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CUHK Releases Students' Results in Computer-based Assessment in PISA 2012

There has been widespread concern over the opportunities and challenges brought about by the coming of the information age and the expansion of the internet to the field of education. To reveal how competent Hong Kong students are in using digital technologies and online information, the Hong Kong Centre for International Student Assessment of the Institute of Educational Research at The Chinese University of Hong Kong (CUHK) released today (1 April) the results of Computer-based Assessment (CBA), as part of the Programme for International Student Assessment (PISA) 2012.

The results of PISA 2012 on students' performance in reading, mathematics and science were released in December 2013. As PISA aims at studying students' ability to apply knowledge in daily life, it incorporated CBA of problem solving, mathematics and reading on top of the conventional written assessment to tie in with the latest trend. From April to May 2012, 2,714 students aged 15 from 148 schools were randomly selected for the CBA. They were requested to answer questions by searching and exploring interactive simulations produced by a computer programme in 40 minutes. Their parents and schools were also requested to provide background information through questionnaires.

Survey results

Among the 44 countries and economies participating in the CBA, Hong Kong students ranked fourth in both problem solving and mathematics, and third in reading (Table 1). For CBA problem solving, Hong Kong students attained an average score of 540, lagging behind students in Singapore (562), Korea (561) and Japan (552), and being on a par with Macao students. For CBA mathematics, the average score of Hong Kong students was 550, which was lower than those of Singapore (566), Shanghai (562) and Korea (553). For digital reading, Hong Kong students scored an average of 550, which had significantly improved from 515 in PISA 2009, despite the fact that they were outperformed by students in Singapore (567) and Korea (555).

Among the six levels of CBA problem solving scale, level 5 and above belong to top levels while level 2 is the baseline level (Figure 1). Results showed that 19.3% of Hong Kong students reached the top levels, outperforming the average of 11.4% of the Organisation for Economic Co-operation and Development (OECD). This percentage was lower than those of Singapore (29.3%), Korea (27.6%) and Japan (22.3%), but higher than that of Macao (16.6%) (Figure 2). On the other hand, 89.6% of Hong Kong students reached the baseline level, outperforming the OECD average of 78.6% but being outperformed by Korea (93.1%), Japan (92.9%), Macao (92.5%) and Singapore (92.0%) (Figure 3).

Information technology resources in families and schools

The study analysed the impact of availability of information and communication technologies (ICT) resources in families and schools on Hong Kong students' performance. A great majority of students (over 98%) had access to computers and internet at home. Results showed that students having access to computers at home, including desktop computers, notebook computers and tablet computers, outperformed significantly those without by 59 score points in CBA problem solving, a finding which is similar to that of digital reading in 2009. In view of the strong negative impact of lack of computers at home on students' learning, the Government should provide support and appropriate ICT resources for students of these families, despite their small number.

In the school aspect, while over 80% of students had access to computers and internet at school, there are 20.7% of schools which reported a shortage of computers, 7.6% a shortage of internet access resources, and 23.0% a shortage of educational software. Shortage of these ICT resources was said to have affected teaching quality at schools (Figure 4). While Hong Kong's policy on information technology in education has been strengthened over the last decade, these results indicated that about 10 to 20% of schools still sensed a shortage of ICT resources and this percentage had increased since 2009. Education policymakers should be aware of the current needs for ICT resources of schools and provide them with renewal of computer hardware and software so as to meet the needs of today's society. Further research is also needed to promote the effective use of ICT at schools, thereby enhancing students' performance regardless of their backgrounds.

Online activities and CBA performance

PISA analysed the relationship between various online activities and CBA performance. Activities found to be positively correlated with students' performance included using email, reading news on the internet, obtaining practical information from the internet, and participating in social networks. On the contrary, students who frequently downloaded music, films, games or softwares from the internet had poorer performance (Figure 5).

As for the attitudes towards problem solving, the level of perseverance of Hong Kong students was higher than the OECD average, while their openness was far below the OECD average (Figure 6). These two kinds of attitudes were found to be significantly positively correlated with students' performance in CBA problem solving, CBA mathematics and digital reading (Figures 7 to 9). Despite their satisfactory performance in these three areas, the above finding indicates that there is room for improvement in the attitudes towards problem solving among Hong Kong students.

