of boys and girls.

Table 10. Distribution of Students Participating in HKPISA by Grade and Sex

	Number of participating students	Proportion (%)
Grade/Form		
7/S1	135	3.1
8/S2	280	6.4
9/S3	524	11.9
10/S4	2,695	61.2
11/S5	767	17.4
12/S6	4	0.1
Sex		
Female	2,208	50.1
Male	2,197	49.9
	4,405	100.0

Strengths of Hong Kong Education System

The following are some of the strengths of the Hong Kong education system identified in the PISA study.

High-quality Basic Education System

Hong Kong emerges as one of the top performing countries/regions in PISA. Overall, Hong Kong students performed well compared with students in most other countries, ranking first in mathematics, third in science, and sixth in reading among the participating countries/regions. Hong Kong got 560 on the mathematical literacy scale, outperforming all the other participating countries significantly except Japan (557) and Korea (547). Hong Kong scored 541 on the scientific literacy scale. Only Korea (552) and Japan (550) performed better than Hong Kong, but the differences were not statistically significant. On the combined reading scale, Hong Kong obtained a score of 525. Only Finland (546) performed significantly better than Hong Kong at the 0.05 level. In reading, Canada, New Zealand, Australia, and Ireland also performed better than Hong Kong, but the differences were not statistically significant (see Table 11).[4]

High Equality for High and Low Achievers

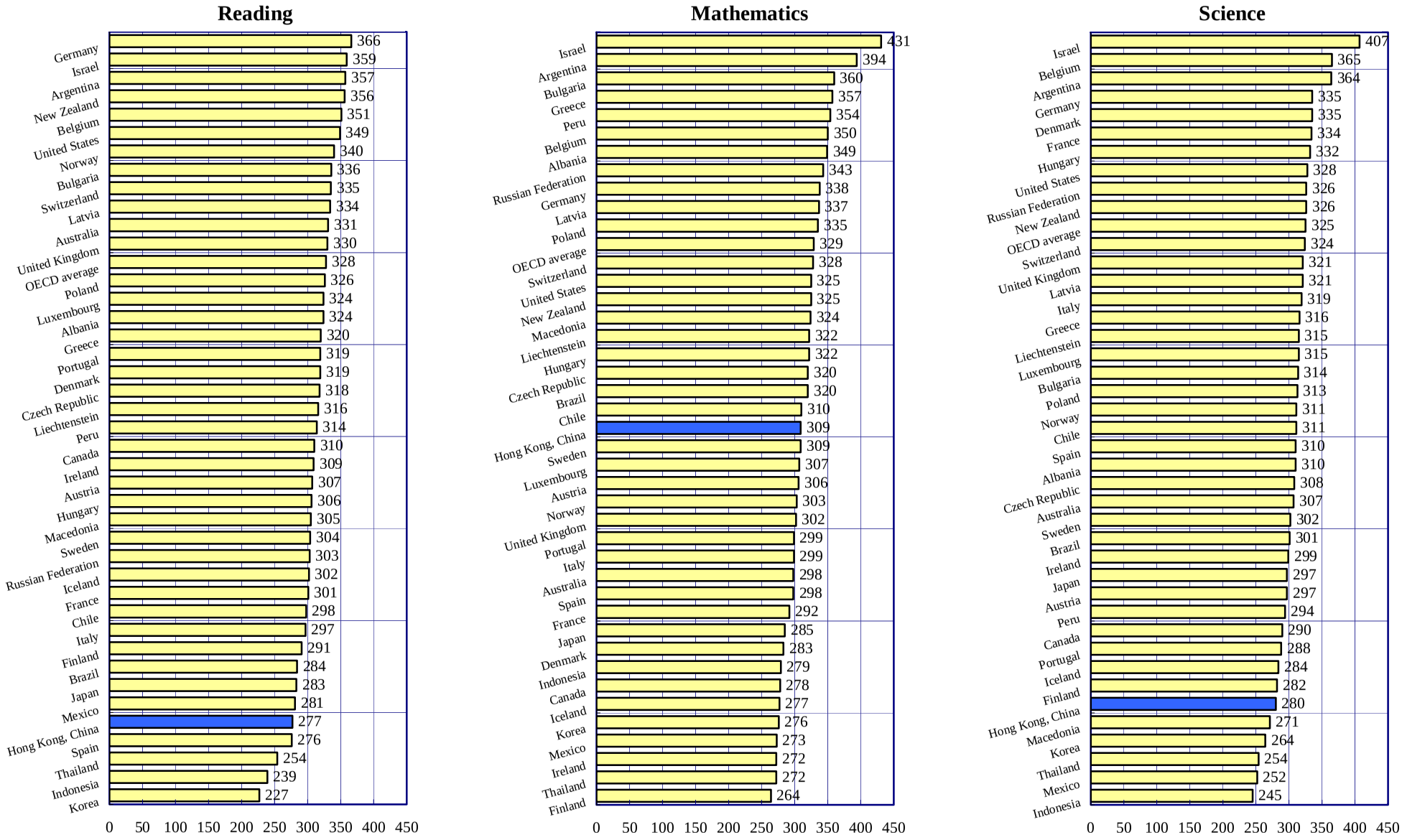
In terms of educational performance, an effective system should have its students achieving an overall high standard together with a small disparity between those who are more advantaged and those who are disadvantaged. One way to examine the disparity is to consider the spread of students' literacy scores. The smaller the spread of the performance score, the closer an education system is to the goal of achieving educational equality. To do this, we calculated the difference between the 5th and 95th percentiles of reading, mathematical, and scientific literacy scores and used them as indices of disparity between the highest and lowest achievers for each of the participating countries/regions. Results in Figure 1 indicated that the disparities between high (95th percentile) and low achievers (5th percentile) are relatively small in Hong Kong. The disparities for combined reading, mathematical, and scientific literacy are 277, 309, and 280 respectively. The corresponding OECD averages are 328, 329, and 325 respectively. The relatively small disparities suggest that most students in Hong Kong have similar access to, and benefit from, the Hong Kong education system at the 0.05 level.

