Year 3 – Connecting computers

Unit introduction

Learners will develop their understanding of digital devices, with an initial focus on inputs, processes, and outputs. They will also compare digital and non-digital devices. Next, learners will be introduced to computer networks, including devices that make up a network's infrastructure, such as wireless access points and switches. Finally, learners will discover the benefits of connecting devices in a network.

Software and Hardware requirements

Lesson 3 requires digital devices with a painting application. Lesson 6 includes a 'network tour', which involves learners identifying key parts of your school network. You will therefore need access to your school's server, switch, and wireless access points.

If you've adapted this unit to better suit your school, please share your adapted resources with fellow teachers in the STEM community. Alternatively, if this unit isn't quite right for your school, why not see if an adapted version which better suits has already been shared?

Overview of lessons

Lesson	Brief overview	Learning objectives
1 How does a digital device work?	This lesson introduces the concepts of input, process, and output and how to protect devices using secure passwords. These concepts are fundamental to all digital devices.	To explain how digital devices function • I can explain that digital devices accept inputs

		• I can explain that digital devices produce outputs • I can follow a process • I can explain what makes a secure password
2 What parts make up a digital device?	Learners will develop their knowledge of the relationship between inputs, processes, and outputs and apply it to devices and parts of devices that they will be familiar with from their everyday surroundings.	To identify input and output devices • I can classify input and output devices • I can describe a simple process • I can design a digital device
3 How do digital devices help us?	Learners will apply their learning from Lessons 1 and 2 by using programs in conjunction with inputs and outputs on a digital device. They will create two pieces of work with the same focus, using digital devices to create one piece of work, and non-digital tools to create the other. Learners will then compare and contrast the two approaches.	To recognise how digital devices can change the way that we work • I can explain how I use digital devices for different activities • I can recognise similarities between using digital devices and using non-digital tools • I can suggest differences between using digital devices and using non-digital tools
4 How am I connected?	Many digital devices are now connected to other digital devices, e.g. computers through wires, tablets through Wi-Fi, and smartphones through mobile phone networks. The benefit of connecting digital devices is that it allows information to be shared between users and systems.	To explain how a computer network can be used to share information • I can recognise different connections

	This lesson introduces the concept of connections and moving information between connected devices. Learners will learn to explain how and why computers are joined together to form networks.	• I can explain how messages are passed through multiple connections • I can discuss why we need a network switch
5 How are computers connected?	This lesson introduces key network components, including a server and wireless access points. Learners will examine each device's functionality and look at the benefits of networking computers.	To explore how digital devices can be connected • I can recognise that a computer network is made up of a number of devices • I can demonstrate how information can be passed between devices • I can explain the role of a switch, server, and wireless access point in a network
6 What does our school network look like?	Learners will further develop their understanding of computer networks. They will see examples of network infrastructure in a real-world setting and relate them to the activities in Lesson 5.	To recognise the physical components of a network • I can identify how devices in a network are connected together • I can identify networked devices around me • I can identify the benefits of computer networks

Subject knowledge and CPD opportunities

You will need an understanding of digital and non-digital devices. The key difference between them is that a digital device is capable of some processing, i.e. it has functions beyond being either on or off. You will also need to be familiar with the concept of input, process, output (IPO), which underpins all digital devices. You will need to understand that devices can have one input that leads to several outputs (e.g. starting a video, leads to outputs from the screen and the speaker) and that many inputs can lead to one output (e.g. using a mouse and a keyboard to produce a document).

You will need a basic understanding of how information (data) flows around a computer network, and how this benefits us. You will also need to know that a network switch manages the way in which data moves around a network. You will need to be familiar with the main parts of a school network, including the server, wireless access points, network switch, router, and output devices such as a printer or copier.

Continual Professional Development

Enhance your subject knowledge to teach this unit through the following free CPD:

- Getting started in year 3
- Teaching computing systems and networks to 5- to 11-year-olds
- Introduction to primary computing

Teach primary computing certificate

To further enhance your subject knowledge, enrol on the teach primary computing certificate. This will support you to develop your knowledge and skills in primary computing and gain the confidence to teach great lessons, all whilst earning a nationally recognised certificate!

Progression

This unit progresses learners' knowledge and understanding of technology by focusing on digital and non-digital devices, from the following units; Technology around me Year 1 and IT around us Year 2, and introducing the concept of computers connected together as a network. Following this unit, learners will explore the internet as a network of networks.