About PISA

PISA is a triennial international study organized by OECD with over 70 participating countries in 2012. It aims at evaluating the basic knowledge and skills essential for participation in society among students aged 15. In 2012, the Computer-based Assessment covered three key areas including problem solving, mathematics and

reading which were set out by scholars from all participating countries or economies, reviewed by international academic specialists and approved by special commissions of the countries or economies. In the information age, digital technologies will play a more important role in PISA assessment.

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Table 1. Performance of 15-Year-Old Students in CBA Problem Solving, CBA Mathematics and Digital Reading in PISA 2012

CBA Problem Solving			CBA Mathematics			Digital Reading		
Countries/Economies	Mean	S.E.	Countries/Economies	Mean	S.E.	Countries/Economies	Mean	S.E.
Singapore	562	(1.2)	Singapore	566	(1.3)	Singapore	567	(1.2)
Korea	561	(4.3)	Shanghai-China	562	(3.4)	Korea	555	(3.6)
Japan	552	(3.1)	Korea	553	(4.5)	**Hong Kong-China**	**550**	**(3.6)**
Macao-China	540	(1.0)	**Hong Kong-China**	**550**	**(3.4)**	Japan	545	(3.3)
Hong Kong-China	**540**	**(3.9)**	Macao-China	543	(1.1)	Canada	532	(2.3)
Shanghai-China	536	(3.3)	Japan	539	(3.3)	Shanghai-China	531	(3.7)
Chinese Taipei	534	(2.9)	Chinese Taipei	537	(2.8)	Estonia	523	(2.8)
Canada	526	(2.4)	Canada	523	(2.2)	Australia	521	(1.7)
Australia	523	(1.9)	Estonia	516	(2.2)	Ireland	520	(3.0)
Finland	523	(2.3)	Belgium	512	(2.5)	Chinese Taipei	519	(3.0)
United Kingdom	517	(4.2)	Germany	509	(3.3)	Macao-China	515	(0.9)
Estonia	515	(2.5)	France	508	(3.3)	United States	511	(4.5)
France	511	(3.4)	Australia	508	(1.6)	France	511	(3.6)
Netherlands	511	(4.4)	Austria	507	(3.5)	Italy	504	(4.3)
Italy	510	(4.0)	Italy	499	(4.2)	Belgium	502	(2.6)
Czech Republic	509	(3.1)	United States	498	(4.1)	Norway	500	(3.5)
Germany	509	(3.6)	Norway	498	(2.8)	Sweden	498	(3.4)
United States	508	(3.9)	Slovak Republic	497	(3.5)	Denmark	495	(2.9)
Belgium	508	(2.5)	Denmark	496	(2.7)	Germany	494	(4.0)
Austria	506	(3.6)	Ireland	493	(2.9)	Portugal	486	(4.4)
Norway	503	(3.3)	Sweden	490	(2.9)	Austria	480	(3.9)
Ireland	498	(3.2)	Russian Federation	489	(2.6)	Poland	477	(4.5)
Denmark	497	(2.9)	Poland	489	(4.0)	Slovak Republic	474	(3.5)
Portugal	494	(3.6)	Portugal	489	(3.1)	Slovenia	471	(1.3)
Sweden	491	(2.9)	Slovenia	487	(1.2)	Spain	466	(3.9)
Russian Federation	489	(3.4)	Spain	475	(3.2)	Russian Federation	466	(3.9)
Slovak Republic	483	(3.6)	Hungary	470	(3.9)	Israel	461	(5.1)
Poland	481	(4.4)	Israel	447	(5.6)	Chile	452	(3.6)
Spain	477	(4.1)	United Arab Emirates	434	(2.2)	Hungary	450	(4.4)
Slovenia	476	(1.5)	Chile	432	(3.3)	Brazil	436	(4.9)
Serbia	473	(3.1)	Brazil	421	(4.7)	United Arab Emirates	407	(3.3)
Croatia	466	(3.9)	Colombia	397	(3.2)	Colombia	396	(4.0)
Hungary	459	(4.0)	*OECD average*	497	(0.7)	*OECD average*	497	(0.6)
Turkey	454	(4.0)						
Israel	454	(5.5)						
Chile	448	(3.7)						
Cyprus	445	(1.4)						
Brazil	428	(4.7)						
Malaysia	422	(3.5)						
United Arab Emirates	411	(2.8)						
Montenegro	407	(1.2)						
Uruguay	403	(3.5)						
Bulgaria	402	(5.1)						
Colombia	399	(3.5)						
OECD average	*500*	*(0.7)*						

