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Subject Leaders Training Computing

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Scope of the computing curriculum

National Curriculum

Purpose of study

A high-quality computing education equips pupils to **use computational thinking and creativity to understand and change the world.**

Computing has **deep links with mathematics, science, and design and technology,** and provides insights into both natural and artificial systems.

The core of computing is **computer science**, in which pupils are taught the principles of information and computation, how digital systems work, and how to put this knowledge to use through programming.

Building on this knowledge and understanding, pupils are equipped **to use information technology to create programs, systems and a range of content.**

Computing also ensures that pupils become **digitally literate** – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

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Aims

The national curriculum for computing aims to ensure that all pupils:

- can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation
- can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems
- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems
- are responsible, competent, confident and creative users of information and communication technology.

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Subject content

Key stage 1

Pupils should be taught to:

- understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions
- create and debug simple programs
- use logical reasoning to predict the behaviour of simple programs
- use technology purposefully to create, organise, store, manipulate and retrieve digital content
- recognise common uses of information technology beyond school
- use technology safely and respectfully, keeping personal information private; identify where to go for help and support when they have concerns about content or contact on the internet or other online technologies.

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Subject content

Key stage 2

Pupils should be taught to:

- design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts
- use sequence, selection, and repetition in programs; work with variables and various forms of input and output
- use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs
- understand computer networks including the internet; how they can provide multiple services, such as the world wide web; and the opportunities they offer for communication and collaboration

Subject content

Key stage 2

Pupils should be taught to:

- use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content
- select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information
- use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.

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Subject content
Key stage 3 and 4

The EYFS curriculum: what we want children to learn

- The curriculum is a top-level plan of everything the early years setting wants the children to learn.
- Planning to help every child to develop their language is vital.
- The curriculum needs to be ambitious. Careful sequencing will help children to build their learning over time.
- Young children's learning is often driven by their interests. Plans need to be flexible.
- Babies and young children do not develop in a fixed way. Their development is like a spider's web with many strands, not a straight line.
- **Depth in early learning is much more important than covering lots of things in a superficial way.**

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Pedagogy: helping children to learn

- Children are powerful learners. Every child can make progress in their learning, with the right help.
- Effective pedagogy is a mix of different approaches. Children learn through play, by adults modelling, by observing each other, and through guided learning and direct teaching.
- Practitioners carefully organise enabling environments for high-quality play. Sometimes, they make time and space available for children to invent their own play. Sometimes, they join in to sensitively support and extend children's learning.
- Children in the early years also learn through group work, when practitioners guide their learning.
- Older children need more of this guided learning.
- A well-planned learning environment, indoors and outside, is an important aspect of pedagogy.

EYFS

Computing is not explicitly referenced in the EYFS framework or Developmental Matters

'In addition, listening to a broad selection of stories, non-fiction, rhymes and poems will foster their understanding of our culturally, socially, **technologically** and ecologically diverse world'. Understanding of the World, EYFS Framework

However there is a need to lay the foundations for the Key Stage 1 curriculum

- Sequencing using vocabulary such as first, next, after…
- Gain knowledge of using floor robots
- Choosing suitable devices, for example iPads, cameras, computers…
- Discussions about online safety or dilemmas using stories
- Developing mouse and keyboard skills

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The characteristics of effective teaching and learning

In planning and guiding what children learn, practitioners must reflect on the different rates at which children are developing and adjust their practice appropriately. Three characteristics of effective teaching and learning are:

- playing and exploring - children **investigate and experience things, and 'have a go'**

- active learning - children **concentrate and keep on trying if they encounter difficulties, and enjoy achievements**

- creating and thinking critically - children have and **develop their own ideas, make links between ideas, and develop strategies for doing things**

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Challenges of teaching the computing curriculum:

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Categories of knowledge:

