

Guidance for the Publishing of Computing Teaching Resources

Introduction

This document is written for authors and publishers of computing 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 computing for primary, secondary and Further Education. 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.

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

1. General principles
2. Computing content
3. Tasks, exercises and assessment
4. Representation and design
5. Supporting teachers
6. Authors and editors

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

1. General principles

A high-quality computing resource:

- 1.1 Embodies and implements the four Aims of the National Curriculum Computing Programmes of Study, and DfE guidance.
- 1.2 Inspires and enthuses pupils, encouraging a thirst for knowledge, and motivating them towards a working understanding of computing either for further study or to enable them to be computer literate citizens.
- 1.3 Should aim to broaden pupils' computing knowledge and understanding beyond minimum examination requirements. While textbooks may take a particular approach to computing 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. Computing content

The content of a high-quality computing resource:

- 2.1 Places primary emphasis on the principles and ideas that underpin the subject, rather than on specific contemporary technologies.
- 2.2 Is presented in a coherent and connected manner:
 - making clear the connections between the three components of the subject (computer science, information technology, and digital literacy)
 - showing a logical progression from one topic to another
 - making explicit connections between new concepts and prior learning

- avoiding any gaps.
- 2.3 Encourages the safe, responsible and ethical use of technology throughout.
- 2.4 Uses authentic examples to illustrate, exemplify and bring alive these general principles and ideas by showing how they connect to the uses of computing and digital technology in a range of meaningful real-world situations.
- 2.5 Features inclusive examples that, taken as a whole, recognise the diversity within the school population and of computing.
- 2.6 Introduces correct and precise computing vocabulary early and uses it consistently wherever possible.
- 2.7 Clearly states the intended audience, with text that is accessible by the pupils at whom it is aimed, and uses language clearly and concisely.
- 2.8 Provides extension material to stretch those progressing well.
- 2.9 Highlights and explores in depth aspects of computing that are unlikely to be immediately clear to pupils.

3. Tasks, exercises and assessment:

High-quality computing tasks, exercises and assessment:

- 3.1 Support progression in learning, deepen understanding, develop computational thinking, and provide practice in what has been learnt.
- 3.2 Require pupils to think logically, develop knowledge, understanding and skills, and apply them to solve problems, as well as demonstrating recall when required.
- 3.3 Provide a level of challenge, and include challenging but engaging tasks.
- 3.4 Include the use of engaging, meaningful and authentic contexts appropriate to the pupils and to the computing being studied.
- 3.5 Be varied so that they involve pupils in a range of cognitive processes. These might include as appropriate:
 - abstracting real-world problems into their computational and informational essence
 - decomposing complex problems into parts
 - creating and analysing algorithms
 - generalising approaches to a wide variety of problems
 - investigating, conjecturing and hypothesising
 - applying, interpreting and analysing
 - commenting on answers and results.
- 3.6 Strike an appropriate balance between tasks and exercises that require the use of a computer, and 'unplugged' activities that address underpinning ideas and concepts.
- 3.7 Develop the skills of tinkering, debugging, creating, persevering, and collaborating, as appropriate to the curriculum, age group and task.
- 3.8 Develop IT skills, competencies and creative expression with digital tools and media.
- 3.9 Provide homework and out-of-school activities where appropriate that give the opportunity to continue the development of fluency and understanding.
- 3.10 Embed opportunities for both formative and summative assessment, giving both pupils and teachers the opportunity to check pupils' understanding, measure progress, and inform future learning.
- 3.11 Pupils should be exposed to questions and items from any formal assessment they experience so that they gain familiarity; they should, however, not dominate the teaching resources.
- 3.12 Where they address programming, develop and exercise a range of abilities related to programming. These may include some or all of the following:
 - writing a program

- reading a program and saying what it does
- predicting what a program will do
- explaining a program to someone else
- forming a hypothesis about what is wrong with an incorrect program
- using logical reasoning to correct an incorrect program
- (A level) proving that a program does what is claimed in all circumstances
- (GCSE, A level) reasoning about how long a program will take to execute.

4. Representation and design

A high-quality computing resource:

- 4.1 Uses relevant, clear and appropriate pictures, diagrams and other images to represent computing ideas and principles in forms that provide insight into the concepts being taught. Where relevant, they reveal underlying structures of ideas, and help pupils make sense of them.
- 4.2 Where there are both print textbooks and digital materials as part of a single course, they adopt 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 computing resource supports teachers:

- 5.1 Any teacher's guide or other material provided for teachers supports teaching in a variety of ways that might include:
 - providing guidance on effective use of the materials
 - providing insight into the computing tasks the pupils are engaging in,
 - approaches to problem-solving
 - identifying points that should be given more emphasis by the teacher.
- 5.2 Given the newness of computing as a school subject, effective teaching resources should recognise that many computing teachers are new to the subject and need additional support. This could include:
 - offering deeper subject knowledge background for the topics covered, giving references to other supportive resources and background reading
 - making resources available in soft-copy format, so they can be edited and adapted by teachers
 - providing exemplary lesson plans and schemes of work
 - providing model answers and strategies to help anticipate and avoid predictable mistakes, misconceptions and misunderstandings
 - identifying cross curricular links, demonstrating how computer science principles can be applied to illuminate or inspire teaching and learning in other subjects, and how those subjects may help provide material and contexts for computer science tasks
 - inspiring and enthusing the teacher herself or himself; conveying a vision of the excitement of the subject.
- 5.3 Where lesson plans or teaching schemes are provided, they are informed by research and ideas of effective teaching. This could 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 computing to everyday contexts and other curricular subjects.



THE **PUBLISHERS**
ASSOCIATION

6. Textbook authors and editors

A high-quality computing resource is:

- 6.1 Authored and reviewed by people with expert knowledge, skills and credibility.
- 6.2 Subject to stringent and independent quality assurance measures to validate the author's work.
- 6.3 Authored and edited according to research evidence and to accrued professional experience.
- 6.4 Trialled and refined in the light of trial data, wherever it is possible and appropriate to do so.