Singapore Mathematics Curriculum

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A PRESENTATION BY
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Outline

- Mathematics Curriculum
- Learning during the Covid
- Learning from PISA
- Challenges*

Objectives of the mathematics curriculum

- to ensure that all students will achieve a level of mastery of mathematics that will enable them to function effectively in everyday life; and

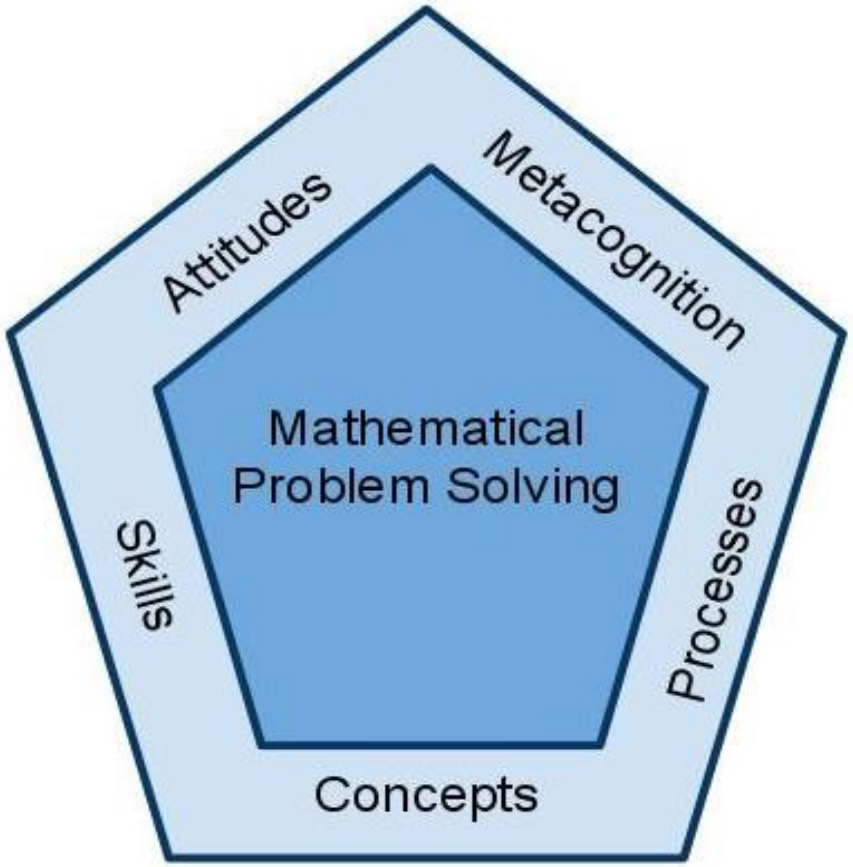
- for those who have the interest and ability, to learn more mathematics so that they can pursue mathematics or mathematics-related courses of study in the next stage of education

Curriculum Framework

Focus on mathematical problem solving

Five important components

- Concepts
- Skills
- Processes
- Metacognition
- Attitude



Consistent Features of
The Mathematics Curriculum Framework
Since 1990s

Recent Development

- These were the key emphases articulated in the recent review of the secondary mathematics curriculum, that was implemented in 2020
- The revised curriculum continued to emphasize mathematical processes, which was the key focus in the 2013 curriculum
- In addition, appreciating the big ideas in mathematics and developing metacognition were emphasized

1. Continue to develop in students the critical mathematical processes such as, reasoning, communication and modelling, as they enhance the learning of mathematics and support the development of 21st century competencies;
2. Develop a greater awareness of the nature of mathematics and the big ideas that are central to the discipline and bring coherence and connections between different topics so as to develop in students a deeper and more robust understanding of mathematics and better appreciation of the discipline; and
3. Give attention to developing students' metacognition by promoting self-directed learning and reflection.

