Singapore

Ministry of Education

Introduction

Overview of Education System[a]

A small nation with few natural resources other than its people, Singapore has always placed a high value on education. Nearly all Singaporean students attend publicly funded schools. Public education in Singapore aims to provide children with a balanced and well-rounded education so that they may realize their potential, learn for life, and contribute meaningfully to family, community, and country.[1]

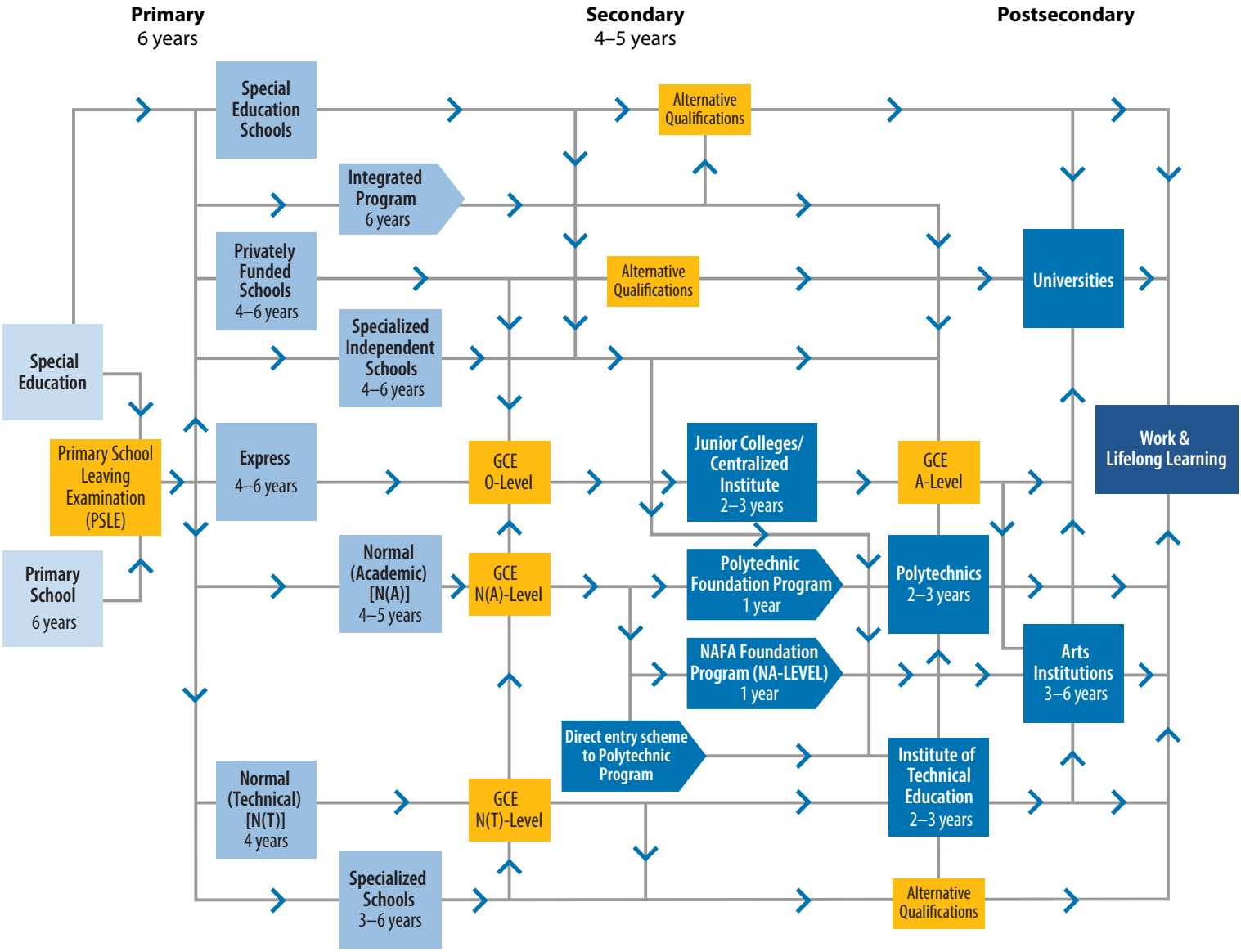
Due to its small size and by design, the Singaporean education system has a relatively flat governance structure, with no intermediary levels of government between the Ministry of Education (MOE) and schools. The key design objective is to create a close nexus between policy and practice through the balanced centralization and decentralization of different elements of the education and school system. MOE is responsible for selected functions within the education system to ensure that important and high-quality education resources are equitably distributed across schools. This includes setting and implementing national policies in critical aspects (e.g., curriculum, teacher recruitment and training, school admission criteria, funding rates, and fees payable) that determine access to education and schools for all children. MOE also devolves significant autonomy and responsibility to individual schools, within broad parameters, in school administration and professional matters (e.g., teacher deployment to grade level and Co-Curricular Activities (CCAs),[b] pedagogical approaches for students with different needs). Such local autonomy at the school level, with support from MOE, facilitates onsite customization and is a key feature of what makes the Singaporean education system nimble and responsive to students' needs to achieve quality educational outcomes.