Table 11. Literacy Performance of 15-year-olds in PISA

Reading literacy			Mathematical literacy			Scientific literacy		
Country/region	*M*	*SE*	Country/region	*M*	*SE*	Country/region	*M*	*SE*
Finland	546	2.6	Hong Kong, China	560	3.3	Korea	552	2.7
Canada	534	1.6	Japan	557	5.5	Japan	550	5.5
New Zealand	529	2.8	Korea	547	2.8	Hong Kong, China	541	3.0
Australia	528	3.5	New Zealand	537	3.1	Finland	538	2.5
Ireland	527	3.2	Finland	536	2.2	United Kingdom	532	2.7
Hong Kong, China	525	2.9	Australia	533	3.5	Canada	529	1.6
Korea	525	2.4	Canada	533	1.4	New Zealand	528	2.4
United Kingdom	523	2.6	Switzerland	529	4.4	Australia	528	3.5
Japan	522	5.2	United Kingdom	529	2.5	Austria	519	2.6
Sweden	516	2.2	Belgium	520	3.9	Ireland	513	3.2
Austria	507	2.4	France	517	2.7	Sweden	512	2.5
Belgium	507	3.6	Austria	515	2.5	Czech Republic	511	2.4
Iceland	507	1.5	Denmark	514	2.4	France	500	3.2
Norway	505	2.8	Iceland	514	2.3	Norway	500	2.8
France	505	2.7	Liechtenstein	514	7.0	United States	499	7.3
United States	504	7.1	Sweden	510	2.5	Hungary	496	4.2
Denmark	497	2.4	Ireland	503	2.7	Iceland	496	2.2
Switzerland	494	4.3	Norway	499	2.8	Belgium	496	4.3
Spain	493	2.7	Czech Republic	498	2.8	Switzerland	496	4.4
Czech Republic	492	2.4	United States	493	7.6	Spain	491	3.0
Italy	487	2.9	Germany	490	2.5	Germany	487	2.4
Germany	484	2.5	Hungary	488	4.0	Poland	483	5.1
Liechtenstein	483	4.1	Russian Federation	478	5.5	Denmark	481	2.8
Hungary	480	4.0	Spain	476	3.1	Italy	478	3.1
Poland	479	4.5	Poland	470	5.5	Liechtenstein	476	7.1
Greece	474	5.0	Latvia	463	4.5	Greece	461	4.9
Portugal	470	4.5	Italy	457	2.9	Russian Federation	460	4.7
Russian Federation	462	4.2	Portugal	454	4.1	Latvia	460	5.6
Latvia	458	5.3	Greece	447	5.6	Portugal	459	4.0
Israel	452	8.5	Luxembourg	446	2.0	Bulgaria	448	4.6
Luxembourg	441	1.6	Israel	433	9.3	Luxembourg	443	2.3
Thailand	431	3.2	Thailand	432	3.6	Thailand	436	3.1
Bulgaria	430	4.9	Bulgaria	430	5.7	Israel	434	9.0
Mexico	422	3.3	Argentina	388	9.4	Mexico	422	3.2
Argentina	418	9.9	Mexico	387	3.4	Chile	415	3.4
Chile	410	3.6	Chile	384	3.7	Macedonia	401	2.1
Brazil	396	3.1	Albania	381	3.1	Argentina	396	8.6
Macedonia	373	1.9	Macedonia	381	2.7	Indonesia	393	3.9
Indonesia	371	4.0	Indonesia	367	4.5	Albania	376	2.9
Albania	349	3.3	Brazil	334	3.7	Brazil	375	3.3
Peru	327	4.4	Peru	292	4.4	Peru	333	4.0