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

Figure 1. Distribution of Students at Each Proficiency Level of the CBA Problem Solving Scale (Hong Kong versus OECD Average)
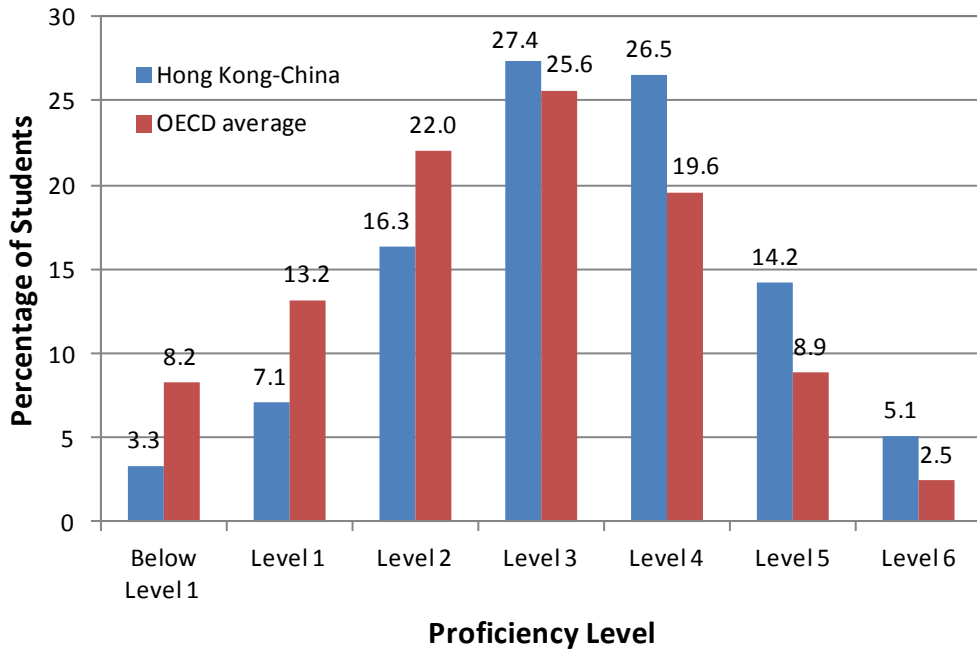

