3.1 A Balanced Curriculum

The structure of the mathematics curriculum adopts a "dimension" or "strand" approach. The curriculum at the primary level has 5 dimensions while at the secondary level 3 dimensions (see Section 2.2.1 for more details). Designing the mathematics curriculum in a framework of learning dimensions enables the learning objectives and students' progress to be structured so that a balanced repertoire of mathematical knowledge and skills can be provided. Since students have different abilities, teachers have to design their school-based curriculum to cater for the reality of their school. In designing school-based mathematics curriculum, special attention should be paid to the balance of the curriculum to be developed and the following issues should be considered: (a) cognitive development of students; (b) aesthetic needs of students; (c) pedagogical strategies in the learning and teaching of mathematics; (d) coherence; (e) students' experience; (f) use of technology; (g) mode of assessment; (h) societal expectation; (i) foundation for further study; (j) provision of resources and support; and (k) adequacy of knowledge for studying other disciplines. To ensure the internal consistency and the balance of the curriculum, opportunities should be provided to students to master all fundamental knowledge in each learning dimension at each key stage. There should be a wide range of examples given in the curriculum. The following section gives some basic principles for developing a school-based mathematics curriculum.

3.2 Central Curriculum and School-based Curriculum Development

This Curriculum Guide is prepared by the CDC to set the direction for mathematics education curriculum development. The central mathematics curriculum is presented in the form of an open and flexible framework of learning targets, generic skills, values & attitudes which all students are entitled to (please refer to Section 2.1 and 2.2). Schools may adapt the central mathematics curriculum and develop their own school-based curriculum to suit the needs, abilities of their students and contexts of the schools through varying the organization of

- content, contexts and examples;
- learning and teaching strategies;
- pace of learning and teaching;
- modes of assessment, etc.

(More details on Catering for Student Diversities can be found in Section 4.3 of this Guide.)

Nevertheless, schools have to fulfill certain CDC requirements, such as

- the amount of lesson time (e.g. 285-357 hours for each of Key Stages 1 & 2, and 330-414 hours for Key Stage 3 as shown in Booklet 2 of the ***Basic Education Guide – Building on Strengths (2002)***),
- learning targets; and
- essential content (e.g. the Foundation Part in the Secondary Mathematics Curriculum (1999)).

In designing their school-based mathematics curriculum, schools are encouraged to make use of the curriculum documents of Primary Mathematics Curriculum (2000) and Secondary Mathematics Curriculum (1999).

At the primary school level, teachers can select some of the enrichment topics on the basis of students' abilities and interests and the time available. Teachers can also select their own enrichment topics or some existing units for further discussion. Since enrichment topics are optional, they are not suggested to be included in tests or examinations. A list of enrichment topics is suggested on p.46 of the *Mathematics Education Key Learning Area – Mathematics Curriculum Guide (P1 – P6) (2000).* In a similar way, teachers at the secondary school level can judge for themselves the suitability and relevance of the topics in the Non-Foundation Part of the curriculum for their own students. Again, for more able students, teachers can adopt some enrichment topics at their discretion to extend students' horizon and exposure in mathematics.

It should be noted that there are many ways of sequencing learning units for each year level. For example, schools can

- focus on one dimension first and then on other dimensions in later years;
- arrange the learning sequence so that students learn all dimensions spirally in each year; or
- reserve more periods in S1 to revise and consolidate students' learning in primary schools and focus only on the Foundation Part of the curriculum over S2 and S3 to cater for low achievers.

(A more detailed exposition of catering for the student diversities at the school level can be found in Section 4.3.2.)

Curriculum development is an on-going process. Schools should develop their own school-based curriculum whenever appropriate and feasible. They should also encourage the professional development of teachers and collaboration with other stakeholders to

achieve the curriculum aims, learning targets and objectives in the mathematics curriculum framework. On the other hand, it should be noted that a school-based curriculum should be the outcome of the balance between guidance from the CDC and the autonomy of the school and teachers. The balance is subject to change over time, as policy and school decisions change. (School may refer to Booklets 2 and 10 of the ***Basic Education Guide – Building on Strengths (2002)*** for more ideas on school-based curriculum development.)

3.3 Cross KLA Links

Mathematics is the foundation and provides supporting knowledge for many other disciplines. It is linked to the other 7 KLAs by providing a basis for making investigations as well as a tool for analyzing data, representing findings and models with symbols, graphs and charts, and for theorizing. And in reverse, other KLAs provide opportunities for students to apply mathematics in real-life situations.

Students learn best through direct experience. Therefore, it is important to relate students' daily life experiences to mathematics. For some topics (like percentage and statistics), integration with other KLAs (like Science Education or Personal, Social and Humanities Education) is one of the ways of organizing students' learning experiences mathematically. Integrated learning removes the boundaries of subjects and reflects the interdependent nature of reality and the complexities of life. It provides students with a holistic context for learning and enables students so that they can make connections between what they are learning in class and problems in the real world. An example showing how this is done can be found in Exemplar 3 at the end of this Guide. Some of the links between the Mathematics Education KLA and the other KLAs are exemplified in the following paragraphs.

In Chinese Language Education and English Language Education, mathematical concepts are essential if students are to understand essays with mathematical and statistical content. In Arts Education, lines and shapes are important elements to create pictures, models and buildings, and patterns and symmetry are often explored in creative dance. In Physical Education, mathematics can help to analyze sports data and design an appropriate strategy for improving sporting performance.

In the Personal, Social and Humanities Education KLA, a variety of mathematical tools and procedures are used for making rational and responsible social decisions, such as identifying patterns and trends in statistical data and assessing validity in personal and

social issues. Mathematical models are also used for theorizing in Social Sciences, and in particular in Economics.

In the Science Education KLA, laws and formulae are represented in mathematical language. Mathematical methods are employed to solve problems and generalize experimental findings, and mathematical models are used to represent physical phenomena. The famous Golden Ratio enables us to appreciate and understand natural phenomena such as the growth of leaves in plants from a mathematical point of view. In the Technology Education KLA, mathematical models are used in computer simulations to explore the feasibility of applying design ideas to investment decisions, and tables and charts are important tools in the representation of technical information.

3.4 Time Allocation

It is assumed that a total of 160 periods should be provided each year at basic education level. The suggested time allocation for the Primary Mathematics Curriculum (2000) and Secondary Mathematics Curriculum (1999) can be summarized as follows:

Level	Number of periods per week	Duration of each period (in minutes)
P1 – 6	5	35
S1 – 3	5	40

The suggested time allocations are not mandatory. They are provided to aid teachers to plan their lessons. Teachers are free to adjust the time allocation required for the curriculum concerned to suit the abilities of their students.