To cater to the diverse needs and interests of students, new education pathways and curricular options have been introduced into the education system progressively and refined over the past two decades. Exhibit 1 illustrates the current diversity of pathways available to students, including various avenues for lateral transfers between courses of study. These pathways are designed to allow students to discover their individual talents and interests, acquire skills in particular domains, and inculcate a passion for learning that will drive the continual pursuit of new knowledge and skills throughout their lives.

a This chapter focuses primarily on the public education system in Singapore. There are also private schools in Singapore. A large majority of private schools are foreign-system schools that mainly cater to children of foreigners working in Singapore. These foreign-system schools follow their own curriculum, language of instruction, and academic year schedule, which are all typically tied to those adopted in their respective home countries. The remaining are private schools registered with the Singapore Ministry of Education and include special education schools, full-time Islamic religious schools (madrassas), and privately funded schools.

b See https://www.moe.gov.sg/education-in-sg/our-programmes/cca/overview for more information.

Exhibit 1: Education System in Singapore (for Graduating Cohorts up to Academic Year 2026)[2]



Source: https://www.myskillsfuture.gov.sg/content/student/en/primary/education-guide/education-landscape/landscape-overview.html

While preschool education is not compulsory in Singapore, early childhood education development programs are widely accessible and subscribed to. Nearly all children are enrolled in a preschool program, with some children starting as early as 18 months of age. With the establishment of the Early Childhood Development Agency in 2013, the government has played a more active role in raising the quality of preschool education through measures including the introduction and review of national curriculum frameworks for early childhood education,[3,4] the implementation of a quality assurance consultancy scheme for preschools,[5] and the establishment of MOE Kindergartens[6] to provide quality affordable preschool education directly, while catalyzing improvements in the rest of the preschool sector. The government has

also taken further concerted efforts to facilitate the preschool enrollment of children from lower-income families through programs such as the Preschool Outreach Programme and KidSTART.[7]

Primary school education is compulsory, and formal schooling starts in Primary 1 (Grade 1) in the year in which children turn 7. To build a strong foundation in literacy and numeracy, the national curriculum emphasizes English language, mother tongue, and mathematics in the primary school years. Science is introduced in Primary 3 (Grade 3). In line with the emphasis on holistic development of students, the national curriculum also includes art, music, character and citizenship education, social studies, physical education, and a wide range of CCAs that allow students to explore their interests while imparting values, inculcating life skills, and building character. At the end of Primary 6 (Grade 6), all students take the Primary School Leaving Examination (PSLE), the results of which are used for merit- and choice-based centralized placement into secondary schools. Beyond academic merit, some students gain direct admission to specific secondary schools based on their strengths in other areas (e.g., sports, music, and leadership), in line with the schools' niches. Students with special talent in the arts, sports, mathematics, or science can also choose to enroll in specialized independent schools that offer customized curricula to develop these talents. There also are specialized schools that cater to students who would benefit from a more customized and practice-oriented curriculum. Some schools offer the Integrated Programme (IP), which combines secondary and preuniversity education that bypasses an intermediate national examination. Students in the IP experience an enriched curriculum that aims to broaden and deepen their thinking, leadership, teamwork, and communication skills.

