



## How do you teach computing with limited access to computers?

Schools and teachers are reporting that they are either currently unable to access their school computer suite, or that their access is severely limited. While it is essential that children develop their computing knowledge by using computers directly, there are ways to adapt teaching to incorporate meaningful activities that introduce ideas or develop understanding away from computers.

Here are six ideas from our team to help you introduce these activities in your classroom:

- 1 Consider rejigging your scheme of work for the year. Some topics are more reliant on a computer than others – for example, programming, multimedia production, internet skills, and data processing could be moved to later in the year. In the meantime, you could focus on networking, computer architecture, and the ethical implications of technology, which can all be taught without being online.
- 2 The [Teach Computing Curriculum](#) has lesson plans for every topic and every key stage. Rather than pick out odd lessons that don't need a computer, we recommend that you choose topics such as those outlined above, and adapt the lesson plans where the activity uses a computer. For example, you can use pen and paper exercises instead of online worksheets, and you can draw network diagrams by hand rather than use software tools. Adhering to the Teach Computing Curriculum while adapting individual activities will help you to demonstrate that you are using a structured computing curriculum, [as noted by Ofsted](#).
- 3 Use unplugged activities where they are helpful, but remember that unplugged is not the same as offline. It's always important to reconnect the unplugged activity to the concept being learned, and you can do this on a computer or offline depending on the activity/topic. Some unplugged activities should be followed up by an application of the principle being learned unplugged using technology. The [latest issue of Research Bytes](#) has some guidance on this.
- 4 Although learning to program does really need a computer to practise the skills over time, there are many aspects of the learning process that can, and even should, be done offline. Learners can be given snippets of code on paper and **predict** what they might do, or **find the errors** in a program, or use a **trace table** to trace through the code systematically. All of these are fantastic exercises for learners to really understand the concepts of programming.
- 5 [Flipped learning](#) may come into its own when it's difficult to use a computer at school. Oak Academy has lots of computing lessons from the Teach Computing Curriculum. You may want to ask students to work through the lessons at home on their own devices, and then use your lessons to consolidate the material through pen and paper exercises, and quizzes.
- 6 To supplement these suggestions, we've created a quick access list of unplugged activities from our professional development courses (see table on the following pages). The activities are modelled in our teacher CPD courses, which demonstrate the adaptive approach suggested in Idea 2 above; they have specific suggestions about how you can use an offline or unplugged activity to introduce a computing concept. Trying some of these activities might also give you ideas for adapting other lessons in a similar fashion.

We really hope these help - let us know if you need more support and guidance by [emailing us](#). Happy computing!

Key stage	Activity	Description
KS1	Programming turtle devices	Children can program roaming devices, such as turtles, to develop a better understanding of sequences and optimising algorithms. This can be done in any teaching space, and has great potential for creativity and customisation to fit with learning themes. While 'fakebots' can be used as a replacement for digital devices, they do not offer the same depth of feedback, or help children understand the need for unambiguous language as effectively. <a href="#">Find out more in this CPD course</a>
	Database design	By comparing familiar things such as types of fruit, or animals, children can apply logic to design a branching database. This can be represented on paper as a decision tree. <a href="#">Find out more in this CPD course</a>
KS1-2	Algorithm decomposition and design	Spending time on the design phase of problem solving leads to improved computational thinking skills. Children can develop their own success criteria, and plan how they will test whether these have been met. The programmed solutions can make use of turtles and other programmable devices away from a normal computer. <a href="#">Find out more in this CPD course</a>
	Acting out algorithms	Simple algorithms that involve bodily movements – walking, or touching your head – can help develop understanding of algorithmic structures such as sequence and repetition. These visible activities present opportunities for formative assessment to make sure concepts are understood before they are more widely applied. <a href="#">Find out more in this CPD course</a>
	Dry runs: Prediction	Children can trace the outcome of an algorithm or program and predict the output. If you use teacher modelling, the whole group can jointly step through the algorithm, and develop improved understanding of control flow, inputs, and outputs. <a href="#">Find out more in this CPD course</a>