Common misconceptions

Learners may have misconceptions with classifying digital and non-digital devices. They should be aware that a digital device is capable of some processing, i.e. it has functions beyond being either on or off. When looking at inputs and outputs, learners may struggle to classify a tablet (iPad) as this can be identified as both an input and output.

When looking at networks, misconceptions may occur when identifying network devices. Be aware the images used are illustrative and are unlikely to be representative of the actual devices in your school network. The school network may differ from the unit, for example most school networks have one switch, although some larger schools have more, especially if they are split over more than one site, and schools may not have a server if they are using online platforms.

When looking at the internet, another misconception may be learners thinking that a Wi-Fi connection is an internet connection; this is wrong, it is just a wireless way of connecting to a network. Equally, learners may mention 3G, 4G, or 5G connections, which connect devices (usually smartphones) to the internet and not solely to a network.

Curriculum links

Computing

- use sequence, selection, and repetition in programs; work with variables and various forms of input and output
- 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
- 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

Education for a Connected World links

Privacy and Security

- I can describe simple strategies for creating and keeping passwords private.

Maths (Lesson 1)

- **Number and place value:** solve number problems and practical problems involving these ideas.

Art (Lesson 3)

- to improve their mastery of art and design techniques, including drawing, painting and sculpture with a range of materials [for example, pencil, charcoal, paint, clay]

Assessment

Formative assessment

Assessment opportunities are detailed in each lesson plan. The learning objectives and success criteria are introduced in the slide decks at the beginning of each lesson and then reviewed at the end. Learners are invited to assess how well they feel they have met the learning objective using thumbs up, thumbs sideways, or thumbs down.

Summative assessment

Please see the summative assessment document of multiple-choice questions for this unit. This can be downloaded as a paper copy, with answers, or in a digital format to be shared.

Attribution statement

This resource was created by Raspberry Pi Foundation and updated by STEM Learning for the National Centre for Computing Education.

Year 3 – Programming A - Sequencing sounds

Unit introduction

This unit explores the concept of sequencing in programming through Scratch. It begins with an introduction to the programming environment, which will be new to most learners. They will be introduced to a selection of motion, sound, and event blocks which they will use to create their own programs, featuring sequences. The final project is to make a representation of a piano. The unit is paced to focus on all aspects of sequences, and make sure that knowledge is built in a structured manner. Learners also apply stages of program design through this unit.

This unit uses the Scratch programming platform to support pupils' learning in computing. Scratch offers an engaging environment for developing key programming skills through creativity and experimentation. However, it is essential that teachers using Scratch understand how to do so safely.
If learners are using the online version of Scratch, be aware this allows them to share and comment on projects. A simplified version of the Scratch's community guidelines is included in lesson one, and can also be found at the end of this unit guide. For the full guidelines, see the Scratch website.

Teachers have a statutory duty to protect pupils from potential risks associated with using online platforms, including those that enable content sharing and interaction. The Department for Education's guidance on Keeping Children Safe in Education makes clear that safeguarding extends to online activity and digital tools used in school.

Software and Hardware requirements

Learners will need to have access to Scratch for this unit. The online version of Scratch runs via a web browser and can be accessed on desktops, laptops and tablets. You may want to consider setting up a teacher account, to create logins for learners to save and access their projects. If internet connectivity is an issue in school, Scratch can be accessed offline via the Scratch app.

If you've adapted this unit to better suit your school, please share your adapted resources with fellow teachers in the STEM community. Alternatively, if this unit isn't quite right for your school, why not see if an adapted version which better suits has already been shared?

Overview of lessons

Lesson	Brief overview	Learning objectives
1. Introduction to Scratch	This lesson introduces learners to a new programming environment: Scratch. Learners will begin by comparing Scratch to other programming environments they may have experienced, before familiarising themselves with the basic layout of the screen.	To explore a new programming environment • I can identify the objects in a Scratch project (sprites, backdrops) • I can explain that objects in Scratch have attributes (linked to) • I can recognise that commands in Scratch are represented as blocks
2. Programming sprites	In this lesson, learners will create movement for more than one sprite. In doing this, they will design and implement their code, and then will create code to replicate a given outcome. Finally, they will experiment with new motion blocks.	To identify that commands have an outcome • I can create a program following a design and understand that each sprite is controlled by the commands I choose • I can predict the coding blocks used to move a sprite • I can match coding blocks to their actions
3. Sequences	In this lesson, learners will be introduced to the concept of sequences by joining blocks of code together. They will also learn how event blocks can be used to start a project in a variety of different ways. In doing this, they will apply principles of design to plan and create a project.	To explain that a program has a start • I can start a program in different ways • I can create a sequence of connected commands • I can explain that the objects in my project will respond exactly to the code

