LCQ17: Scientific, reading and mathematical literacy of Hong Kong students

Following is a question by the Hon Cheung Kwok-kwan and a written reply by the Secretary for Education, Mr Kevin Yeung, in the Legislative Council today (January 8):

Question:

According to the study results of the "Programme for International Student Assessment 2018" released last month by the Organisation for Economic Co-operation and Development, among the 79 countries or economies participating in the study, Hong Kong's 15-year-old students ranked fourth in both (i) mother tongue reading and (ii) mathematical literacy, dropping by two places as compared with the rankings in the last study, and kept the ranking of the ninth place in (iii) scientific literacy. Mainland and Macao students' scores in all of the aforesaid three literacy domains were higher than those of Hong Kong students (with Mainland students even achieving the highest scores), and Hong Kong students' scores in scientific and reading literacy hit a record low since 2006. In view of the aforesaid study results, quite a number of Hong Kong people are worried that Hong Kong students are gradually losing their competitiveness as their academic competence is declining and has been overtaken by their counterparts in neighbouring regions. In this connection, will the Government inform this Council:

(1) given that Hong Kong students' scores in reading and scientific literacy both dropped and their scores in the aforesaid three literacy domains were all lower than those of their Mainland and Macao counterparts, how the Education Bureau (EDB) interprets the aforesaid study results, and whether the EDB has avoided the important and dwelt on the trivial in making the comment, in a press release it issued after the release of the aforesaid study results, that Hong Kong students' "performance in these three areas was significantly higher than the international level";

(2) given that it has been more than four years since education on Science, Technology, Engineering and Mathematics (STEM) was promoted in primary and secondary schools, whether the EDB has studied the reasons why Hong Kong students' score in scientific literacy has dropped instead and hit a record low since 2006; if the EDB has, of the details; whether the EDB will review if the deployment and utilisation of STEM education resources are appropriate and effective;

(3) as some academics have pointed out that the drop in the score of Hong Kong students in scientific literacy may be related to the decrease in recent years in the number of senior secondary students taking the subjects of physics, biology and chemistry simultaneously, whether the EDB will review

the weighting of science subjects in the senior secondary curriculum, as well as the levels and contents of those subjects;

(4) whether the EDB will right away put in place effective measures to enhance local students' literacy in mathematics and science, and whether the EDB will study and make reference to the merits of the education systems in Macao and the Mainland in order to improve Hong Kong's education system; and

(5) of the new measures in place to promote a reading culture among Hong Kong youngsters so as to enhance their reading literacy?

Reply:

President,

The Programme for International Student Assessment (PISA) is organised by the Organisation for Economic Co-operation and Development (OECD). It aims to assess how well 15-year-old students in participating countries/economies have acquired the knowledge and skills essential for meeting the challenges of our society, and develop educational indicators for governments and policy makers of different countries to examine, evaluate and monitor the effectiveness of their education systems both at national and school levels. Since 2000, PISA has been conducted every three years, assessing students' mother tongue reading, mathematical and scientific literacy. Around 600 000 students from 79 countries/economies participated in PISA 2018.

Hong Kong's education, which aims at facilitating students' learning, provides a broad spectrum of knowledge and nurtures high-level thinking, generic skills and positive values to achieve whole-person development. Our primary concern in curriculum design and delivery is the interest of students and their outcomes. In line with this policy objective, we will carefully study the findings of PISA 2018 to understand the strengths and weaknesses of our students, and review the effectiveness of the curriculum as well as learning and teaching in the light of the successful experience of countries/economies with outstanding performance in order to further enhance the quality of education in Hong Kong and improve the competitiveness of our students internationally.

Our reply to the Hon Cheung Kwok-kwan's question is as follows:

(1) PISA 2018 showed that, among the 79 countries/economies participating in the study, Hong Kong's 15-year-old students ranked fourth in both mother tongue reading and mathematical literacy, and ninth in scientific literacy. In reading literacy, although the ranking of Hong Kong students dropped slightly from second in 2015 and their score dropped marginally from 527 to 524, the score was still significantly above the OECD average of 487. The results reveal that Hong Kong students' performance was still outstanding. As for mathematical literacy, despite the slight drop in the ranking of our students in PISA 2018, the average score increased from 548 in 2015 to 551 in 2018, significantly above the OECD average (the OECD average scores in 2015 and 2018 were 490 and 489 respectively). In addition, 29 per cent of Hong

Kong students attained the highest level of mathematical literacy (i.e. Levels 6 and 5 on a scale from 1 to 6), higher than 26.5 per cent in PISA 2015 and significantly above the OECD 2018 average of 10.9 per cent, reflecting that our students' performance in mathematical literacy remained outstanding. As for scientific literacy, Hong Kong students' ranking did not drop, staying at the ninth in both PISA 2018 and PISA 2015. Although the average score in science (517) was slightly lower than that in the previous assessment (523), the OECD average score in science dropped from 493 in 2015 to 489 in 2018 as well. Compared with other OECD countries/economies, Hong Kong students attained an average score that was significantly higher than the OECD average, sustaining good overall performance. In sum, Hong Kong's performance in the above three areas was significantly above the international level.