Figure 2. Percentage of Students Attaining Top Levels (Level 5 and Above) in CBA Problem Solving in Top Ten Countries/Economies
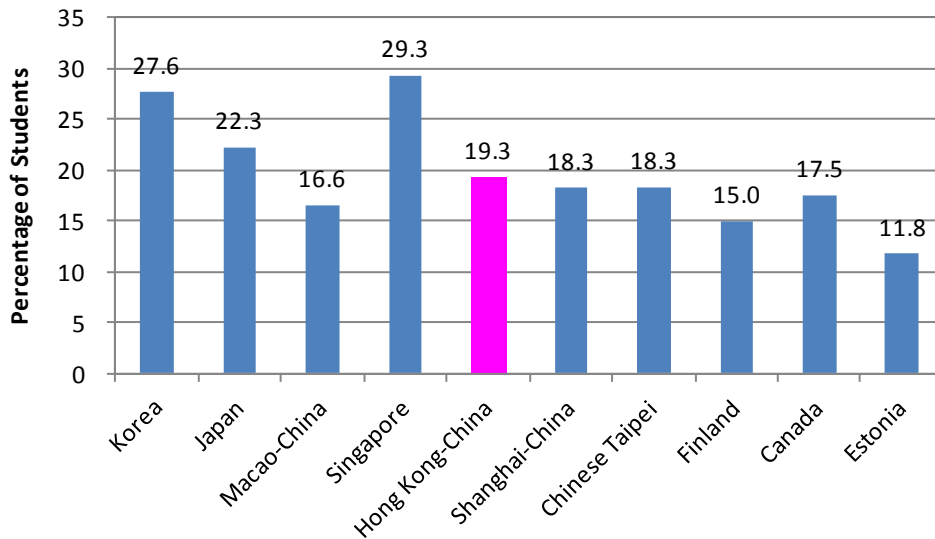
Figure 3. Percentage of Students Attaining Baseline Level (Level 2) in CBA Problem Solving in Top Ten Countries/Economies
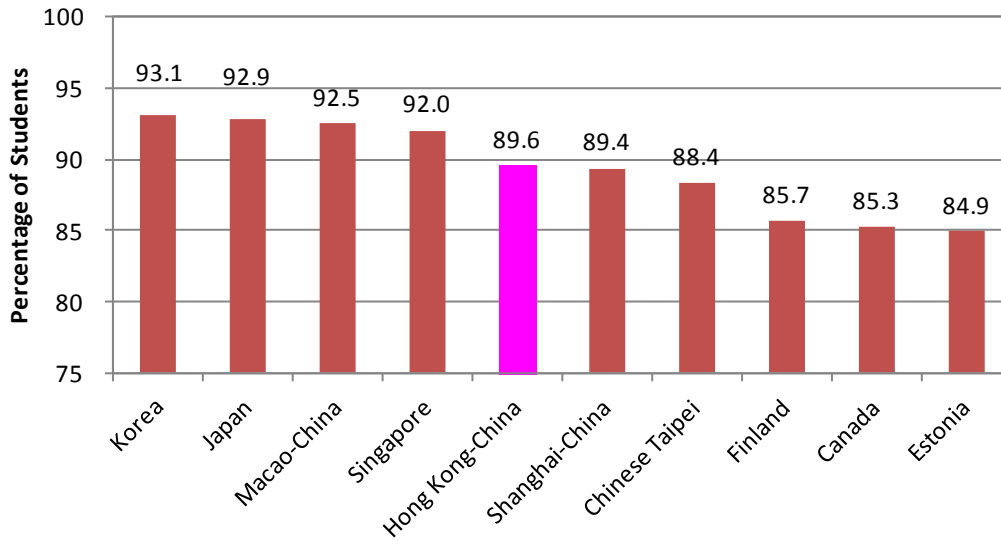

Figure 4. Percentage of Schools Reporting that Shortage of ICT Resources in School Had Affected Teaching Quality (PISA 2012)
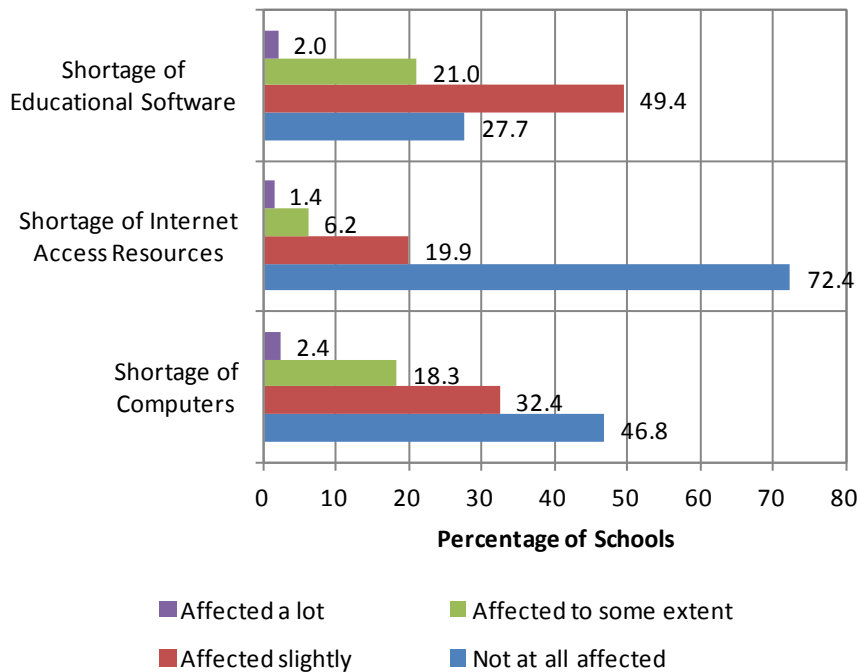
Figure 5. Relationship between Online Activities and CBA Problem Solving Performance of Hong Kong Students

Chart: CBA Problem Solving Mean Score

Using email
- Never or hardly ever: 517
- Once or twice a month: 537
- Once or twice a week: 552
- Almost every day or Every day: 556