Note: Shaded area indicates scores significantly different from that of Hong Kong.

Figure 1. Achievement Gap Between High and Low Achievers



High Equality in Different Social Background

Socio-economic status (SES) has only a relatively small impact on the literacy performance of Hong Kong students. The impacts of SES on academic achievement are often expressed as socio-economic gradients (OECD &UNESCO, 2003).[5] The gradient is an indication of the extent of inequality attributable to SES. The shallow social gradients of Hong Kong suggest that Hong Kong students perform equally well regardless of their different socio-economic cultural backgrounds (see Figure 2).

Results in Figure 2 indicated that there is a low influence of home background on student performance. In other words, Hong Kong's 15-year-olds scored higher than those students with similar SES in many other countries (see Figure 1). The achievement gap of students from different SES in Hong Kong is relatively small compared with other countries. One reason could be that Hong Kong educators and parents are doing well in helping the disadvantaged students. On the other hand, we do not have many students who have attained outstanding scores on the reading proficiency scales. Only about 10% of Hong Kong's 15-year-old students are at Level 5 (the highest level) in reading proficiency, which is lower than other outstanding countries.

Challenges for Hong Kong Educators and Policy-makers

On the other hand, Hong Kong has the following challenges to be addressed.

Students Are Doing Well But Feeling Bad

Although the Hong Kong students did very well in the cognitive test, this may have been achieved at the expense of other aspects of student development, such as their self-confidence and interest in learning (Ho, 2000; Leung & Wong, 1997). Consistent to many previous international studies, results in Figure 3 indicated that Hong Kong students have very low self-concept in reading and mathematics. Although Hong Kong ranked sixth in reading literacy and first in mathematical literacy,

Figure 2. Relationship Between Students' Reading Literacy and Economic, Social and Cultural Status

