

# Hong Kong SAR

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## Introduction

### Overview of Education System<sup>1</sup>

Hong Kong's education system is globally acclaimed for its exceptional rigor and quality. Under the supervision of the Education Bureau (EDB), a government agency responsible for formulating education policies and decisions, the system encompasses various education stages, namely preprimary, primary, secondary, and postsecondary education, each designed to cater to different developmental phases of students.

In the initial stage of education, children between the ages of 3 and 6 are enrolled in kindergartens. The kindergarten education curriculum emphasizes fostering children's learning interest, building proper values and positive attitudes, and enhancing self-confidence as well as self-care abilities. A direct subsidy is provided to local nonprofit kindergartens joining the Kindergarten Education Scheme, which is, in principle, sufficient for the provision of quality half-day kindergarten services for all eligible children.

In Hong Kong, the education system features various types of schools, such as government schools, aided schools, direct subsidy scheme (DSS) schools, and private schools. Government schools are operated directly by the government. Aided schools (mostly run by religious, charitable, or clan organizations) are fully subvented by the government and are managed by incorporated management committees or school management committees. In addition, there are DSS schools, which can charge school fees and receive government subvention based on enrollment, and self-financed private schools providing alternatives to parents.

The government is committed to developing a vibrant international school sector mainly to meet the demand for international school places from nonlocal families living in Hong Kong and families coming to Hong Kong for work or investment.

At the postsecondary level, publicly funded and self-financing programs at subdegree, undergraduate, and levels above undergraduate are available in Hong Kong. Publicly funded programs are provided by the eight University Grants Committee (UGC)-funded universities, the Hong Kong Academy for Performing Arts, and the Vocational Training Council (VTC). Postsecondary institutions provide articulation pathways with multiple entry and exit points.

Primary education, covering a span of 6 years from Primary 1 to Primary 6, caters to children typically ages 6 to 12. This phase is crucial in offering a comprehensive curriculum that includes subjects such as Chinese language, English language, mathematics, general studies, music,

physical education, and visual arts. The main goal is to develop students' learning capacities and interests, as well as to lay a solid foundation in students to deepen their knowledge, skills, values, and attitudes when they proceed to secondary education. Assessment during this phase of education prioritizes continuous and formative evaluations, focusing on holistic student development rather than relying solely on high-stakes testing.

Secondary education in Hong Kong is bifurcated into two distinct stages: junior secondary, spanning 3 years from Secondary 1 to Secondary 3, and senior secondary, also lasting 3 years, from Secondary 4 to Secondary 6. The junior secondary stage provides a broad-based education that prepares students for the more focused and specialized studies at the senior secondary stage. Key learning areas (KLA) at this stage include Chinese Language Education; English Language Education; Mathematics Education; Personal, Social, & Humanities Education; Science Education; Technology Education; Arts Education; and Physical Education. The senior secondary phase is particularly critical, as it culminates in the Hong Kong Diploma of Secondary Education (HKDSE), an essential qualification for university admission. This phase of education is broad and balanced with diversification and specialization and prepares students for higher education and their future professional careers.

### Use and Impact of TIMSS

Hong Kong has actively participated in TIMSS since its inception. TIMSS results are used in a variety of ways to inform education policies in the region. One of the key uses of TIMSS is benchmarking Hong Kong students' performance against international standards. The results provide valuable comparative data, allowing policymakers to assess Hong Kong's standing in relation to other countries and identify areas for improvement.

TIMSS results have provided the most useful indicators for Hong Kong to evaluate its education policies. The data obtained from TIMSS have informed curriculum development. For instance, if the results indicate that students are struggling with specific mathematical concepts, adjustments can be made to the curriculum to address these challenges. TIMSS data have also influenced the development of assessment frameworks and teaching strategies to enhance student learning outcomes.

Furthermore, TIMSS results have shed light on the strengths and weaknesses of Hong Kong's education system. Policymakers and educators can analyze the data to identify patterns and trends in student performance, allowing them to make informed decisions on resource allocation and instruction practices. The information derived from TIMSS has helped shape policies aimed at enhancing teaching and learning in mathematics and science.

TIMSS has also raised public awareness and engagement in education matters. The release of TIMSS results stimulates discussions among educators, parents, policymakers, and the general public. This increased awareness fosters a sense of accountability and encourages stakeholders to work collaboratively to improve the quality of education in Hong Kong.