While not compulsory, secondary school completion is nearly universal in Singapore. Prior to 2024, Secondary 1 (Grade 7) students enrolled in Express, Normal (Academic), or Normal (Technical) courses of study, designed to match student aptitudes and interests, and leading to the Singapore-Cambridge General Certificate of Education (GCE) Ordinary or Normal Level (O-Level or N-Level) qualifications. As of 2024, secondary schools have implemented Full Subject-Based Banding, starting with Secondary 1 students. Students study in mixed-ability form classes, which provide additional opportunities for social interaction with peers of diverse strengths and interests.[8] They study a suite of six common curriculum subjects together—art, design and technology, food and consumer education, music, physical education, and character and citizenship education (CCE). Additionally, they take subjects such as mathematics, science, humanities, and languages at three different levels, allowing them the flexibility to pursue their strengths and interests in these subjects.

In Singapore, the study of science is compulsory through Secondary 2 (Grade 8) and the study of mathematics through Secondary 4 (Grade 10), reflecting the country's focus on mathematics and science education. At the upper secondary level, students with the inclination and interest could study mathematics and science on a deeper level by selecting from a wider range of electives. For example, on top of general mathematics, students may take an additional mathematics course that delves deeper into the subject, covers a broader range of topics, and prepares them for advanced mathematics courses at the postsecondary level. For science, 9 out

of 10 upper secondary students choose to study physics, biology, chemistry, or a combination of these subjects.

After secondary school, 9 out of 10 students in each age cohort matriculate to a course of study at a preuniversity institution, the Institute of Technical Education (ITE), or at a polytechnic. A preuniversity institution prepares students for university education, and students graduate from these courses with a Singapore-Cambridge GCE Advanced Level (A-Level) or an International Baccalaureate qualification. ITE equips students with industry-relevant technical and professional knowledge and skills and provides them with enriched learning experiences together with industry partners. Many students from ITE go on to pursue a diploma. Polytechnics offer practice-oriented diploma courses in diverse disciplines, such as health and social sciences, mass communications, business, hospitality, environmental technology and engineering, design, and data science and artificial intelligence. Eligible preuniversity and polytechnic students may enroll in one of the six autonomous local universities. Students in these universities receive subsidized government funding for part-time and full-time degree programs.

On top of providing preemployment training, the ITE, polytechnics, and universities are key providers of continuing education and training (CET) for working adults. These options include full-time courses and part-time skill- and knowledge-building programs that enable adult workers to continue developing useful and industry-relevant skills throughout their working lives. The focus on lifelong learning and skills development is supported at the national level by the SkillsFuture movement, launched in 2015. SkillsFuture initiatives and programs provide adult workers with opportunities and support for skills development, partnering industries to systematically train prospective and current employees in industry-relevant skills.[9] For instance, the SkillsFuture Series is a curated list of short, industry-relevant training programs that focuses on emerging and in-demand skills according to four economic growth pillars, namely, Care, Digital, Green, and Industry 4.0.[10] Building on the progress of the SkillsFuture movement, further initiatives were introduced in 2024 to enhance support for CET (e.g., SkillsFuture Level-Up provides Singaporeans ages 40 and above with subsidies for upgrading or pursuing a second full-time diploma, as well as training allowances to partly cover their loss of income).[11]

As shared, holistic education is integral to the Singaporean education system. On top of academic studies, the development of competencies that are essential for students to thrive in the 21st century[12] (e.g., socioemotional competencies; critical, adaptive, and inventive thinking; communication; and collaboration) and the learning of values, ethics, and the Singaporean identity through CCE are integrated across all grade levels in Singapore. Community projects through MOE's Values-in-Action programs also develop students' civic literacy and empower them to exercise agency to contribute to the community.