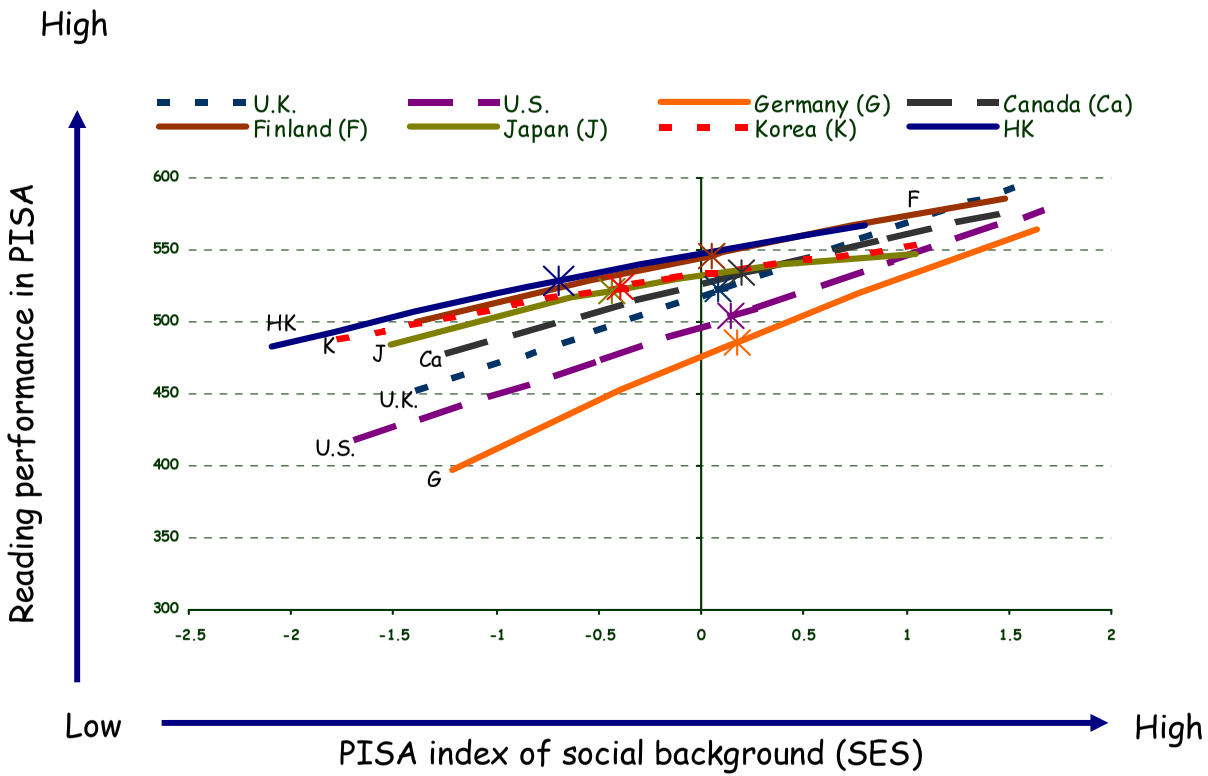
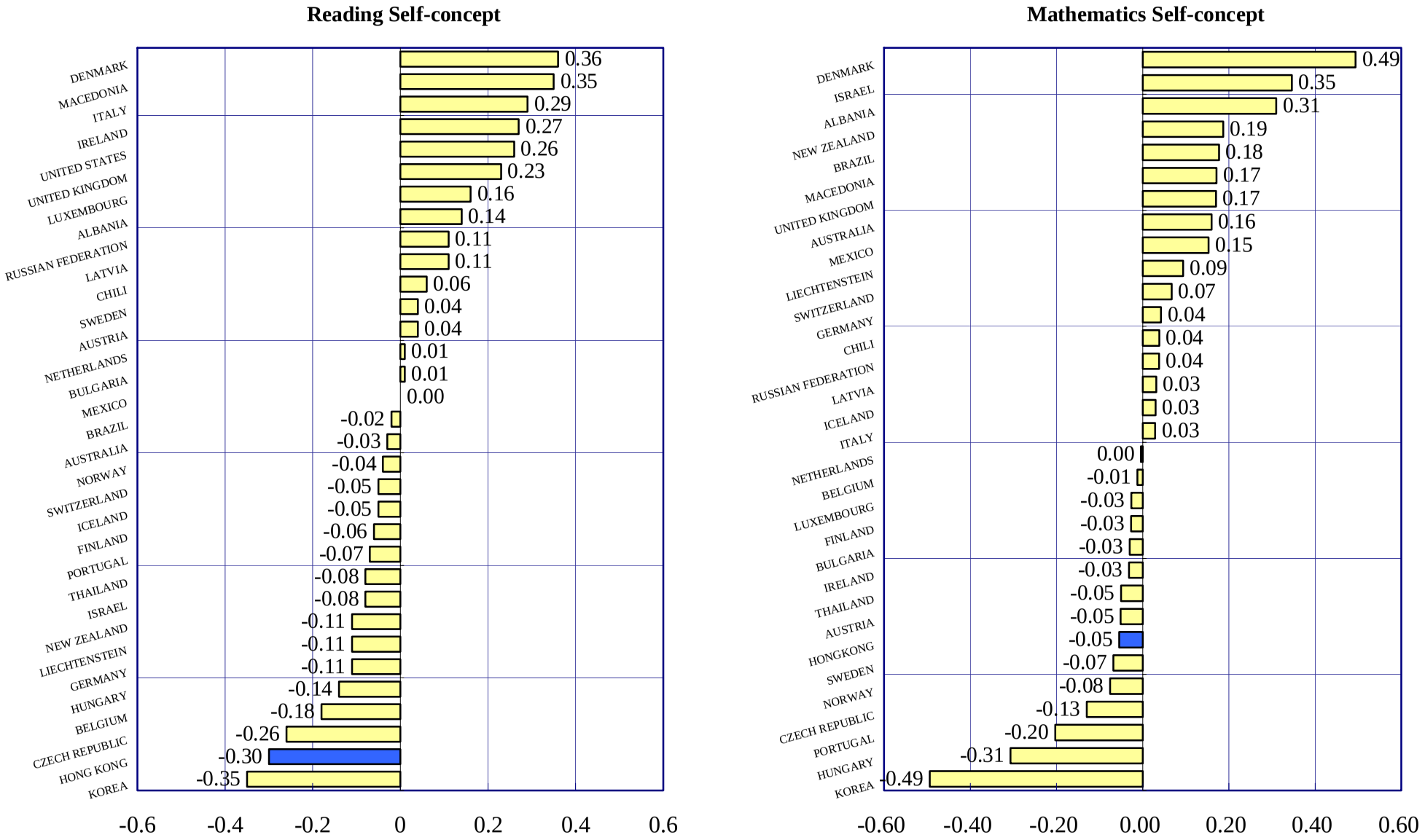