# The Mathematics Curriculum in Primary and Lower Secondary Grades

## Fourth-Grade Mathematics Curriculum

In Hong Kong, the mathematics curriculum for the majority of students in the fourth grade of primary school is guided by the Mathematics Education KLA curriculum framework.<sup>2</sup> The time allocated to Mathematics KLA should account for no less than 11% of the lesson time over the 6 years of primary education. The framework, developed by the Curriculum Development Council (CDC) under the EDB, outlines the learning objectives, content, and pedagogical approaches for mathematics instruction.

The fourth-grade mathematics curriculum focuses on developing students' foundational mathematical knowledge and skills. It covers various mathematical domains, including Number Sense, Measurement, Geometry, and Data Handling. Students learn to perform basic arithmetic operations with whole numbers, such as addition, subtraction, multiplication, and division, as well as addition and subtraction with fractions and decimals. They also explore geometric concepts, such as shapes and angles, and develop an understanding of measurement, including length, weight, capacity, time, and area. Exhibits 1 and 2 summarize the mathematics learning targets for Key Stages 1 and 2, respectively, in Hong Kong.

### Exhibit 1: Learning Targets for Key Stage 1 (Primary 1 to 3)

Strand	Students are expected to:
Number	<ul style="list-style-type: none"> <li>● recognize concepts of whole numbers<sup>a</sup> and simple fractions</li> <li>● recognize and use the commutative and associative properties of addition and multiplication</li> <li>● perform four arithmetic operations of whole numbers and addition and subtraction of simple fractions, and check the reasonableness of results</li> <li>● use numbers to formulate and solve simple problems</li> </ul>
Measures	<ul style="list-style-type: none"> <li>● recognize concepts of length, distance, weight, and capacity</li> <li>● use different ways to compare the length, weight, capacity of objects, and distance between objects and record the results</li> <li>● understand the need for using standard units of measurements</li> <li>● choose and use appropriate measuring tools and standard units to compare the length, weight, capacity of objects, and distance between objects and record the results</li> <li>● estimate the result of measurements</li> <li>● recognize money, time, and date and their use in daily life</li> <li>● integrate knowledge in the strands of Number, Measures, and Shape and Space to solve simple problems</li> </ul>

<sup>a</sup> In the primary mathematics curriculum, "whole numbers" refers to non-negative integers.

### Exhibit 1: Learning Targets for Key Stage 1 (Primary 1 to 3) (Continued)

Strand	Students are expected to:
Shape and Space	<ul style="list-style-type: none"> <li>• identify intuitively and describe 2D and 3D shapes</li> <li>• recognize properties of points and lines and the concept of faces of 3D shapes</li> <li>• recognize concepts of right angles, acute angles, and obtuse angles</li> <li>• recognize concepts of perpendicular and parallel</li> <li>• recognize concepts and properties of squares, rectangles, parallelograms, and trapeziums</li> <li>• recognize inclusion relations<sup>b</sup> between parallelograms and squares, and parallelograms and rectangles</li> <li>• recognize inclusion relations between different types of triangles</li> <li>• make 2D shapes and appreciate the beauty of geometric shapes</li> <li>• describe the relative position of different objects and recognize the four directions</li> </ul>
Data Handling	<ul style="list-style-type: none"> <li>• recognize the importance of the organization and representation of statistical data</li> <li>• collect and group statistical data according to given criteria</li> <li>• use appropriate scales to construct simple statistical charts and interpret them</li> <li>• formulate and solve simple problems arising from statistical data or statistical charts</li> </ul>

### Exhibit 2: Learning Targets for Key Stage 2 (Primary 4 to 6)

Strand	Students are expected to:
Number	<ul style="list-style-type: none"> <li>• recognize and use the distributive property of multiplication</li> <li>• recognize concepts of prime numbers and composite numbers</li> <li>• understand concepts of highest common factors and least common multiples</li> <li>• understand concepts of whole numbers, fractions, decimals, percentages, and the relations among them</li> <li>• perform four arithmetic operations of whole numbers, fractions, and decimals, and check the reasonableness of results</li> <li>• use numbers to formulate and solve problems</li> </ul>

<sup>b</sup> Inclusion relations in shapes refer to the way different geometric figures can be contained within one another. This concept is often discussed in the context of sets, where one shape can be considered a subset of another.

