

6.1 Textbooks

In order to broaden students' learning experiences, they are encouraged to learn in a wide learning environment and from a variety of learning resources. However, even in such an environment, textbooks still play an important role in mathematics instruction. They influence the learning and teaching that takes place in most classrooms. Therefore, well-written mathematics textbooks will help students learn and realize the spirit of the mathematics curriculum of Hong Kong.

A set of guiding principles for quality textbooks has been formulated for the writing, reviewing and selection of textbooks. The following shows some basic consideration in the selection of mathematics textbooks:

- Textbooks should be in line with the curriculum objectives, contain the core elements of the curriculum (e.g. all the learning dimensions should be included).
- They should facilitate the suitable development of the mathematics knowledge, thinking abilities, generic skills, values and attitudes promoted in the curriculum.
- Quality mathematics textbooks should stress on the importance of the learning process as much as finding the correct answer.
- Textbooks should provide opportunities for students to investigate tasks, discuss findings, make conjectures, test hypotheses, and defend their solutions.
- There should be learning activities and task-oriented problems at the students' level of understanding to engage students in exploratory work and encourage high level of thinking (e.g. building the concept of odd and even numbers through exploring the numbers with manipulatives at the primary level).
- There should be adequate examples and illustrations to help students understand the mathematical concepts and skills.
- The content sequence should be logical with concepts and skills built on prior knowledge.
- Textbooks should allow teachers flexibility and enable them to select learning experiences that engage students in solving problems in the "real world".
- The language used in the textbooks should be simple, clear, easy to understand and appropriate to the students' level.
- Accuracy of the contents, use of mathematical terms and quotation of real-life data (for the Data Handling Dimension, say) all add to the quality of textbooks and render textbooks important source of reading for students.

Because of the large student population, the published textbooks may not be able to meet the needs of all students. In choosing mathematics textbooks for use by students, schools should set up a mathematics textbook committees to evaluate the relevance and suitability of the materials in meeting the educational needs and abilities of their students. The extent to which teachers can exercise professionalism in adapting the contents to meet the learning and teaching objectives should also be taken into consideration. Schools may make reference to the Textbook Information and Recommended Textbook List on the Homepage of the Curriculum Development Institute at <http://cd.ed.gov.hk> when selecting mathematics textbooks and other learning and teaching materials.

6.2 Quality Learning and Teaching Resources

Textbook is only one of the many learning and teaching resources which can be used in class teaching. Other resources for the learning and teaching of mathematics may include concrete materials (such as counters, blocks and geometric models), audio-visual materials, written resources (such as magazines, journals, reference materials developed by ED (see Sections 6.2.1 and 6.2.2 below)), IT resources (such as commonly used software and educational software), Internet (see Section 6.2.3 below), community resources (see Section 6.2.3 below) and etc. Using the textbook as the only resource is not sufficient to provide the curriculum framework for the mathematics program. Adaptation of textbooks and other learning and teaching resources may be necessary to meet the needs and abilities of different students. When concepts are to be learned, manipulative materials are needed. When skills are to be sharpened or facts to be memorized, repetitive games or activities are needed. When independent work is prescribed, activity cards, projects, and computer programs/software are needed. Providing quality learning and teaching resources to support mathematics curriculum is therefore basic to effective teaching. At the same time, teachers need to develop their learning and teaching materials to suit their students.

In general, the basic principles for selecting learning and teaching resources are more or less the same as those for selecting mathematics textbooks. Nevertheless, it is worthwhile to take the following criteria into account in the use of resources:

- The materials should provide a means for students to acquire the mathematical concepts or master the skills.
- They should promote students' interest and active involvement in learning mathematics.
- They should provide different levels of difficulty and learning experiences to cater for students' diversified needs and abilities.

- They are to complement or extend the content of the mathematics textbook, enabling students to make connections and achieve a wider understanding of concepts and skills.