Use and Impact of TIMSS

Singapore has participated in every cycle of TIMSS since 1995. Participating in TIMSS has provided Singapore with insights, as well as valuable benchmarking and trend information, not just about student knowledge and skills in mathematics and science, but also about other

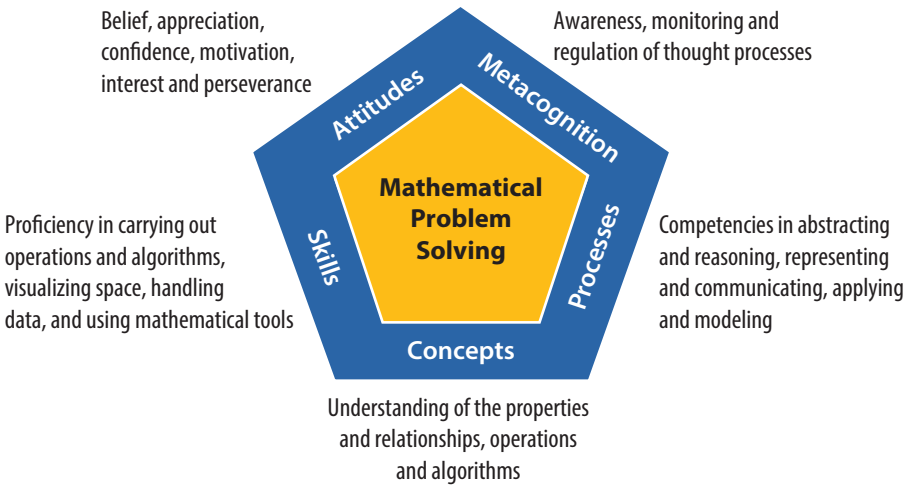
important developmental outcomes, such as students' attitudes toward learning the subjects and their social and emotional well-being in school. For example, TIMSS data are used to identify specific strengths and weaknesses (e.g., common errors and learning difficulties) in various domains of learning for different groups of students. Insights from TIMSS are also shared with school mathematics and science department heads, who then work together with teachers to devise teaching and learning approaches that address student learning difficulties identified by the study.

TIMSS data also serve as an additional high-quality source of rich information, complementing other local sources, which MOE uses for secondary analyses to inform policy and program reviews, where appropriate. For example, TIMSS data on instruction time in Singapore and other education systems were used in a review of the length of school days for primary schools. TIMSS data in the Student and Teacher Questionnaires were also used to identify any early impact of syllabus changes on mathematics teaching and learning in the classrooms, as well as to determine the value of learning science and students' informal learning experiences in science.

The Mathematics Curriculum in Primary and Lower Secondary Grades

The Singapore Mathematics Curriculum Framework (see Exhibit 2) guides the development of mathematics syllabi at all grade levels, from primary to preuniversity education. It emphasizes the development of students' mathematical abilities, with a focus on problem-solving. Five interrelated components support the development of problem-solving abilities: concepts, skills, processes, metacognition, and attitudes. The framework provides directions for the teaching, learning, and assessment of mathematics.

Exhibit 2: Singapore Mathematics Curriculum Framework[13,14]



Source: https://www.myskillsfuture.gov.sg/content/student/en/primary/education-guide/education-landscape/landscape-overview.html

The Singapore mathematics curriculum comprises a set of syllabi spanning 12 years, from primary to preuniversity education. As mathematics is a hierarchical subject, higher concepts and skills are built upon foundational ones and learned in sequence. The curriculum is designed in a spiral manner where concepts and skills in each content strand (e.g., Number and Algebra, Geometry and Measurement) are revisited and built upon at each level to achieve greater depth and understanding. Exhibit 3 presents a summary of the concepts and skills to be learned by the end of Secondary 2 (Grade 8). Teachers help their students learn these concepts and skills by adopting age- and grade-appropriate pedagogical approaches. Central to these pedagogical approaches at the primary and lower secondary levels is the Concrete-Pictorial-Abstract (C-P-A) approach, whereby students build an understanding of abstract mathematical concepts from everyday experiences and meaningful contexts, using concrete and pictorial representations.