Figure 3. Self-concepts Across Countries/regions in PISA



students' ranked the second lowest in reading self-concept and seventh lowest in mathematics self-concept among the 41 countries/regions in PISA. This pattern is quite consistent in Asian countries including Korea and Japan. It appears that parents and teachers in Asian society might need to strike a balance between cognitive and affective domain of students' learning. Feeling good is as important as doing good if we want our students to have the confidence and passion for lifelong learning.

Students Have High Attendance But Low Engagement

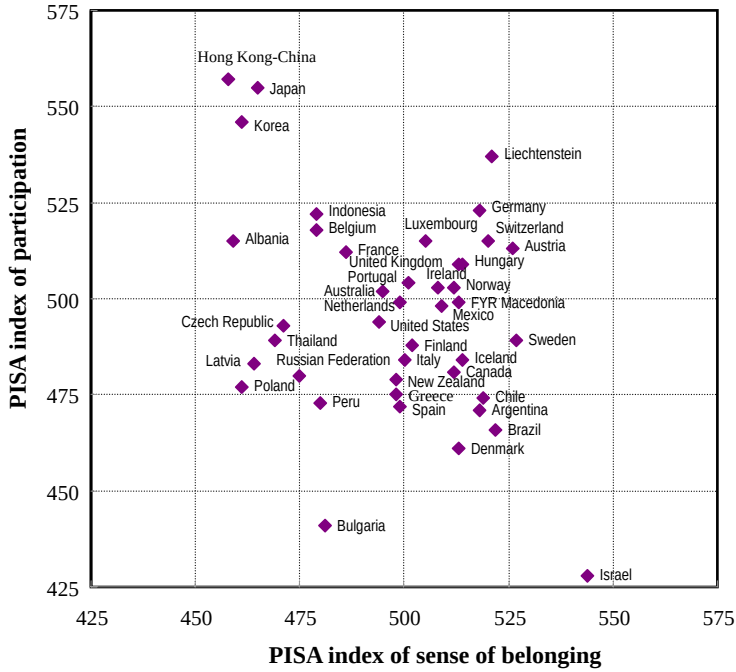
Recent thematic report from OECD titled *Student Engagement at School* displayed a very interesting finding. Figure 4 indicated that although Asian societies including Hong Kong, Japan, and Korea have a very high student participation rate (as measured by the frequency of absence, class skipping and late arrival at schools during the two weeks prior to the PISA survey), students' sense of belonging is very low in all three countries (Willms, 2003).