(School may refer to Booklet 7 of the *Basic Education Guide – Building on Strengths (2002)* for more ideas on quality learning and teaching resources.)

6.2.1 Resource Development by ED in Support of Mathematics Education KLA

To support the Mathematics Education KLA, the following resources are found to be useful:

Primary (Note: Only Chinese versions are available)

1. 運用計算機探究數之奧秘 – 第二學習階段 (1999)
2. 空間探究 – 第一及第二學習階段 (2000)
3. 小學數學科教學資料冊 (第一輯) (2001)
4. 小學數學輔導教學 (2001)
5. 小學數學科教學資料冊 (第二輯) (2002)

Secondary

1. Teaching Package on S1-5 Mathematics 1 – Use of Information Technology (2001)
中一至中五數學科 教學資源套 1 – 運用資訊科技 (2001)
2. Teaching Package on S1-5 Mathematics 2 – Catering for Learner Differences (2001)
中一至中五數學科教學資源套 2 – 照顧學習差異 (2001)
3. Teaching Package on S1-5 Mathematics 3 – Fostering High-order Thinking Skills (2001)
中一至中五數學科 教學資源套 3 – 培養高層次思維能力 (2001)
4. 中學數學輔導教學 (2001) (Note: Only Chinese version is available)
5. Learning and Teaching Package on S1-5 Mathematics 4 – Number and Algebra Dimension (Key Stage 3) (2002)
中一至中五數學科 學與教資源套 4 – 數與代數範疇 (第三學習階段) (2002)
6. Learning and Teaching Package on S1-5 Mathematics 5 – Measures, Shape and Space Dimension (Key Stage 3) (2002)

中一至中五數學科學與教資源套 5 – 度量、圖形與空間範疇
(第三學習階段) (2002)

7. Learning and Teaching Package on S1-5 Mathematics 6 – Data Handling Dimension (Key Stage 3) (2002)

中一至中五數學科學與教資源套 6 – 數據處理範疇 (第三學習
階段) (2002)

6.2.2 Research & Development/Seed Projects

To facilitate the implementation of the Primary Mathematics Curriculum (2000) and Secondary Mathematics Curriculum (1999) and further support teachers, the following research and development projects are being/will be conducted:

1. *Developing Thinking Abilities through the Primary Mathematics Curriculum* – The aim of the project is to develop primary students' understanding of basic mathematical concepts and their ability to think, communicate and solve problems. 20 primary schools participate in this project. The participating schools develop exemplars and try the exemplars out in their classrooms. Research reports will be compiled.
2. *Use of Open-ended Questions in Mathematics Assessment (Key Stage 3)* – The aim of this project is to study the effect of using open-ended questions in mathematics assessment. The participating schools are invited to develop some of the assessment items for the project.

6.2.3 Community Resources Available

Materials around such as advertisement leaflets, statistical reports presented in the media, graphs printed in the newspaper could supply up-to-date information that cannot be found in other sources and they could easily arouse students' interest in learning. Associations/organizations in the community also provide resources such as seminars and forums to familiarize teachers with current issues in mathematics education. Some of these are listed below:

1. Hong Kong Association for Mathematics Education
香港數學教育學會
<http://www.hkame.org.hk/>

2. Hong Kong Association for Science and Mathematics Education
香港數理教育學會
<http://www.hkasme.org/us.htm>
3. Hong Kong Mathematical Society
香港數學會
4. International Mathematical Olympiad Hong Kong Committee
國際數學奧林匹克香港委員會
5. Hong Kong Statistical Society
香港統計學會
<http://www.hkss.org.hk>
6. Census and Statistics Department
政府統計處
Tel.: 2582 4807
<http://www.info.gov.hk/censtatd/>
7. Hong Kong Science Museum
香港科學館
Tel.: 2732 3232
<http://www.lcsd.gov.hk/CE/Museum/Science/>
8. Curriculum Resources Centre, 24 Tin Kwong Road, Kowloon
九龍天光道 24 號課程資源中心
Tel.: 2762 7549
9. Multi-media Professional Library, Hong Kong Teachers' Centre (Kowloon), 3/F,
19 Hok Yuen Street, Hung Hom, Kowloon
九龍紅磡鶴園街四號三樓香港教師中心（九龍）教師專業圖書館
Tel.: 2142 1333
10. Multi-media Professional Library, Hong Kong Teachers' Centre, 4 Pak Fuk
Road, North Point, Hong Kong
香港北角百福道四號香港教師中心教師專業圖書館
Tel.: 2564 9608
11. Media Production Services Unit, 4/F, 19 Hok Yuen Street, Hung Hom,
Kowloon
九龍紅磡鶴園街四號四樓教具製作中心
Tel.: 2366 0881