Exhibit 3: Mathematics Concepts and Skills

Primary Mathematics Grades 1–6	Lower Secondary Mathematics Grades 7–8
Number and Algebra	
• whole numbers, fractions, and decimals; and the four arithmetic operations (addition, subtraction, multiplication, and division) • calculation with calculators • factors and multiples • ordering of numbers • approximation and estimation • percentage	• negative numbers, integers, rational numbers, and real numbers; and the four arithmetic operations (addition, subtraction, multiplication, and division) • calculation with calculators • prime numbers, highest common factor, and lowest common multiple • ordering of numbers • use of symbols, including <, >, ≤, and ≥
Number and Algebra	
• ratio • rate • algebraic expressions in one variable	• approximation and estimation • percentage • ratio, and direct and inverse proportion • map scales • rate and speed • algebraic expressions and formulas • algebraic manipulation (linear and quadratic) • functions and graphs (linear and quadratic) • linear equations with one unknown • simultaneous linear equations with two unknowns • quadratic equations • linear inequalities with one unknown

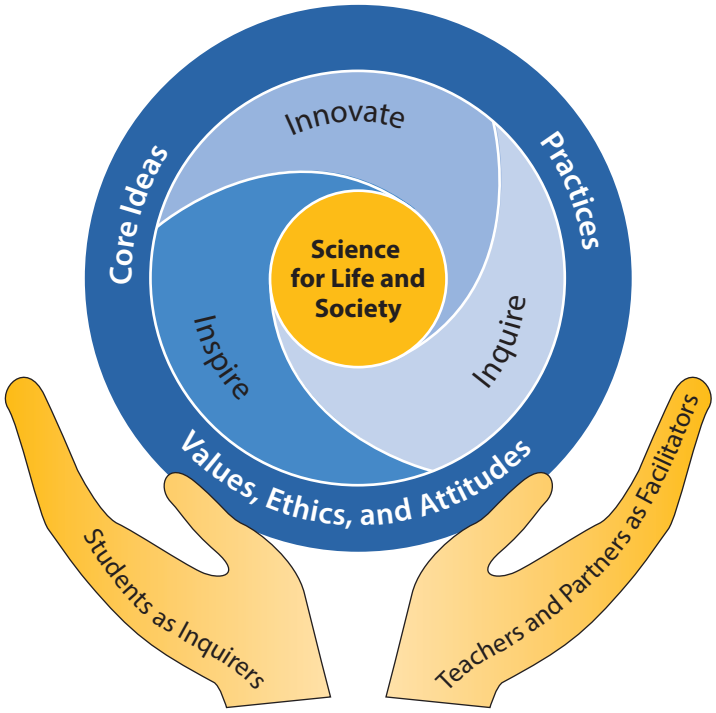
Exhibit 3: Mathematics Concepts and Skills (Continued)

Primary Mathematics Grades 1–6	Lower Secondary Mathematics Grades 7–8
Geometry and Measurement	
• measurement of length, mass, volume, time, and angle • area and perimeter of triangles, squares, and rectangles; area and circumference of circles; and volume of cubes and cuboids • properties of simple geometric figures • nets of simple solids • line symmetry	• properties and construction of simple geometric figures • angles associated with parallel lines • angles of polygons • congruence and similarity • area and perimeter of plane figures, volume and surface area of three-dimensional solids • the Pythagorean theorem • trigonometric ratios of acute angles in a right-angled triangle
Statistics and Probability	
• picture graphs, bar graphs, tables, line graphs, and pie charts (including interpretation and use of information to solve problems) • average	• data analysis (including interpretation and analysis of various statistical representations) • probability

The Science Curriculum in Primary and Lower Secondary Grades

The Singapore Science Curriculum Framework (see Exhibit 4) encapsulates the key thrust of science education in Singapore, which is to provide students with a strong foundation in science for life, learning, citizenry, and work. It guides the development of the science curriculum to inculcate in students the spirit of scientific inquiry, inspire them to apply science in their daily lives, and innovate using science. It also defines the three domains that are integral to building strong science fundamentals: **Core Ideas** of science; **Practices** of science; and the **Values, Ethics, and Attitudes** in science. Students' inquiry learning is facilitated by teachers and also with partners such as National Parks Board, Science Centre Singapore, and Singapore Food Agency.