## Exhibit 2: Learning Targets for Key Stage 2 (Primary 4 to 6) (Continued)

Strand	Students are expected to:
Algebra	<ul style="list-style-type: none"> <li>• use symbols to represent numbers</li> <li>• use algebraic expressions to represent the operations of and relations between quantities that are described in words and involve unknown quantities</li> <li>• use algebra to formulate and solve simple problems and recognize how to check the reasonableness of results</li> </ul>
Measures	<ul style="list-style-type: none"> <li>• recognize the concepts of perimeter, area, volume, and speed</li> <li>• use different ways to compare the perimeter and area of 2D shapes, volume, and speed of objects, and record the results</li> <li>• choose appropriate standard units to measure and compare the perimeter and area of 2D shapes, volume, and speed of objects, and record the results</li> <li>• use measuring tools and standard units to measure, compare, and draw angles of different sizes</li> <li>• recognize the degree of accuracy of measurements</li> <li>• estimate the result of measurements</li> <li>• inquire and use measurements formulae of 2D shapes and 3D shapes</li> <li>• recognize relation between volume and capacity and solve problems</li> <li>• perform interconversion between units of time and solve problems related to time and speed</li> <li>• integrate knowledge in the strands of Number, Measures, and Shape and Space to formulate and solve problems</li> </ul>
Shape and Space	<ul style="list-style-type: none"> <li>• recognize concepts and properties of rhombuses and circles</li> <li>• recognize the inclusion relations between different types of quadrilaterals</li> <li>• recognize the concept of vertices and edges of 3D shapes</li> <li>• recognize the concept and properties of spheres</li> <li>• make 2D shapes and 3D shapes from given information and appreciate the beauty of geometric shapes</li> <li>• recognize the eight compass points</li> </ul>

## Exhibit 2: Learning Targets for Key Stage 2 (Primary 4 to 6) (Continued)

Strand	Students are expected to:
Data Handling	<ul style="list-style-type: none"> <li>• understand criteria for organizing and representing statistical data</li> <li>• use approximate values and appropriate scales to construct statistical charts and interpret them</li> <li>• recognize relations of data and patterns on the changes of data from statistical charts</li> <li>• recognize the concept of average and solve problems</li> <li>• formulate and solve problems arising from statistical data or statistical charts</li> <li>• choose appropriate statistical charts to represent given data</li> <li>• judge the appropriateness of the representation of statistical charts</li> </ul>

To correspond to the Primary Education Curriculum Guide (PECG) (pilot version) launched in 2022,<sup>3</sup> primary schools should consider their own contexts, developments in various curriculum areas, and school priorities to incorporate the major renewed emphases indicated in the PECG into their school development plans and school curriculum (see Exhibit 3). Thus, the mathematics curriculum includes elements of problem-solving, critical-thinking, and communication skills. Students are encouraged to apply mathematical knowledge and strategies to solve real-world problems and present their solutions using appropriate mathematical language and representations. The curriculum also promotes the use of manipulatives and technology to enhance conceptual understanding and mathematical reasoning.

## Exhibit 3: Major Renewed Emphases of the PECG (Pilot Version) (2022)

Direction/Guideline	Details
Updated seven learning goals of primary education	<ul style="list-style-type: none"> <li>• national identity</li> <li>• positive values and attitudes</li> <li>• knowledge of KLAs</li> <li>• language skills</li> <li>• generic skills</li> <li>• reading and information literacy</li> <li>• healthy lifestyle</li> </ul>
Three major directions of ongoing renewal of primary school curriculum	<ul style="list-style-type: none"> <li>• cultivating values</li> <li>• creating space</li> <li>• student-centred learning</li> </ul>



### Exhibit 3: Major Renewed Emphases of the PECG (Pilot Version) (2022) (Continued)

Direction/Guideline	Details
Seven major renewed emphases of ongoing renewal of primary school curriculum	<ul style="list-style-type: none"> <li>• strengthening values education (including life education, national education, and national security education)</li> <li>• making good use of learning time and creating space to promote a balanced physical and mental development</li> <li>• enriching learning experiences relevant to all aspects of life and promoting whole-person development</li> <li>• better catering for learner diversity</li> <li>• reinforcing science, technology, engineering, arts, and mathematics (STEAM) education and nurturing students' media and information literacy</li> <li>• strengthening cross-curricular learning and reading across the curriculum for developing lifelong learning capabilities</li> <li>• enhancing assessment literacy for promoting learning and teaching effectiveness</li> </ul>

#### Eighth-Grade Mathematics Curriculum

In Hong Kong, the mathematics curriculum for the majority of students in the eighth grade of lower secondary school is based on the junior secondary (Key Stage 3, i.e., Grades 7 to 9) mathematics curriculum framework, building upon the foundation established in earlier grades. The curriculum aims to deepen students' mathematical understanding, enhance their abilities to communicate using mathematical language, develop critical-thinking skills, and foster a positive attitude toward learning mathematics.