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KS1-2	Data collection	Children can plan how to collect data which will, ultimately, be processed and communicated using a computer. Links to other subject areas including maths, geography, and science are easily made. <a href="#">Find out more in this CPD course</a>
KS1-4	Internet safety	Many of the activities contained within the teacher guide 'Education for a Connected World', are most effective away from a computer. Discuss with colleagues in PSHE how you can share the responsibility of teaching these important skills and knowledge. <a href="#">Find out more about the 'Education for a Connected World' framework</a>
KS2	Using 'unplugged' data structures	Conceptual models can help children develop a better understanding of variables, which leads to better algorithm and program design. <a href="#">Find out more in this CPD course</a>
	Exploring networks	The key network infrastructure of your school can be explored without even switching on a PC. Find, identify, and describe the function of switches, servers, and other components. <a href="#">Find out more in this CPD course</a>
	Media literacy	Children can use the teacher whiteboard, or printed materials to explore bias and multiple viewpoints in media and online content. <a href="#">Find out more in this CPD course</a>
	Multimedia projects	Devices such as audio recorders, cameras, tablets, can help children plan a multimedia project and gather the component parts, ready to assemble in software once computers can be accessed. <a href="#">Find out more in this CPD course</a>
	Presenting information	Children who are inexperienced presenters sometimes lean too hard on technology. Instead, take the opportunity to develop presentation skills that are complemented by technology, not dependent on it. <a href="#">Find out more in this CPD course</a>

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Key stage	Activity	Description
KS3	Data representation	Understanding how to manipulate binary numbers, and understanding their role in computer systems, is vital knowledge for secondary computing. Conversions and calculations don't need a computer, while digital images and other representations can make use of the teacher screen. <a href="#">Find out more in this CPD course</a>
	Algorithm representation	Algorithms, and everyday processes, can be represented using flowcharts. Linking flowcharts to 'human algorithms', carried out by human agents, can help with iterative development and debugging. Algorithms, such as searches and sorts, can be studied using everyday objects such as weights, playing cards, or containers of water. <a href="#">Find out more in this CPD course</a>
	Exploring the 'hinterland' of computing	The hinterland is the rich subset of subject knowledge that isn't directly contained in the testable 'core'; it brings the subject to life, deepening understanding and improving recall. Learn about the challenges overcome by Jean-Dominique Bauby, who 'wrote' an entire book by only moving an eyelid; the role of the first programmer, Ada Lovelace; or how Turing and Flowers cracked the Enigma code at Bletchley. <a href="#">Find out more in this CPD course</a>
KS3-4	Mental models	For students to flourish in computer science, an accurate mental model of a computer is important. Students can develop their understanding of the Fetch-Execute cycle, or of how clock speeds affect computation, away from a machine. <a href="#">Find out more in this CPD course</a>
	Encryption	Encrypt and decrypt messages using Caesar cyphers and one-time pads, to learn the benefits, and overheads, of secure communication. <a href="#">Find out more in this CPD course</a>

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KS3-4	Careers in computing and tech	<p>Check the jobs section of a local or national newspaper to audit the skills required, the study routes to attain them, and the conditions of employment that can be expected. Earnings in digitally-skilled jobs tend to be higher than in non-digital roles.</p> <p><a href="#">Find out more in this CPD course</a></p>
KS4	Networks and communication	<p>Networks help computers, and the humans using them, to communicate. As well as learning how networking technologies such as Wi-Fi work, why not look at semaphore or Morse code to learn about transmission rates, errors, and checks?</p> <p><a href="#">Find out more in this CPD course</a></p>
	Cybersecurity	<p>Develop guidance for humans – the weakest point in any computer system – to improve data security. Phishing, social engineering, physical security measures, these issues can be brought to life by talking about real incidents in the news.</p> <p><a href="#">Find out more in this CPD course</a></p>
	Computer systems	<p>Computers are always best disassembled when they are not plugged in! So take this opportunity to showcase the inside of an old desktop machine, identifying hard drives, motherboards, network cards, and other vital components. Show learners what each does, and how they are designed to work together in a modular system.</p> <p><a href="#">Find out more in this CPD course</a></p>