Exhibit 4: Singapore Science Curriculum Framework[15,16]



The primary and lower secondary science curricula are designed around themes that students can relate to in their everyday experiences and on commonly observed phenomena in nature. The five themes at the primary levels are diversity, cycles, energy, interactions, and systems. The lower secondary science curriculum builds on these themes with two additional themes: the scientific endeavor and models. In addition, sustainability, climate change, science behind health care, and emerging technologies are four contemporary topics that lend currency and relevance to the lower secondary science themes. Pedagogy-wise, the way science is taught at the primary level as a way of exploring and understanding the physical and natural world is continued at the lower secondary levels. Lower secondary students are also introduced to the scientific endeavor theme to develop their understanding of how science is practiced and applied. At both primary and lower secondary science levels, students are provided with hands-on learning opportunities situated in everyday contexts. This allows students to be inspired by science, to inquire like scientists, and to innovate using science. Exhibit 5 presents a summary of the topics to be learned under each theme by the end of Secondary 2.

Exhibit 5: Science Themes and Topics

Primary Science Grades 3–6	Lower Secondary Science Grades 7–8
Diversity	
• diversity of living and nonliving things (general characteristics and classification) • diversity of materials	• exploring diversity of matter by physical properties • exploring diversity of matter by chemical composition • exploring diversity of matter using separation techniques
Cycles	
• cycles in plants and animals (life cycles and reproduction) • cycles in matter and water	
Energy	
• energy forms and uses (light, heat, and photosynthesis) • energy conversion	
Interactions	
• interaction of forces (magnets, frictional force, gravitational force, and force in springs) • interaction within the environment	• application of forces and transfer of energy • transfer of heat energy • chemical changes • interactions within ecosystems
Models	
	• model of cells—the basic units of life • model of matter—the particulate nature of matter • model of matter—atoms and molecules • ray model of light
Systems	
• plant system (plant parts and functions, respiratory, and circulatory systems) • human system (digestive, respiratory, and circulatory systems) • cell system • electrical system	• transport system in living things • human digestive system • human sexual reproductive system • electrical systems
The Scientific Endeavor	
	• the scientific endeavor

Teacher Professional Development Requirements and Programs

Professional Development Requirements

MOE works closely with the National Institute of Education (NIE) and other partners to provide teachers with a range of preservice and in-service professional learning experiences. This professional learning continuum is jointly designed and implemented by MOE and NIE, with regular reviews to ensure the relevance and effectiveness of continual professional learning support for teachers.

Beyond the initial teacher preparation programs at NIE, teachers have access to a wide range of in-service professional learning experiences that include in-service courses, as well as further certification programs such as master's and doctoral degrees. Some of these in-service courses are essential, for instance, those related to implementation of new syllabuses. Beyond these, MOE's approach to professional learning rests fundamentally on a philosophy of teacher ownership and teacher leadership. Teachers are thus empowered to chart their own growth using the Teacher Growth Model[17]—a professional learning road map for teachers—in consultation with and support from their supervisors. The Teacher Growth Model is refreshed regularly, the most recent being in 2023, to help teachers build and deepen their competencies in key strategic areas to take on the roles of the future-ready teacher. These areas include pedagogical practices to promote student agency, inclusivity, and digital literacy, in tandem with other transformations made in the education system (e.g., shifts toward technology-enabled blended learning[c]). In recent years, MOE has also provided strong support for teachers in areas such as differentiated instruction, e-pedagogy, and assessment literacy.