The mathematics curriculum covers a wide range of topics in Key Stage 3, including algebra, geometry, measurement, data analysis, and probability. Students learn to solve equations and inequalities, work with algebraic expressions, and apply algebraic concepts to solve problems. They explore geometric properties and relationships, including angles, congruence, similarity, and transformations. Measurement topics include area, volume, and surface area, while data analysis involves organizing, representing, and interpreting data using statistical methods. Students also explore basic concepts of probability. Exhibit 4 lists the learning targets of the junior secondary mathematics curriculum.

#### Exhibit 4: Learning Targets for Key Stage 3 (Secondary 1 to 3)

Strand	Students are expected to:
Number and Algebra	<ul style="list-style-type: none"> <li>• recognize concepts of negative integers, negative rational numbers, and irrational numbers</li> <li>• further use numbers to formulate and solve problems</li> <li>• investigate and describe relationships between quantities using algebraic symbols, including patterns of sequences of numbers</li> <li>• interpret simple algebraic relations from numerical, symbolic, and graphical perspectives</li> <li>• manipulate simple algebraic expressions and relations, and apply knowledge and skills to formulate and solve simple real-life problems and justify the validity of the results obtained</li> <li>• apply knowledge and skills in the Number and Algebra strand to formulate and solve problems in other strands</li> </ul>
Measures, Shape, and Space	<ul style="list-style-type: none"> <li>• recognize errors in measurement and apply the knowledge to solve problems</li> <li>• extend concepts and formulae of measurements of 2D figures and 3D figures and apply the knowledge to solve problems</li> <li>• explore and visualize the geometric properties of 2D figures and 3D figures</li> <li>• use inductive and deductive approaches to study the properties of 2D rectilinear figures</li> <li>• perform geometric proofs involving 2D rectilinear figures with appropriate symbols, terminology, and reasons</li> <li>• inquire and describe geometric knowledge in 2D space using algebraic relations and apply the knowledge to solve problems</li> <li>• inquire and describe geometric knowledge in 2D space using trigonometric ratios and apply the knowledge to solve problems</li> <li>• apply knowledge and skills in the Measures, Shape, and Space strand to formulate and solve problems in other strands</li> </ul>
Data Handling	<ul style="list-style-type: none"> <li>• recognize methods of organizing discrete and continuous statistical data</li> <li>• further choose appropriate statistical charts to represent given data and interpret them</li> <li>• understand the measures of central tendency</li> <li>• select and use the measures of central tendency to describe and compare datasets</li> <li>• investigate and judge the validity of arguments derived from datasets</li> <li>• recognize the concept of probability and apply the knowledge to solve simple probability problems</li> <li>• integrate knowledge in statistics and probability to solve simple real-life problems</li> </ul>



Similar to primary education, the EDB hopes that mathematics education provides meaningful context for the developments of generic skills and positive values and attitudes, and corresponds to the seven learning goals of secondary education (see Exhibit 5). Thus, the junior secondary mathematics curriculum emphasizes the development of mathematical reasoning and communication skills. Students are encouraged to apply mathematical concepts and skills to analyze and solve complex problems in various contexts. They learn to justify their reasoning and communicate mathematical ideas effectively using appropriate mathematical language and representations.

### Exhibit 5: Three Directions/Guidelines in the Secondary Education Curriculum Guide

Direction/Guideline	Details
Seven learning goals of secondary education	<ul style="list-style-type: none"> <li>• national and global identity</li> <li>• breadth of knowledge</li> <li>• language proficiency</li> <li>• generic skills</li> <li>• information literacy</li> <li>• life planning</li> <li>• healthy lifestyle</li> </ul>
Nine generic skills (also applies to primary education)	<ul style="list-style-type: none"> <li>• communication skills (basic skills)</li> <li>• mathematical skills (basic skills)</li> <li>• information technology skills (basic skills)</li> <li>• critical-thinking skills (thinking skills)</li> <li>• creativity (thinking skills)</li> <li>• problem-solving skills (thinking skills)</li> <li>• self-management skills (personal and social skills)</li> <li>• self-learning skills (personal and social skills)</li> <li>• collaboration skills (personal and social skills)</li> </ul>
12 priority values and attitudes (also applies to primary education)	<ul style="list-style-type: none"> <li>• perseverance</li> <li>• respect for others</li> <li>• responsibility</li> <li>• national identity</li> <li>• commitment</li> <li>• integrity</li> <li>• benevolence</li> <li>• law-abidingness</li> <li>• empathy</li> <li>• diligence</li> <li>• unity</li> <li>• filial piety</li> </ul>

## The Science Curriculum in Primary and Lower Secondary Grades

### Fourth-Grade Science Curriculum

Similar to the mathematics curriculum, the science curriculum for the majority of students in the fourth grade of primary school is based on the Science Education KLA curriculum framework developed by the CDC and the EDB.<sup>4</sup> Science education is one of the three components within the subject general studies for primary school (the other two components are Personal, Social, and Humanities Education and Technology Education); the school should allocate not less than 11% of lesson time throughout the 6 primary school years for general studies.