Computational Thinking

- A relatively new area of focus
- The teaching and learning of mathematics can support the development of computational thinking
- There are parallels between the problem-solving skills and computational thinking skills
- Key strategy – getting students to design algorithms in mathematics

Computational Thinking – abstraction, generalisation, decomposition, algorithm design

Getting students to design and implement some of the algorithms in mathematics (e.g., finding prime factors, multiplying two matrices, finding the median of a list of data) can potentially help these students develop a clearer understanding of the algorithms and the underlying mathematics concepts as well.

Use of Technology

- The role of technology, particularly the use of computers, was articulated in the curriculum

- Two aspects
  - computers as a mathematical tool
  - Computers as a pedagogical tool

Computational tools are essential in many branches of mathematics. They support the discovery of mathematical results and applications of mathematics. Mathematicians use computers to solve computationally challenging problems, explore new ideas, form conjectures and prove theorems. Many of the applications of mathematics rely on the availability of computing power to perform operations at high speed and on a large scale.

Computational tools are also essential for the learning of mathematics. In particular, they support the understanding of concepts (e.g. simulation and digital manipulatives), their properties (e.g. geometrical properties) and relationships (e.g. algebraic form versus graphical form).

21st Century Competencies

- Mathematics support the development of important 21st century competencies
- The choice of pedagogical approaches and tasks e.g., how learning is organized, the kind of conversation in the classrooms, makes a difference
- The learning experience of students matters

The learning of mathematics creates opportunities for students to develop key competencies that are important in the 21st century. When students pose questions, justify claims, write and critique mathematical explanations and arguments, they are engaged in reasoning, critical thinking and communication. When students devise different strategies to solve an open-ended problem or formulate different mathematical models to represent a real-world problem, they are engaged in inventive thinking. When students vary their approaches to solve different but related problems, they are engaged in adaptive thinking.

Flexibility, Choice & Support

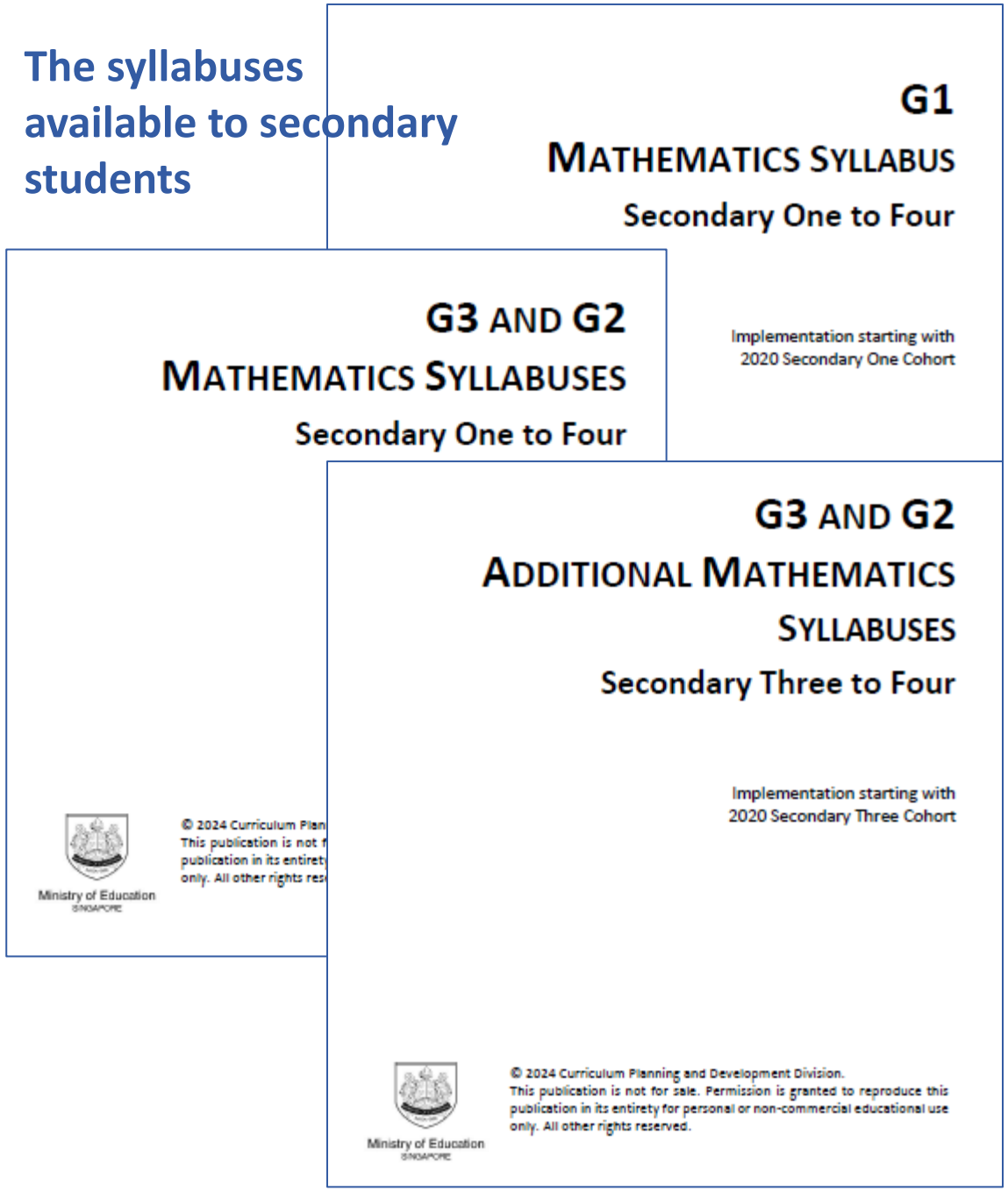
Common curriculum from Grade 1 to 4, with learning support