In the student questionnaire of PISA, the sense of belonging is based on students' response to six items describing their personal feeling about being accepted by their peers and whether or not they felt lonely, "like an outsider" or "out of place?". Figures 4 and 5 reflected that Hong Kong schools are able to engage students' body but not their heart. Recent studies concerning erosion of social capital have pointed out the negative outcomes of student disengagement. Many educators would argue that we might address the problem of student disaffection with closer link among home, school, and community. Asian communities may have very strong "learning norms" in schools but we also need to nurture a "caring norm" for the long-term well-being of the youngsters.

Schools Have Autonomy But Teachers Have Low Participation

Evidence from the PISA survey supports that the extent of school autonomy varies among countries. Figure 6 indicated that, of the three participating Asian societies, the school autonomy of Hong Kong appears to be higher than the OECD average. The index of school autonomy of Korea and Japan are similar to the OECD average. Although Hong Kong

Figure 4. Country Mean on the Indices of Sense of Belonging and Participation



appears to have high degree of school autonomy, many controls rest with the upper management of the schools. Elected board and school administrators in Hong Kong tend to have more responsibility in making decision on staffing, budgeting, student affairs, and curriculum. However, Figure 7 indicated that teachers' autonomy of Hong Kong appears to be the lowest among the participated countries/regions. To what extent and how to distribute power and responsibilities across various stakeholders in different areas of decision-making is worthy of further investigation in future analysis.

Conclusion and Implications

While this was the first time that the PISA assessment was administered in Hong Kong, this was not the first international study that Hong Kong