The fourth-grade science curriculum aims to develop students' scientific literacy and inquiry skills. It covers various scientific domains, including Physical Science, Life Science, Earth Science, and Environmental Science. Students explore key scientific concepts and phenomena through hands-on investigations, observation, and data collection. They learn about the properties of matter, energy, forces, and motion in Physical Science. In Life Science, they study topics such as plants, animals, ecosystems, and the human body. Earth Science topics include Earth's materials, weather, and natural resources. Environmental Science focuses on understanding the interrelationships between humans and the environment, including conservation and sustainability. The learning objectives at Key Stages 1 and 2 are listed in Exhibits 6 and 7, respectively.

#### Exhibit 6: Learning Objectives for Science Education at Key Stage 1 (Primary 1 to 3)

Strand	Learning Objectives
Scientific Investigation	<ul style="list-style-type: none"> <li>• to show curiosity and interest in exploring the environment</li> <li>• to observe phenomena in daily life</li> <li>• to make simple measurements and grouping</li> <li>• to record observations and make simple presentations</li> <li>• to conduct simple scientific investigations</li> </ul>
Life and Living	<ul style="list-style-type: none"> <li>• to show love and care to living things and the environment</li> <li>• to recognize the observable characteristics and needs of living things</li> <li>• to recognize the different stages of growth and development in living things</li> <li>• to recognize some body parts and their functions</li> <li>• to develop healthy living habits</li> <li>• to be aware of the interaction between living things and the environment</li> <li>• to appreciate the existence of a variety of living things</li> </ul>

### Exhibit 6: Learning Objectives for Science Education at Key Stage 1 (Primary 1 to 3) (Continued)

Strand	Learning Objectives
The Material World	<ul style="list-style-type: none"> <li>to identify some common materials and their uses in daily life</li> <li>to identify the characteristics and changes of common materials using senses</li> <li>to design and make artifacts with common materials</li> <li>to show concern for the environment and be committed to environmentally friendly practices in daily life</li> </ul>
Energy and Change	<ul style="list-style-type: none"> <li>to recognize sources of energy and know their uses in daily life</li> <li>to recognize heat transfer and some related phenomena</li> <li>to understand the need for saving energy</li> <li>to describe energy use at home and in school</li> </ul>
Earth and Beyond	<ul style="list-style-type: none"> <li>to recognize and describe the basic patterns and objects in the sky</li> <li>to identify some features of weather changes</li> <li>to identify the features of day and night and how they are related to people's life patterns</li> </ul>
Science, Technology, Society, and Environment	<ul style="list-style-type: none"> <li>to be aware that science and technology are closely connected to activities in one's daily life</li> <li>to show concern about the safety issues in relation to the use of science and technology</li> <li>to develop a caring attitude toward living things and the environment</li> <li>to recognize the proper ways of treating living things and the environment</li> </ul>

### Exhibit 7: Learning Objectives for Science Education at Key Stage 2 (Primary 4 to 6)

Strand	Learning Objectives
Scientific Investigation	<ul style="list-style-type: none"> <li>to show curiosity and sustained interest in exploring science and technology</li> <li>to make observations, conduct measurements, record data, and present findings</li> <li>to discuss observations and suggest simple interpretations</li> <li>to classify things according to common properties or features</li> <li>to design and conduct simple scientific investigations</li> </ul>
Life and Living	<ul style="list-style-type: none"> <li>to respect and care for all living things and show concern for endangered species</li> <li>to recognize functions of major organs and systems of the body</li> <li>to be aware of the physical and emotional changes during puberty</li> <li>to show basic understanding of the life cycle of some living things</li> </ul>