4. Ordering commands	This lesson explores sequences, and how they are implemented in a simple program. Learners have the opportunity to experiment with sequences where order is and is not important. They will create their own sequences from given designs.	To recognise that a sequence of commands can have an order • I can explain what a sequence is • I can combine sound commands • I can order notes into a sequence
5. Looking good	This lesson develops learners' understanding of sequences by giving them the opportunity to combine motion and sounds in one sequence. They will also learn how to use costumes to change the appearance of a sprite, and backdrops to change the appearance of the stage. They will apply the skills in Activity 1 and 2 to design and create their own project, including sequences, sprites with costumes, and multiple backdrops.	To change the appearance of my project • I can build a sequence of commands • I can decide the actions for each sprite in a program • I can make design choices for my artwork
6. Making an instrument	In this lesson, learners will create a musical instrument in Scratch. They will apply the concept of design to help develop programs and use programming blocks — which they have been introduced to throughout the unit. They will learn that code can be copied from one sprite to another, and that projects should be tested to see if they perform as expected.	To create a project from a task description • I can identify and name the objects I will need for a project • I can relate a task description to a design • I can implement my algorithm as code

Subject knowledge and CPD opportunities

Throughout this unit, there are opportunities to model skills within Scratch, where concepts have been demonstrated through an embedded screen recording. Pedagogically, it is more beneficial to model the concepts to the learners, which allows for easier questioning and understanding. We recommend that you use the videos for your own subject knowledge, to see what needs to be modelled, and then give a live demonstration within the lesson. However, the videos are provided on the slides if you wish to use them instead.

This unit focuses on developing learners' understanding of sequences in a new programming language. It highlights that the order of sequences is important. This unit also develops learners' understanding of design in programming, using the approach outlined below.

When programming, there are four levels which can help describe a project (known as levels of abstraction). Research suggests that this structure can support learners in understanding how to create a program and how it works:

- Task - what is needed
- Design - what it should do
- Code - how it is done
- Running the code - what it does

Spending time at the task and design levels before engaging in code-writing can aid learners in assessing the 'do-ability' of their programs. It also reduces a learner's cognitive load during programming. Learners will move between the different levels throughout the unit and this is highlighted within each lesson plan.

Continual Professional Development

Enhance your subject knowledge to teach this unit through the following free CPD:

- Getting started in year 3
- Introduction to primary computing
- Introduction to Programming with Scratch
- Teaching programming using Scratch and Scratch Jr

Teach primary computing certificate

To further enhance your subject knowledge, enrol on the teach primary computing certificate. This will support you to develop your knowledge and skills in primary computing and gain the confidence to teach great lessons, all whilst earning a nationally recognised certificate!

Progression

This unit assumes that learners will have some prior experience of programming; via the KS1 NCCE units. They will have experienced programming via floor robots; Moving A Robot Year 1 and Robot algorithms Year 2, alongside the use of ScratchJr through Programming animations Year 1 and Programming quizzes Year 2. ScratchJr uses a similar programming environment to Scratch, which is highlighted in lesson 1 of this unit.

Common Misconceptions

This unit introduces Scratch to learners. When using the software, learners should be aware that the colour of the coding blocks is important. The programming palette is organised into nine colour-code categories, and understanding this will help learners navigate the platform. For all projects to run, they must use an event command (e.g. when green flag is clicked) to start their program; learners often forget this, and as such their code will not start. When working with multiple sprites on Scratch, learners may code the wrong Sprite. To avoid this, learners must click on the sprite to bring up its individual code tab, before starting.

Learners will need to understand that an algorithm is a precise set of ordered instructions, and that this is different from a program. They will also need to be aware that the sequence of their coding blocks is important, with the computer carrying out the commands in that order.