In 1990s, Internet becomes another popular source for sharing and retrieving information. Gathering and selecting information from these sources would be another major learning activities in the 21st century. The following web sites are also useful as a reference for mathematics teachers:

1. Mathematics Section, Curriculum Development Institute, ED
<http://cd.ed.gov.hk>
2. 數學資訊站 - 數學網
<http://www.edp.ust.hk/math/>
3. HKeducationCITY.net
香港資訊教育城 - 小學數學學科園地
<http://www.hkedcity.net/teacher/ilearning/>
4. EduMath (數學教育)
<http://www.fed.cuhk.edu.hk/~fllee/mathfor/edumath/edma9906.html>
5. HKIED : 蘋果樹下的巨人 - 牛頓
<http://itied.ied.edu.hk/workteam/maths/>
6. 數學教育網
<http://www.mathsedu.net/>
7. 中國基礎教育網
<http://cbe21.com>
8. 數學資料庫
<http://ihome.cuhk.edu.hk/~s005636/>
9. MacTutor History of Mathematics archive
<http://www-history.mcs.st-and.ac.uk/~history/>
10. Ask Dr. Math
<http://mathforum.org/dr.math/drmath.elem.html>
11. Centre for Innovation in Mathematics Teaching
<http://www.ex.ac.uk/cimt/>
12. Math Forum
<http://mathforum.org/>
13. Secondary Mathematics Assessment and Resource Database
<http://smard.cqu.edu.au/index.html>
14. The National Council of Teachers of Mathematics
<http://www.nctm.org/>
15. The Geometry Center
<http://www.geom.umn.edu/>
16. Interactive Mathematics Miscellany and Prizes
<http://www.cut-the-knot.com/front.html>

6.3 Resource Management in Schools

Proper use of resource materials in teaching can accelerate the rate at which students learn and make learning and teaching more interesting and effective. The Mathematics panel head should keep their panelists well informed of the teaching resources available in their schools and the whereabouts of the various resources centre and libraries from which relevant information can be obtained. Panel heads should also try their best to secure funds from the school management to build up a suitable stock of resource materials, namely teaching aids, reference books/materials, audio-visual aids and computer software for the teaching of mathematics.

Resources acquired may be either classroom-based (like counters, abacuses and graph boards which are basic equipments and should be readily available to students for everyday use) or school-based (like models, beam-balances and clinometers which are shared equipments and used less often). If space is available, new resources and learning packages/kits should be displayed. Ease of access will rely on thorough planning and organization. It is preferable to compile/update the list of available teaching aids, audio-visual aids and computer software in the school for the reference of teachers to promote their awareness of using them in class teaching. Besides, reference books/materials to be procured for either students or teachers should cover both the academic and recreational aspects of mathematics. It is also advisable to compile/update the list of available mathematics journals/reference books/materials in the school for teachers' perusal.

The Mathematics panel heads have the responsibility to encourage teachers to use the new resources. Staff workshops or demonstration can provide teachers with an understanding of the purpose and methods of using resources. The organization and management of resources will be more likely to succeed if there is an open exchange and discussion among teachers in panel meetings about new purchases, storage and access to materials, experience of using different types of learning and teaching resources.

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