## Exhibit 7: Learning Objectives for Science Education at Key Stage 2 (Primary 4 to 6) (Continued)

Strand	Learning Objectives
Life and Living	<ul style="list-style-type: none"> <li>• to recognize ways of keeping one’s body healthy</li> <li>• to recognize the interdependence of living things and their environment</li> <li>• to appreciate the existence of a variety of living things in this world</li> </ul>
The Material World	<ul style="list-style-type: none"> <li>• to explore some physical properties of common materials in relation to their suitability for different purposes</li> <li>• to recognize the use of some materials and their impacts on humans and the environment</li> <li>• to design and build models by using different materials</li> <li>• to distinguish between reversible changes and those that cannot be easily reversed</li> <li>• to make wise use of natural resources and develop a lifestyle that promotes sustainable development</li> </ul>
Energy and Change	<ul style="list-style-type: none"> <li>• to recognize some patterns or phenomena related to light, sound, electricity, and object movement</li> <li>• to recognize different forms of energy involved in energy change</li> <li>• to use energy wisely and save energy in daily life</li> <li>• to recognize the safety measures in using energy of different forms in daily life</li> </ul>
Earth and Beyond	<ul style="list-style-type: none"> <li>• to recognize Earth as a wealth of resources to fulfill humans’ needs</li> <li>• to identify and describe climate and seasonal changes and their effects on human life</li> <li>• to illustrate some natural phenomena observable on Earth caused by the movement of the Sun, Earth, and the Moon</li> <li>• to appreciate the wonder of the universe and the contributions of space exploration to everyday life</li> </ul>
Science, Technology, Society, and Environment	<ul style="list-style-type: none"> <li>• to recognize the applications and effects of scientific and technological advances in daily life</li> <li>• to appreciate some important people who have contributed to scientific and technological advancements of this world</li> <li>• to show concern for the environment and climate changes and recognize the importance of environmental conservation</li> <li>• to recognize that the study of science and technology can both increase one’s understanding of the world and improve the quality of human life</li> <li>• to identify the issues related to personal health and safety and take appropriate actions to safeguard these in daily life</li> </ul>

The curriculum promotes inquiry-based learning, where students actively engage in scientific inquiry, formulate questions, design experiments, and analyze data to draw evidence-based conclusions. It emphasizes the development of science process skills, such as observation, data collection, classification, prediction, and inference. Students are encouraged to communicate their findings and explanations using scientific language and representations. In implementing the curriculum, schools should also consider embedding the important elements listed in Exhibit 3.

## The New Provisional Primary Science Curriculum in Academic Year 2025–2026<sup>5</sup>

To better promote STEAM education and innovation and technology (I&T) learning in primary and secondary schools, the EDB is taking several actions. These include improving school curricula, increasing teacher training, and offering resource support. These efforts aim to help schools enhance science and I&T education for all students and foster talent development. Starting in academic year 2025–2026, all primary schools in Hong Kong must start implementing the primary science curriculum at Primary 1 (Grade 1) and Primary 4 (Grade 4) and progressively implement it in other grade levels.

With the motto of “Explore With Curiosity, Learn Through Applying, Innovate for Tomorrow,” the new primary science curriculum focuses on nurturing students’ curiosity, imagination, and thirst for knowledge about their world and environment. It aims to develop their science process skills and establish a foundation of basic scientific knowledge and concepts. The new science curriculum should take up not less than 7% of the lesson time across the 6 primary years (compared with 11% of general studies that included three learning components); thus, the lesson time dedicated to science education will significantly increase. The curriculum covers four learning strands: Life and Environment; Matter, Energy, and Changes; Earth and Space; and Science, Technology, Engineering, and Society, with a total of 15 themes across the four strands.

### Eighth-Grade Science Curriculum

In Hong Kong, the science curriculum for the majority of students in the eighth grade of lower secondary school is also based on the Science Education KLA framework. The curriculum builds upon the foundational knowledge and skills developed in earlier grades, aiming to deepen students’ understanding of scientific concepts, processes, and applications. It is suggested that the science curriculum should account for 10 to 15% of the total lesson time over the 3 years of Key Stage 3.

The eighth-grade science curriculum covers a wide range of scientific disciplines, including physics, chemistry, biology, and earth science. Students delve deeper into topics such as forces, energy, matter, chemical reactions, cells, genetics, ecology, and geological processes. They explore the fundamental principles and laws that govern the natural world and investigate complex scientific phenomena through laboratory experiments and investigations. Exhibit 8 summarizes the learning objectives for science education at Key Stage 3 (Secondary 1 to 3).