Figure 5. School Climate: Sense of Belonging

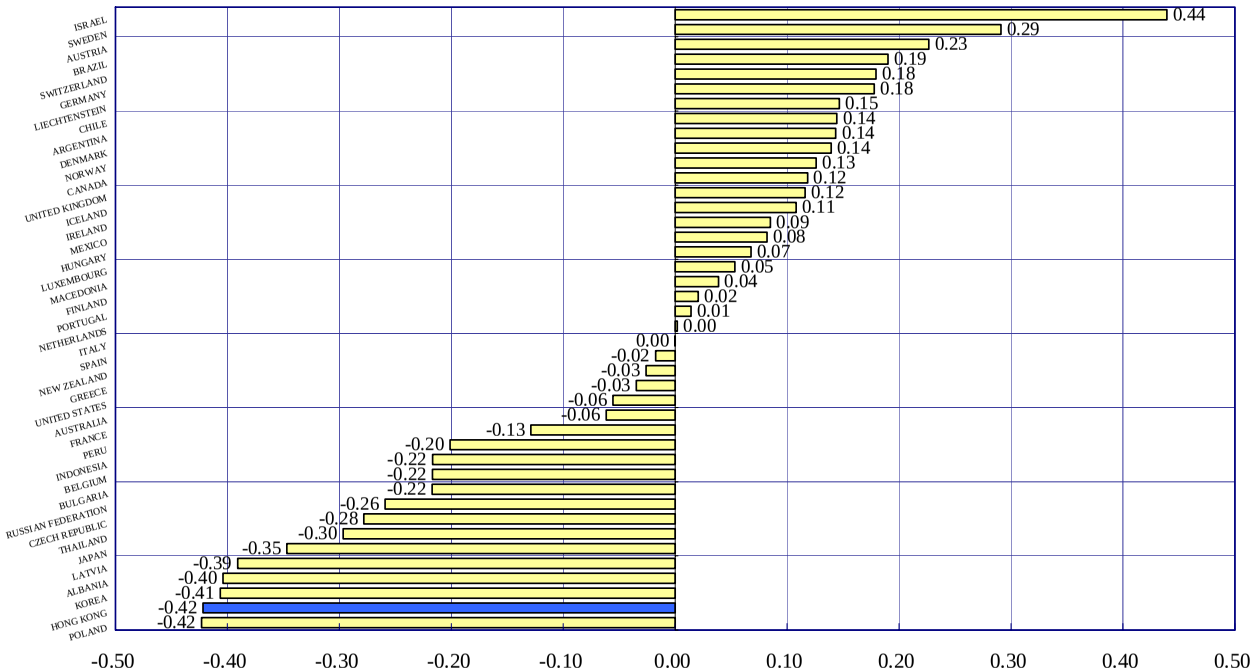


Figure 6. School Autonomy

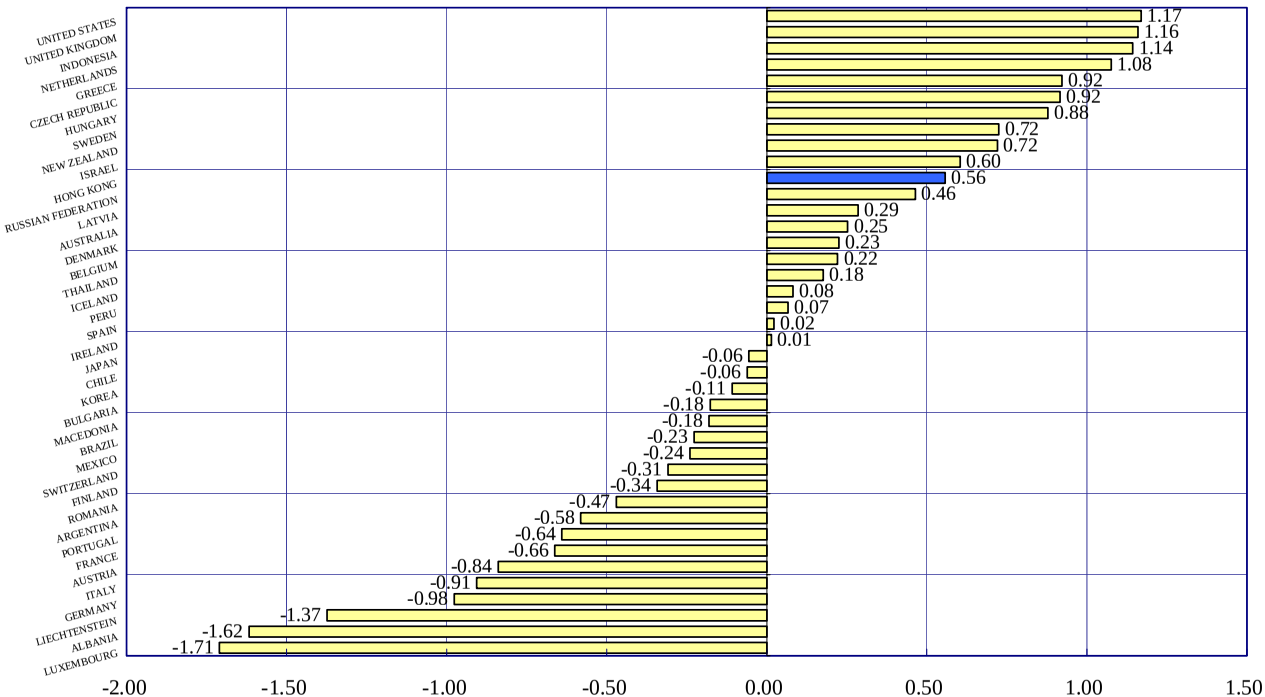
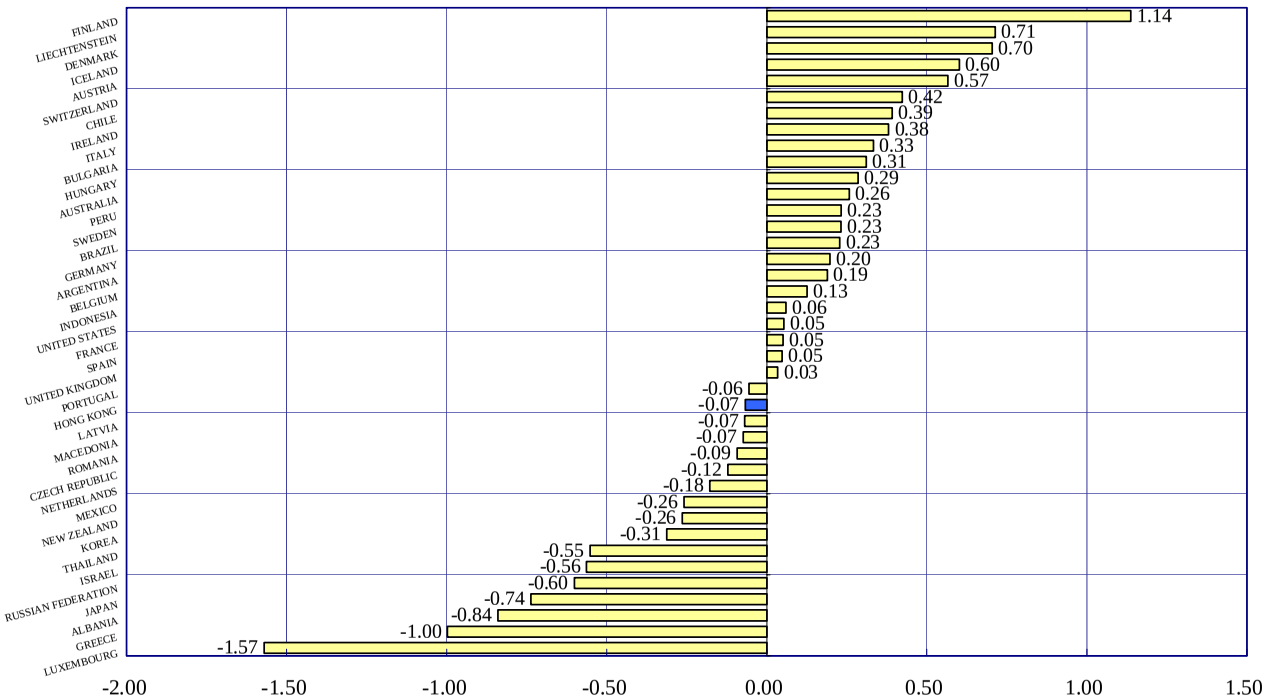