Reading news on the Internet
- Never or hardly ever: 514
- Once or twice a month: 530
- Once or twice a week: 546
- Almost every day or Every day: 548

Obtaining practical information from the Internet
- Never or hardly ever: 500
- Once or twice a month: 537
- Once or twice a week: 548
- Almost every day or Every day: 553

Participating in social networks
- Never or hardly ever: 515
- Once or twice a month: 518
- Once or twice a week: 543
- Almost every day or Every day: 545

Downloading music, films, games or software from the Internet
- Never or hardly ever: 527
- Once or twice a month: 552
- Once or twice a week: 542
- Almost every day or Every day: 535

CBA Problem Solving Mean Score

Legend:
- Never or hardly ever
- Once or twice a month
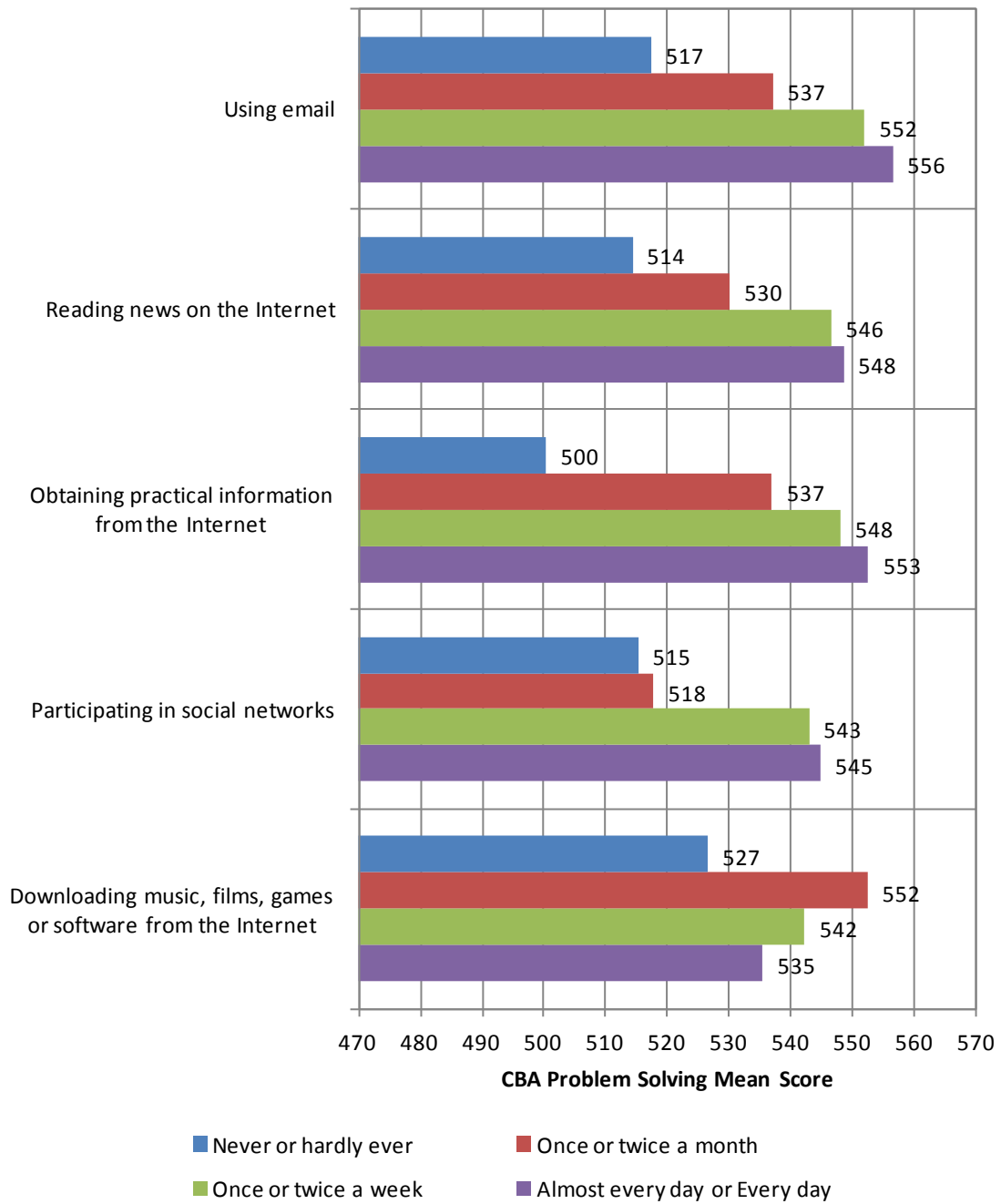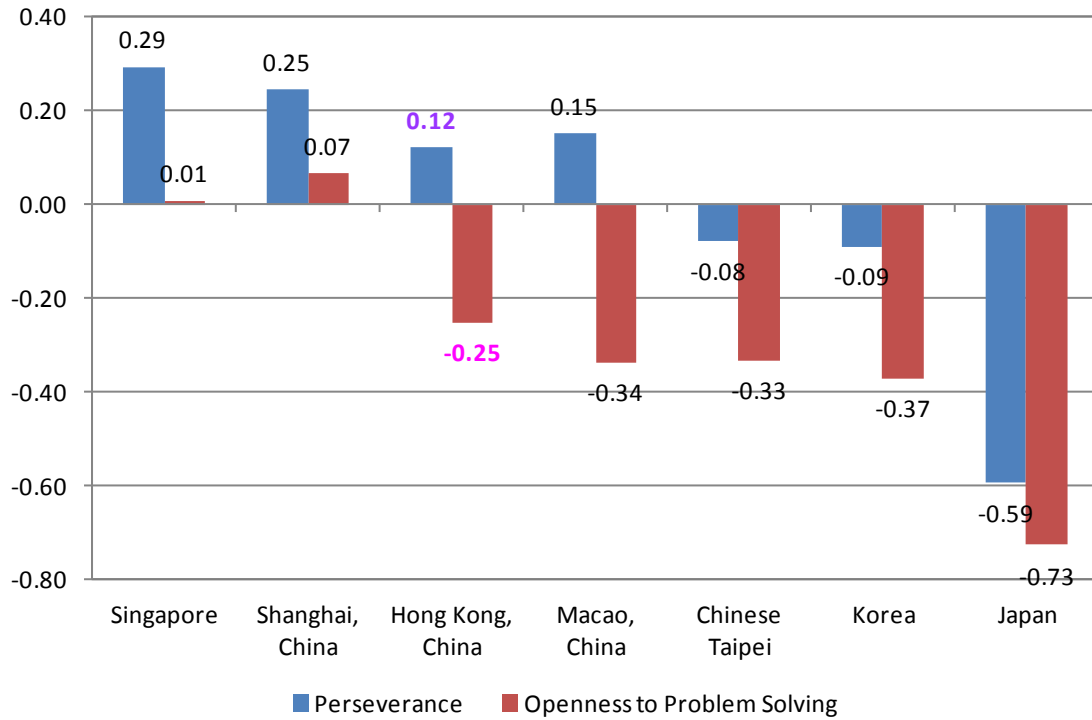- Once or twice a week
- Almost every day or Every day