(2) The Education Bureau (EDB) released the Report on "Promotion of STEM Education – Unleashing Potential in Innovation" in late 2016, and has been actively promoting STEM education by implementing a wide range of strategies, so as to enable students to develop abilities required to excel in the 21st century. These strategies included, among others, renewing the curriculum of the Science Education Key Learning Area (KLA), enhancing teachers' professional training in STEM education, and providing resources to support schools in taking forward school-based STEM education projects. STEM education is not a separate and new subject, but is implemented in local primary and secondary curricula through the Science, Technology and Mathematics Education KLAs (such as Mathematics at the primary and secondary levels, Science and Computer Literacy at the junior secondary level, and General Studies at the primary level). These KLAs must be included in both primary and secondary school education. The aims of promoting STEM education are to enable students to recognise the relationship between innovative technology and their daily lives, to enhance their ability in integration and application of knowledge and skills learnt in the relevant KLAs, and to nurture their collaborative, hands-on, minds-on and creative problem-solving skills. Evaluation of the effectiveness of STEM education in schools by merely looking at the PISA rankings of students in mathematical and scientific literacy is far from comprehensive. Given the different circumstances and developmental focus of schools, the pace at which STEM education is promoted in schools may, understandably, vary. All along, we have gained an understanding of the progress of implementation of STEM education in schools, including the effectiveness of relevant supporting measures, through various channels (including daily liaison with schools, school visits, school inspections and questionnaires). Leveraging their existing strengths, schools have generally implemented school-based STEM education. By improving the design of STEM learning activities, most schools have provided their students with STEM-based learning activities and assessment tasks, which include investigations, "hands-on and minds-on" activities, "design-and-make" activities, problem-solving activities, and open-ended assessment tasks related to daily life, to enhance their problem-solving skills, creativity and innovation. As a result, many students have become more interested in STEM and more proactive in learning with self-confidence, fully demonstrating the positive impact brought by STEM education on students.

(3) and (4) We have been discussing with stakeholders the strengths and weaknesses of our students in learning by actively making reference to PISA-related data and the practices of other countries/economies, with a view to optimising the learning and teaching of science and enhancing students' interests and capabilities in science and technology. Apart from international studies, the EDB has been keeping an eye on the learning and performance of Hong Kong students from multi-perspectives through different sources including school inspection reports, students' overall performance in the Hong Kong Diploma of Secondary Education Examination, and their performance in major international competitions.

The senior secondary curriculum and subjects under the New Academic Structure (NAS), implemented since 2009, are formulated prudently upon extensive consultation, taking into account different factors including, among others, social demands, students' needs, lateral coherence of various subjects, and international benchmarks. Students' needs and school contexts have been considered from a professional perspective to provide an adequate choice of subjects to students with different aptitudes, abilities and backgrounds. The former division between the arts and science streams in the old system has been replaced with a broad and balanced senior secondary curriculum under the NAS. The proportion of senior secondary students taking one or more STEM-related elective subjects has remained at about 60 per cent in recent years, and Biology, Physics and Chemistry have also been among the most popular elective subjects for senior secondary students.

The EDB has all along reviewed the implementation of the curriculum in a timely manner, including drawing reference from different places' curricula and curricula implementation as well as their successful experience, and has promoted the professional development of teachers through international exchange platforms at various levels so as to improve students' learning effectiveness and continuously enhance the quality of education in Hong Kong. We conducted the NAS Review from 2012 to 2015 to improve the implementation of the senior secondary curriculum and assessment. We established the Task Force on Review of School Curriculum (Task Force) in November 2017 to holistically review the implementation of the primary and secondary curricula. The Task Force conducted a public consultation from June to October 2019 on its six directions of preliminary recommendations, including how to enhance STEM education in primary and secondary schools. Upon the Task Force's submission of its final report in early 2020, the EDB will consider and implement various recommendations, where feasible, as soon as possible.

(5) To further enhance the reading interests and abilities of students, we will draw reference from the successful experience of other places and continue with our efforts in the promotion of "Reading to Learn". We will also continue to strengthen the support for schools, including providing a recurrent grant to facilitate schools to further promote reading starting from the 2018/19 school year, implementing the new "Reading across the Curriculum" initiative and the reform of the Chinese Language Curriculum introduced in recent years, as well as providing continuous programmes/training for teachers' professional development and the learning

and teaching resources on reading to help teachers (including teacher-librarians) employ appropriate reading strategies and organise reading activities.