- Computer science
- Information technology
- Digital literacy

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Computer science

- Algorithms and programming
- Data
- Systems

Information technology

- Digital artefacts
- Compuitng contexts

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Digital literacy

- Mechanics
- Searching / selecting information
- E-safety

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Curriculum planning

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Component knowledge

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Examples of components

Model

Composite

To draw from observation

Component

Knowledge of formal

Elements – tone, line

Form, shape

Component

Knowledge of principles

of different drawing media

- pen, pencil, ink

Component

Knowledge of methods

and techniques

- sighting, gridding

Component

Knowledge of the effects

of different ways of

drawing – reference to

specific art

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Pedagogy

Distracting activities

E.g. Algorithms - write a sequence for how to make a jam sandwich – sequence selection and repetition – becomes more about the of making a sandwich rather than the key knowledge of algorithms

Experimentation

May not focus on key knowledge – only surface knowledge and can form bad habits

Scaffolding

This can be useful but it must support acquisition of knowledge e.g. step-by step tutorials become a task rather than a learning opportunity

Focus on curriculum goals, recall and developing automaticity

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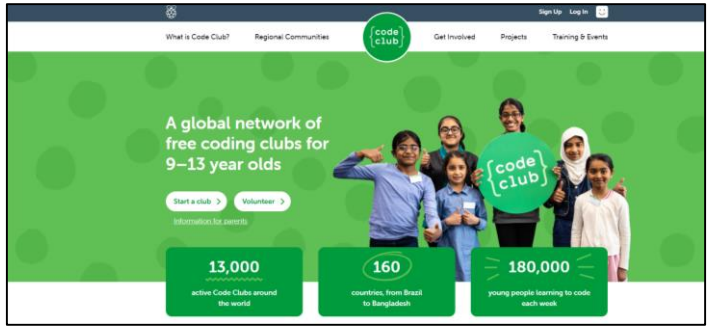
Assessment

- Identify component knowledge
- Don’t just focus on outcomes / composite tasks
- Cover all categories of the computing curriculum
- Use it to inform planning and gaps in learning for pupils
- Is pupil’s work accessible to show progression over time?

Culture

- Is the computing curriculum inclusive? Do pupils enjoy computing?
- Do you run computer clubs?
- Do pupils enter competitions?
- Are visits or visitors linked with computing?
- Do you make links with the world of work and careers?

https://codeclub.org/en/



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Systems

- Role of the subject leader
- Time for subject leader to develop the computing curriculum
- Teacher expertise
- Training
- Support for staff
- Networks
- Effective use of external schemes

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Policy

- Are the statutory requirement to teach computing to all pupils at every key stage?
- Does the curriculum follow the national curriculum or a curriculum of comparable breadth and ambition?
- How much curriculum time is allocated for computing?
  Is it sufficient and does it ensure pupil's knowledge builds on prior learning?
- Is computing seen as priority by senior leaders?
- How do whole school policies impact on computing?

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Things to consider…

Knowledge not activities

Sequence of learning

Subject knowledge of staff

Monitoring and evaluation

Monitoring and evaluating

Things to think about:

- Work scrutiny evidences the impact of the curriculum on pupils' learning
- Lesson visits – focus on implementation
- It indicates whether pupils are learning and remembering long term what intend pupils to learn and remember
- Long term memory change is what is being looked for in impact
- Discussion with pupils evidences impact on knowledge retention
- **Knowing more and remembering more**

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Resources

Associations

Computing at School (CAS) Home Page

Naace: The Educational Technology Association

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Resources

https://teachcomputing.org

Teach Computing

The National Centre for Computing Education is funded by the Department for Education and marks a significant investment in improving the provision of computing education in England. Run by a consortium made up of STEM Learning, the Raspberry Pi Foundation and BCS, The Chartered Institute for IT, our vision is to achieve a world-leading computing education for every child in England.

Funding and fees

Our online courses for key stages 1-4 are free to all teachers.

Face to face and remote courses are fully or part funded, for teachers in state-funded education.

Teachers from state-funded schools or colleges

Face to face or remote course	Fee	Subsidy
Short or introductory course	Free	No
Primary	£65	Yes*
Computer Science Accelerator	Free	Yes
Secondary KS3 and KS4	£65 (free to CS Accelerator graduates in secondary state education)	No

* For primary courses, funding is available for one teacher in a state-funded primary school per academic year.

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