Curriculum links

Computing

- 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
- 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

Assessment

Formative assessment

Assessment opportunities are detailed in each lesson plan. The learning objectives and success criteria are introduced in the slide decks at the beginning of each lesson and then reviewed at the end. Learners are invited to assess how well they feel they have met the learning objective using thumbs up, thumbs sideways, or thumbs down.

Summative assessment
Please see the assessment rubric document for this unit. The rubric can be used to assess student's work from lesson 6.

We recommend the use of teacher and learner accounts in Scratch to help with assessment throughout this unit. For guidance on setting up teacher accounts, visit scratch.mit.edu/educators/faq. A teacher account enables you to manage learners' accounts and organise projects into studios. If you are unable to use teacher and learner accounts, work can be saved offline to local devices.

Scratch guidelines

- **Stay Safe Online**: Don't share personal info like your full name, address, or phone number. Also, don't share details about where you go to school or your social media accounts.

- **Be Kind and Helpful**: When you comment on someone's project, say something nice about it and offer suggestions in a friendly way. Don't be mean or spammy.

- **Share and Collaborate**: You can use other people's stuff on Scratch to make your own cool projects but remember to give credit. And when you share your work, others can use it too, as long as they give credit and make changes.

- **Be Honest**: Always tell the truth and be yourself when you're on Scratch. Don't pretend to be someone else.

- **Keep Scratch Friendly**: Make sure your creations and chats are friendly for everyone. If you see something mean or inappropriate, you can click the link that says "report" on any project, comment, discussion post, studio, or profile page. If you're unsure or it's a bit complicated, you can ask your teacher or a trusted adult to get in touch with us. The Scratch team will take care of it.

Year 3 – Desktop publishing

Unit introduction

Learners will become familiar with the terms ‘text’ and ‘images’ and emojis and understand that they can be used to communicate messages offline and online. They will use desktop publishing software and consider careful choices of font size, colour and type to edit and improve premade documents. Learners will be introduced to the terms ‘templates’, ‘orientation’, and ‘placeholders’ and begin to understand how these can support them in making their own template for a magazine front cover. They will start to add text and images to create their own pieces of work using desktop publishing software. Learners will look at a range of page layouts thinking carefully about the purpose of these and evaluate how and why desktop publishing is used in the real world.

The suggested application for this unit is Canva https://www.canva.com/ . Canva is web based and can be used on tablets, desktops and laptops. Mac, Windows and Android apps are available: https://www.canva.com/download/windows/ .

Students below the age of 13 require parental consent to use Canva for Education. For further details and to download a sample consent template visit: https://www.canva.com/help/invite-teachers-and-students/

To use Canva as a teacher, you will require a Canva for Education account. To learn more and sign up for a FREE Canva teacher account visit: https://www.canva.com/help/about-canva-for-education/.

NB: Due to Canva’s teacher verification process we would recommend signing up prior to teaching the unit to allow time for verification of your teaching status to take place.

Once you have been granted access to Canva you can follow their guide on inviting students and teachers to your class by visiting: https://www.canva.com/help/invite-teachers-and-students/

Overview of lessons

Lesson	Brief overview	Learning objectives
1. Words and pictures	In this lesson, learners will become familiar with the terms 'text' and 'images' and understand that text and images need to be used carefully to communicate messages clearly. Learners will be able to give advantages and disadvantages of using text, images, emojis or both text. Images and emojis to communicate messages effectively online.	To recognise how text and images convey information • I can explain the difference between text and images • I can recognise that text and images can communicate messages clearly • I can identify the advantages and disadvantages of using text and images • I understand how to use emojis respectfully online
2. Can you edit it?	This lesson will build on last week's lesson, in which we looked at using images and text to communicate a message effectively. In this lesson we will look at desktop publishing. Learners will think about how to make careful choices regarding font size, colour, and type in an invitation. The use of the Return, Backspace, and Shift keys will be explored and learners will be taught how to type age-appropriate punctuation marks. This will build on the typing skills learned in the Year 1 'Digital writing' unit. Learners will understand that once content has been added, it can be rearranged on the page.	To recognise that text and layout can be edited • I can change font style, size, and colours for a given purpose • I can edit text • I can explain that text can be changed to communicate more clearly
3. Great template!	In this lesson, pupils will look at the role of an editorial designer, being the person who is responsible for putting content together.	To choose appropriate page settings • I can explain what 'page orientation' means