Figure 7. Teacher Participation



participated in. Results of previous international studies are not directly comparable to the results of the present one because of differences in assessment frameworks, age of sampled students, and participating countries/regions. It is difficult to say that Hong Kong has been improving over time. However, the present study has provided an initial baseline of the quality of our education system at the secondary level in 2002.

Overall, Hong Kong students performed well in the three domains in the first cycle of PISA. It can be posited tentatively that our education system is quite effective in developing students' literacy without sacrificing equality. Students, regardless of their socio-economic background, can benefit from the basic education system. The achievement gap between the high achiever and the low achiever is relatively lower than that of the OECD average. However, students in Hong Kong display very low self-concept in reading and mathematics. It appears that Hong Kong might need to strike a balance between the cognitive and affective outcomes. Moreover, Hong Kong students have very low sense of belonging to their schools. Thus, Hong Kong might have many disengaged students who have fairly high levels of literacy skills. Finally, it is important to delegate greater responsibility to different stakeholders within schools in a decentralized education system. Sharing the authority and responsibility should be reinforced to respond for improving the social climate of Hong Kong schooling systems and to the rapidly changing needs of the society.

In sum, the literacy performance of Hong Kong 15-year-olds in the first cycle of PISA is encouraging. Yet there are still rooms for Hong Kong to improve and investigate. A number of questions are worthwhile for future studies: Why do Hong Kong youngsters have a high level of achievement but low self-concept? Why do Hong Kong schools engage students' body but not their heart? Why does the current decentralization policy strengthen only school autonomy but not teacher participation? What are the possible ways to improve our schooling system and establish a "democratic" and "humanistic" schooling system with "hearts"?

Notes

1. OECD/PISA Consortium is comprised of Australian Council for Educational Research (ACER), National Institute for Educational Measurement (CITO) of the Netherlands, Educational Testing Service (ETS) of the U.S., National Institute for Educational Policy Research (NIER) of Japan, and Westat of the U.S.
2. The numbers reported in Beaton et al. (1996) and Mullis, Martin, Smith et al. (2001) were different. For the sake of consistency, the numbers reported in Mullis, Martin, Smith et al. were used.
3. If the option schools were included, 167 Hong Kong secondary schools participated in the assessment, which consisted of 167 principals and 6,184 students and their parents.
4. The mean performance in the three domains for the 41 participating countries/regions with valid database are shown in Table 11. The OECD average was set to 500 points with a standard deviation of 100.
5. Steeper gradients indicate a greater relationship between SES and student performance, and shallower gradients indicate a smaller relationship between SES and student performance, or less inequality.

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