Figure 6. Indices of Perseverance and Openness towards Problem Solving of Students in East Asian Societies

Note: 1.   The OECD average is 0.00
2.   Perseverance refers to working on tasks until everything is perfect, not giving up easily, and doing more than what is expected when confronting with a problem.
3.   Openness refers to seeking explanations of things, linking facts together, and not avoiding complexity when confronting with a problem.

Figure 7. Relationship between Perseverance and Openness towards Problem Solving and CBA Problem Solving Performance of Hong Kong Students
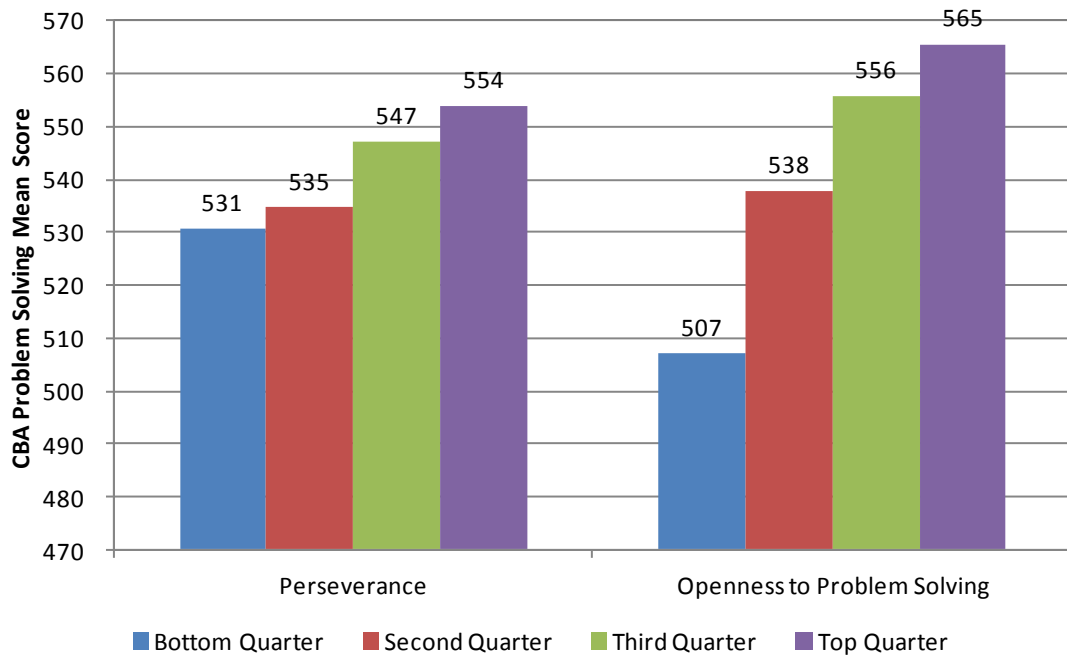
Figure 8. Relationship between Perseverance and Openness towards Problem Solving and CBA Mathematics Performance of Hong Kong Students
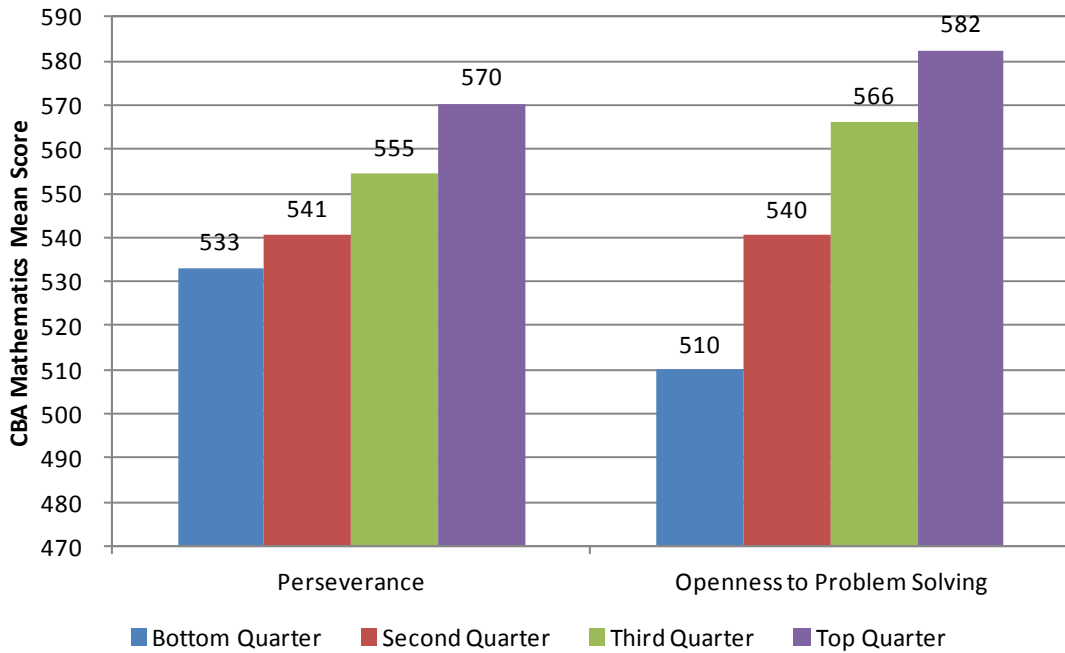

Figure 9. Relationship between Perseverance and Openness towards Problem Solving and Digital Reading Performance of Hong Kong Students