Ongoing Professional Development Programs

The Academy of Singapore Teachers (AST) was set up in 2010 to champion professional learning for the teaching fraternity. In addition to the Teacher Growth Model, the Singapore Teaching Practice was developed to make explicit how effective teaching and learning is achieved in Singapore schools and to guide teachers in honing their craft.[18]

Beyond learning through courses, teachers also learn through job-embedded assignments, mentoring, and coaching. Experienced teachers are equipped with the knowledge, skills, and tools to support younger colleagues in growing and deepening their teaching practice. In addition, subject chapters[d] and networked learning communities provide teachers with opportunities to learn from and with one another. Teachers also have the opportunity to participate in experiential learning through the Teacher Work Attachment Plus Programme, where they are attached to organizations in the public, private, and people sectors and can gain fresh perspectives on the world of work to inform their professional practice.[19]

c Blended learning is an approach to curriculum implementation that is purposefully designed around a mix of home-based and inschool activities, leveraging both online and offline approaches to learning. It has been implemented in every school with secondary and preuniversity levels since 2022.

d The subject chapters are led by Principal Master and Master Teachers from four subject clusters: humanities and CCE, learner profile, mathematics, and science. These chapters aim to build a culture of teacher-led professionalism and pride in the teaching fraternity.

Established in 2015 and 2021, the two Centres for Teaching and Learning Excellence are a partnership between AST, NIE, and hosting schools to accelerate experimentation with research-based curricular innovations, strengthening the research-practice nexus.[20] They provide teachers with opportunities for in situ professional learning, where learning occurs within the authentic context of the classroom through the conduct of master classes and demonstration classes.

Monitoring Student Progress in Mathematics and Science

Schools assess students both formally and informally based on a continuum of purposes of assessment. Starting in Primary 3, schools typically conduct one summative-purposed assessment at the end of each year. For the other more formative assessments, teachers adopt a variety of subject-appropriate assessment methods, such as oral presentations, written tests, and portfolios. In-class formative assessments allow teachers to monitor student progress, identify their strengths and areas for growth, and provide meaningful and immediate feedback. They also allow teachers to adapt and differentiate teaching methods and materials to student profiles, readiness, and interests.

Schools closely monitor student progress and work closely with parents to support student learning. Parents are updated regularly through progress reports, personal phone calls, and school-organized parent-teacher meetings.

National examinations aligned with the national curriculum are administered in the final years of primary, secondary, and preuniversity education to ascertain students' learning at the end of each key stage and to make decisions such as placement to schools in the next key stage. The Singapore Examinations and Assessment Board, in collaboration with MOE, conducts the following national examinations: the PSLE, GCE N-Level, GCE O-Level, and GCE A-Level.

Special Initiatives in Mathematics and Science Education

Mathematics and science education in Singapore aims to cultivate student interest and lay a strong foundation in numeracy and scientific literacy from the early years of formal education. There are policies and programs in place designed to engage students with diverse interests and learning needs. For example, secondary school students with the aptitude and interest may opt to take more demanding mathematics and science courses. They may also enroll in schools that specialize in mathematics and science (e.g., NUS High School of Math & Science, School of Science & Technology). In addition, programs and resources are in place to support those who need more targeted help at both the primary and secondary levels.

A wide range of informal science, technology, engineering, and mathematics (STEM) programs complements the formal curriculum at both the school and national levels. Science fairs, competitions, learning trails (where students apply mathematics and science concepts in real-world settings), camps, workshops, attachments to research institutes, and internships with STEM-related companies, for example, serve to engage and motivate students at all levels

of learning. At the national level, MOE collaborates with partners such as the Agency for Science, Technology, and Research; Infocomm Media Development Authority; and Science Centre Singapore to design programs for both the general student population and those with specific interests and talents. For example, Science Centre Singapore partners with primary and secondary schools to develop school-based STEM Applied Learning Programmes (ALPs) that allow students to apply their STEM knowledge to solve real-world problems.[e] Currently, more than half of the secondary schools in Singapore offer applied learning programs in STEM.[21] MOE provides opportunities for students with deep interest and aptitude in mathematics and science to work on research projects with mentors from institutes of higher learning and industries. MOE also works with overseas STEM education partners to provide students with a variety of exchange opportunities, with a view to broadening their horizons and inspiring them to pursue STEM careers.

In 2023, MOE launched the Engineering and Tech Programme Scholarship for preuniversity students who are interested and passionate in STEM. They participate in hands-on experiences through workshops and gain industry insights through internships. These experiences inspire them to explore STEM-related studies or careers.

Suggested Reading

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