Differentiated curriculum from Grade 5

At the secondary level, the G1, G2 and G3 syllabuses cater to different needs and abilities of learners

Elective at upper secondary offers opportunities for those who are interested to study more mathematics

The syllabuses available to secondary students



Learning During COVID

- Keeping schools open for as long as possible
- Pivoting to online learning and blended learning
- Supporting low progress learners
- System level support
- Emerging from Covid with new capabilities and teaching and learning possibilities

Curriculum perspective

There is strong alignment and agreement between what PISA measures and what our curriculum values and seeks to achieve.

The focus on problem solving, reasoning, modelling and the more recent idea of computational thinking, are apparent in both frameworks

"The important role of reasoning needs greater emphasis in our understanding of what it means for students to be mathematically literate. In addition to problem solving, this framework argues that mathematical literacy in the 21st Century includes mathematical reasoning and some aspects of computational thinking."

PISA2022 Assessment and Analytical Framework

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Performances

- Strong mathematics performance despite COVID-19 disruptions
  - 41% achieved Level 5 or 6
  - 8% achieved below Level 2
- Students from lower-SES homes also performed well in comparison with OECD averages for the same group

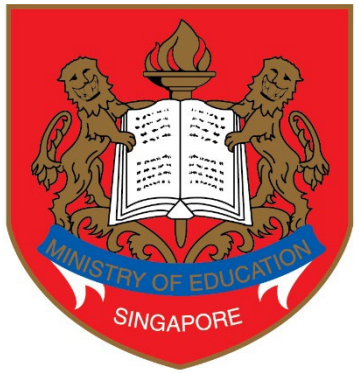
Mean Mathematics Scores of Singapore and OECD students from bottom-25% SES in PISA 2022

	Mean Scores
Singapore B25	515
OECD Average	472
OECD B25	431

Challenges

- Uplifting the low progress learners is an on-going task
- Better understanding of how these students learn, and what motivate them
- Develop ways of teaching that support them in making sense of mathematics
- Develop better resources, including digital ones, that will support their learning

Thank you



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