### Exhibit 8: Learning Objectives for Science Education at Key Stage 3 (Secondary 1 to 3)

Strand	Learning Objectives
Scientific Investigation	<ul style="list-style-type: none"> <li>• to identify problems for scientific investigations</li> <li>• to identify variables for fair tests</li> <li>• to plan, design, and conduct scientific investigations</li> <li>• to handle an apparatus appropriately with necessary precautions</li> <li>• to make detailed observations and record data</li> <li>• to make use of multiple representations to present findings from scientific investigations</li> <li>• to analyze data, draw conclusions, and evaluate the investigation process</li> </ul>
Life and Living	<ul style="list-style-type: none"> <li>• to develop interest in studying living things and show respect to all living things and the environment</li> <li>• to appreciate the diversity of life and to understand the basic principles of classification systems</li> <li>• to recognize that a cell is the basic unit of life</li> <li>• to develop basic understanding of some of the life processes</li> <li>• to recognize the processes related to reproduction and understand how a new life is born</li> <li>• to recognize DNA as the genetic material and the “book of life”</li> <li>• to understand the importance and ways of maintaining body health</li> <li>• to be aware of the impact of human activities on the environment and biodiversity</li> </ul>
The Material World	<ul style="list-style-type: none"> <li>• to recognize the physical and chemical properties of different materials</li> <li>• to recognize the uses of different materials in relation to their structures and properties</li> <li>• to understand the need to conserve natural resources</li> <li>• to recognize some chemical changes and the materials involved</li> </ul>
Energy and Change	<ul style="list-style-type: none"> <li>• to compare the energy options available for particular uses in society</li> <li>• to identify the processes of energy change and the conditions that may affect them</li> <li>• to identify the forms and transformation of energy in a series of interactions</li> <li>• to relate the observed changes in an energy receiver to the quantity of energy transferred</li> <li>• to recognize the environmental effects due to energy production and consumption</li> <li>• to recognize the need to conserve energy and act responsibly in daily life</li> </ul>



## Exhibit 8: Learning Objectives for Science Education at Key Stage 3 (Secondary 1 to 3) (Continued)

Strand	Learning Objectives
Earth and Beyond	<ul style="list-style-type: none"> <li>• to recognize the useful sources of minerals and other natural resources available on Earth</li> <li>• to understand the meanings and relationship of distance, speed, and time in describing motion</li> <li>• to describe the effects of force on the motion of an object on Earth</li> <li>• to appreciate the wonder of the universe and the contributions of space exploration to everyday life</li> </ul>
Science, Technology, Society, and Environment	<ul style="list-style-type: none"> <li>• to show basic understanding of the development of science and technology and its contribution to one’s life</li> <li>• to recognize the effects of human activities on the environment, climate, and natural resources on Earth</li> <li>• to act responsibly in conserving the environment for sustainable development</li> <li>• to recognize the usefulness and limitations of science and technology</li> </ul>

The curriculum emphasizes the development of scientific inquiry skills and critical-thinking abilities. Students are encouraged to design and conduct experiments, gather and analyze data, and draw evidence-based conclusions. They learn to evaluate scientific information critically, make connections between scientific concepts, and apply their knowledge to real-world situations. The curriculum also fosters scientific literacy, promoting an understanding of the nature of science and the ethical implications of scientific advancements. In implementing the curriculum, schools should also consider embedding the important elements listed in Exhibit 5.

## Teacher Professional Development Requirements and Programs

### Professional Development Requirements

In Hong Kong, professional development requirements for practicing mathematics and science teachers of fourth- and eighth-grade students aim to support teachers in enhancing their pedagogical knowledge, content knowledge, and instructional strategies.

For practicing teachers, ongoing professional development is encouraged and often mandated by the EDB and the schools themselves. Teachers are expected to participate in various professional development activities to stay updated with the latest research, teaching methodologies, and curriculum changes.

Specific requirements may vary depending on the school and the individual teacher’s needs, but common professional development expectations include attending subject-specific workshops, seminars, conferences, and training sessions. Teachers are encouraged to engage in collaborative learning communities and participate in curriculum development projects to share best practices and develop innovative teaching strategies.

## Ongoing Professional Development Programs

In Hong Kong, there are several ongoing professional development programs available to practicing mathematics and science teachers of fourth- and eighth-grade students. These programs are designed to provide continuous learning opportunities and support teachers in their professional growth. Programs include the following:

- subject-specific workshops—The EDB and various educational organizations offer subject-specific workshops for mathematics and science teachers that focus on deepening teachers’ content knowledge, exploring effective teaching strategies, and providing resources to enhance classroom instruction.
- teacher networks and communities—Hong Kong has established teacher networks and communities where educators can collaborate, share ideas, and engage in professional discussions. These networks provide a platform for teachers to exchange experiences and learn from each other, fostering a culture of continuous improvement.
- curriculum development projects—Teachers can participate in curriculum development projects organized by the EDB or educational institutions. These projects involve designing and refining curriculum materials, developing innovative teaching approaches, and integrating technology into instruction.
- online learning platforms—Online learning platforms, such as the EDB’s Learning Support Website and other educational websites, offer self-paced courses and resources for teachers. These platforms provide access to instructional materials, lesson plans, and professional development modules that teachers can engage with at their convenience.
- school-based professional development—Schools often organize in-house professional development programs tailored to their teachers’ needs. These programs may include peer observations, mentoring, action research projects, and collaborative lesson planning sessions.