	Learners will be introduced to the terms 'templates', 'orientation', and 'placeholders' within desktop publishing software. The learners will create their own magazine template, which they will add content to during the next lesson. This lesson has been designed on a laptop using Canva and this is reflected in the slides. Teachers may decide to use Canva, or other software such as Microsoft Publisher.	• I can recognise placeholders and say why they are important • I can create a template for a particular purpose
4. Becoming a designer	In this lesson, learners will add their own content (text and images) to the magazine templates they created in lesson 3. They will copy the information for the front of their magazine from a prewritten document and paste it into the chosen place on their magazine cover. Images will be added from within the search facility in Canva. Learners will recap the role of an editorial designer (introduced to them in lesson three) exploring elements of the job role in more detail.	To add content to a desktop publishing publication • I can choose the best locations for my content • I can paste text and images to create a magazine cover • I can make changes to content after I've added it
5. Lay it out	In this lesson, learners will think about the different ways information can be laid out on a page. They will look at a range of page layouts such as letters and newspapers, and begin to think about the purpose of each of these.	To consider how different layouts can suit different purposes • I can identify different layouts • I can match a layout to a purpose • I can choose a suitable layout for a given purpose
6. Why desktop publishing?	In this lesson, learners will explain what desktop publishing means in their own words. They will think about how desktop publishing is used in the wider world and consider the benefits of using desktop publishing applications.	To consider the benefits of desktop publishing • I can identify the uses of desktop publishing in the real world • I can say why desktop publishing might be helpful • I can compare work made on desktop publishing to work created by hand

Progression

This unit progresses learners' knowledge and understanding of using digital devices to combine text and images building on work from the following units; Digital Writing Year 1, Digital painting Year 1, and Digital Photography Year 2.

Common Misconceptions

Learners may have misconceptions around typing skills. They should be aware that caps lock should only be used if they are typing a full sentence in capital letters. Shift should be used for single letters, as this is more efficient and uses fewer key presses. There may also be misconceptions around the delete and backspace keys. The backspace key deletes to the left of the cursor, and the delete key deletes to the right. When considering their design, learners may think the more colours and effects used, the better their document, however, encourage them to consider the audience and accessibility.

Curriculum links

National curriculum links

Computing

- 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

English programmes of study links

- Pupils should be taught to draft and write by: in non-narrative material, using simple organisational devices [for example, headings and subheadings]
- Evaluate and edit by assessing the effectiveness of their own and others' writing and suggesting improvements
- Proofread for spelling and punctuation errors

Education for a Connected World links

Managing online information

- I can use key phrases in search engines
- I can use search technologies effectively

Copyright and ownership

- When searching on the internet for content to use, I can explain why I need to consider who owns it and whether I have the right to reuse it
- I can demonstrate the use of search tools to find and access online content which can be reused by others

Assessment

Formative assessment

Assessment opportunities are detailed in each lesson plan. The learning objectives and success criteria are introduced in the slide decks at the beginning of each lesson and then reviewed at the end. Learners are invited to assess how well they feel they have met the learning objective using thumbs up, thumbs sideways, or thumbs down.

Summative assessment

Please see the assessment rubric document for this unit. The rubric can be used to assess student's work from lessons 3 to 6.

Subject knowledge

Experience of using desktop publishing packages will support your delivery of this unit, however all of the skills the learners will be using are demonstrated throughout the unit. You will need to recognise the different ways in which information can be presented on a page (letters, postcards, posters etc.) and the different purposes each of these formats are used for. Additionally, you will need to have an understanding of the advantages of using text, images, or both to communicate messages.

Within your chosen desktop publishing software, you will need to be confident in showing pupils how to change font size, colour, and style, guidance is provided within the resources for this unit. You will also need to know how to create templates using placeholders, as well as an awareness of the additional tools available to you. The ability to share files with your learners, via Canva, (or if using other software via Google Drive or on your school's network) would support the delivery of this unit.

You should be aware of your school's procedures relating to children searching for images and how to report any issues.

It would be beneficial to have an understanding of the places that desktop publishing software is used in the real world, and some knowledge of the benefits of using desktop publishing applications.

Enhance your subject knowledge to teach this unit through the following free CPD:

- **Getting started in year 3**
- **Introduction to primary computing**

To further enhance your subject knowledge, enrol on the primary certificate. This will support you to develop your knowledge and skills in primary computing and gain the confidence to teach great lessons, all whilst earning a nationally recognised certificate!