

## Guidance for the Publishing of Mathematics Teaching Resources

### Introduction

This document is written for authors and publishers of mathematics teaching resources for school-age pupils. It will also be useful for teachers and other interested parties. It outlines the features which are associated with high-quality resources, in line with domestic and international research.

The term 'teaching resources' covers anything that is published to support the teaching of mathematics. This includes textbooks, workbooks, teacher's guides and other materials, in print or digital form. It could apply to a complete scheme of work covering several years. Equally it could apply to a more focused resource produced with a more specific aim or outcome in mind.

*Further detailed and more specific pedagogical guidance for publishers of mathematics textbooks can be found within the guidelines published by [NCETM](#).*

A description of well-written resources is set out below under the following headings:

1. General principles
2. Mathematical content
3. Tasks and exercises
4. Representation and design
5. Supporting teachers
6. Assessment and review
7. Authors and editors

Teaching resources have most impact when supported by high quality teacher professional development.

### 1. General principles

A high-quality mathematics resource:

- 1.1 Should support primary, Key Stage 3, GCSE and A level by developing resources prompted by recent curriculum reforms.
- 1.2 Inspires and enthuses pupils, encouraging a thirst for knowledge, and motivating them to towards a working understanding of mathematics either for further study or to enable them to be mathematically literate citizens.
- 1.3 Should aim to broaden pupils' mathematical knowledge and understanding beyond minimum examination requirements. While textbooks may take a particular approach to mathematics and should take note of examination needs, they should not be narrowly targeted on particular specifications as this may lead to a focus purely on passing the test.

### 2. Mathematical content

The content of a high-quality mathematics resource:

- 2.1 Is presented in a coherent and connected manner. It shows clear progression from one topic to another and how current ideas develop from any previous work.
- 2.2 Concepts are presented and developed in a detailed, step-by-step way to avoid gaps in learning.

- 2.3 Text is accessible with regard to the age and ability levels of pupils at whom it is aimed, and language is used clearly and concisely.
- 2.4 Correct and precise mathematical vocabulary is introduced early and used consistently.
- 2.5 When new concepts are introduced, these are related to key concepts with which pupils are already familiar. Explicit connections are made to prior learning.
- 2.6 Related concepts, for example pairs of inverse operations, are frequently presented together to expose important mathematical relationships and to develop pupils' fluency.
- 2.7 Aspects of the mathematical ideas that are likely not to be immediately clear to pupils are highlighted and explored in depth.

### 3. Tasks and exercises

High-quality mathematical tasks and exercises:

- 3.1 Are provided to support progression in learning. They should:
  - embed fluency in carrying out standard procedures
  - deepen conceptual understanding
  - build pupils' skills in applying mathematics and problem-solving.
- 3.2 Tasks and questions provide the appropriate level of challenge. Some include the use of engaging and relevant contexts appropriate to the age and ability of the pupil and to the mathematics being studied.
- 3.3 Some tasks and activities require pupils to comment on answers and results, and to make conjectures, generalisations and reasoned arguments.
- 3.4 Tasks are varied so that they involve pupils in a range of cognitive processes. These include:
  - consolidation and practice
  - investigating, conjecturing and hypothesising and generalising
  - explaining, reasoning, and proving
  - applying, interpreting and analysing.
- 3.5 Resources provide homework and out-of-school activities that give the opportunity to continue the development of fluency and understanding.
- 3.6 Engaging practice activities allow extended application of concepts and techniques in differently-framed mathematical problems. These should allow exploration and varied application.

### 4. Representation and design

A high-quality mathematics resource:

- 4.1 Uses clear representations of mathematics that provide insight into the concepts being taught.
- 4.2 Representations of the mathematics in the form of pictures, diagrams and other images (connected to concrete mathematical materials) are used to provide access to the mathematics. They reveal underlying structures and help pupils make sense of mathematical ideas.
- 4.3 Illustrations and contexts used are relevant and appropriate to the particular mathematical ideas and concepts.
- 4.4 Where there are both textbooks and digital materials they have a coherent and consistent approach. Different ways of presenting ideas reinforce one another by exploiting the advantages of each medium.

### 5. Supporting teachers

A high-quality mathematics resource supports teachers:

- 5.1 Any teacher's guide or other material provided for teachers supports the enhancement of teacher knowledge and pedagogy. It provides guidance on effective use of the materials. It also provides insight into the mathematical tasks the pupils are engaging in, and points that should be drawn out.
- 5.2 The resources take account of classic, standard or predictable mistakes, misconceptions and misunderstandings. Guidance enables teachers to anticipate and plan how to tackle these.
- 5.3 Where lesson plans or teaching schemes are provided, they are informed by research and ideas of effective teaching. This would include the constructive use of mistakes and misconceptions, providing a range of different activities in lessons and encourage pupils to think about the application of mathematics to everyday contexts and other curricular subjects.
- 5.4 Resources work best when supported by high quality teacher professional development.

## **6. Assessment and review**

A high-quality mathematics resource supports good assessment practice by providing:

- 6.1 Opportunities for both formative and summative assessment of learning.
- 6.2 Assessments give both pupils and teachers the opportunity to review learning and to check pupils' understanding. This applies both to fluency in using standard techniques and the ability to apply understanding in new or unfamiliar situations.
- 6.3 Assessments allow both pupils and teachers to measure progress and inform future learning.
- 6.4 Materials should include activities at the start of each set of learning activities to identify whether the pupil has a secure grasp of the necessary pre-requisites for the learning activity.
- 6.5 At the end of each block of learning, well-designed assessment should check the extent to which the pupil has grasped key concepts and techniques and should not be narrowly focused on examination questions alone.

## **7. Textbook authors and editors**

A high-quality mathematics resource is:

- 7.1 Authored and reviewed by people with expert knowledge, experience, skills and credibility.
- 7.2 Subject to stringent and independent quality assurance measures.
- 7.3 Authored and edited by experts who draw on research evidence and accrued professional experience.
- 7.4 Materials are trialled and refined in the light of trial data, wherever it is possible to do so.