The professional development programs in Hong Kong emphasize the importance of lifelong learning for teachers. They aim to support teachers in deepening their subject knowledge, improving pedagogical skills, and staying abreast of advancements in education. By providing a range of professional development opportunities, Hong Kong promotes the continuous growth and development of mathematics and science teachers in primary and lower secondary grades.

## Monitoring Student Progress in Mathematics and Science

In Hong Kong, student progress in mathematics and science is monitored through a combination of regional assessments, student grades/marks/report cards, and classroom tests.

Hong Kong conducts regular regional assessments to monitor student progress. One of the key assessments is the Territory-Wide System Assessment (TSA), which evaluates students’ academic performance in various subjects, including mathematics. The TSA provides a

snapshot of students' achievement levels and helps identify areas for improvement at both individual and school levels.

Student grades, marks, and report cards play a crucial role in monitoring student progress. These assessments are conducted by teachers based on students' performance in class assignments, tests, quizzes, and projects. Teachers evaluate students' understanding of key concepts, problem-solving skills, and their ability to apply knowledge to real-life situations. Grades and marks are recorded and communicated to students and parents through report cards, providing a comprehensive overview of students' progress over a specific period.

Classroom tests are regularly administered to assess students' understanding and mastery of mathematics and science topics. These tests are designed to evaluate students' knowledge, skills, and application of concepts covered in the curriculum. Teachers create assessments that align with the learning objectives and content of their specific courses. These tests provide valuable feedback to teachers about students' strengths and weaknesses and guide instruction planning and interventions.

The combination of regional assessments, student grades/marks/report cards, and classroom tests allows for comprehensive monitoring of student progress in mathematics and science in Hong Kong. These assessment methods serve different purposes: Regional assessments provide a broader perspective on students' performance across the territory, student grades/marks/report cards offer continuous feedback on individual student achievement, and classroom tests provide ongoing assessment within the context of daily instruction. Together, they contribute to a comprehensive understanding of students' progress, inform instruction decisions, and support targeted interventions to improve learning outcomes in mathematics and science.

## Special Initiatives in Mathematics and Science Education

In Hong Kong, there are special initiatives and educational programs aimed at promoting mathematics and science education, encouraging students to pursue careers in these fields, and addressing achievement gaps. These initiatives are implemented through regional policies, governmental institutions/programs, and educational initiatives.

The Hong Kong government recognizes the importance of mathematics and science education for the future development of the city. There is a particular emphasis on enhancing the quality and relevance of mathematics and science instruction across all grade levels. This includes curriculum revisions, the development of teaching resources, and professional development programs for teachers to improve their pedagogical practices and subject knowledge.

Hong Kong places a strong emphasis on STEAM education. The government has launched various initiatives to promote interdisciplinary learning and the integration of STEAM subjects into the curriculum. These initiatives aim to nurture students' creativity, critical-thinking skills, problem-solving skills, and their ability to apply scientific knowledge to real-world contexts.

Hong Kong has programs and initiatives to cater to the needs of high-achieving students in STEAM. These programs/initiatives provide specialized enrichment activities and competitions, among other opportunities, to challenge and stimulate the learning of gifted students. Outstanding students are identified for further training and nominated to participate in national and international competitions, including China’s Mathematical Olympiad, China’s Physics Olympiad, the International Junior Science Olympiad, and the International Mathematical Olympiad.

To support lower-achieving students in mathematics and science, Hong Kong has implemented various programs and interventions. For example, the Learning Support Grant offers additional resources to schools to provide comprehensive services and individual remedial support to students who require extra assistance.

Through these special initiatives, Hong Kong aims to cultivate a strong foundation in mathematics and science education, nurture talents, and provide equitable opportunities for all students to excel in these fields. The focus on STEAM education and the targeted support for high-achieving and lower-achieving students contribute to closing achievement gaps and fostering a diverse and skilled workforce in mathematics, science, and technology.

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