Year 5 – Sharing information

Unit introduction

In this unit, learners will develop their understanding of computer systems and how information is transferred between systems and devices. Learners will consider small-scale systems as well as large-scale systems. They will explain the input, output, and process aspects of a variety of different real-world systems. Learners will also take part in a collaborative online project with other class members and develop their skills in working together online.

Overview of lessons

Lesson	Brief overview	Learning objectives
1 Systems	This lesson introduces learners to the concept of a system. Learners will develop their understanding of components working together to make a whole. They will outline how digital systems might work and the physical and electronic connections that exist.	To explain that computers can be connected together to form systems • I can explain that systems are built using a number of parts • I can describe that a computer system features inputs, processes, and outputs • I can explain that computer systems communicate with other devices
2 Computer systems and us	In this lesson, learners will consider how larger computer systems work. Learners will consider how devices and processes are connected. They will also reflect on how computer systems can help us.	To recognise the role of computer systems in our lives • I can identify tasks that are managed by computer systems • I can identify the human elements of a computer system • I can explain the benefits of a given computer system
3 Transferring information	This lesson introduces the idea that parts of a computer system are not always in the same place or country. Instead, those parts of a system must transfer information using the internet. This lesson builds on the introduction to the internet in the Year 4 ‘What is the	To recognise how information is transferred over the internet • I can recognise that data is transferred using agreed methods • I can explain that networked digital devices have unique addresses

	internet?' unit, adding awareness of IP addresses and the rules (protocols) that computers have for communicating with one another.	• I can explain that data is transferred over networks in packets
4 Working together	In this lesson, learners will consider how people can work together when they are not in the same location. They will discuss ways of working and start a collaborative online project. The online activity assumes that learners can make simple slides including text and images. If your learners are unsure how to do this, you may wish to spend some time on the Year 3 'Desktop publishing' unit before this lesson.	To explain how sharing information online lets people in different places work together • I can recognise that connected digital devices can allow us to access shared files stored online • I can send information over the internet in different ways • I can explain that the internet allows different media to be shared
5 Better working together	In this lesson, learners will reflect on how they worked together in the previous lesson and how their working together might be improved. Learners will work together on an unplugged activity and use that experience to develop their own ideas of good collective working practices.	To contribute to a shared project online • I can suggest strategies to ensure successful group work • I can make thoughtful suggestions on my group's work • I can compare working online with working offline
6 Shared working	In the previous two lessons, learners worked together online on a shared project. This lesson introduces another approach to online working: reusing and modifying work done by someone else. (Using someone else's work needs to be done within the bounds of copyright and with the relevant permissions.) This lesson uses the Scratch programming tool, which allows learners to use other people's work.	To evaluate different ways of working together online • I can identify different ways of working together online • I can recognise that working together on the internet can be public or private • I can explain how the internet enables effective collaboration

Progression

This unit progresses learners' knowledge and understanding of computing systems and online collaborative working.

Curriculum links

National curriculum links

- 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
- 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

- I can assess and justify when it is acceptable to use the work of others
- I can give examples of content that is permitted to be reused

Year 5 – Vector drawing

Unit introduction

In this unit, learners start to create vector drawings. They learn how to use different drawing tools to help them create images. Learners recognise that images in vector drawings are created using shapes and lines, and each individual element in the drawing is called an object. Learners layer their objects and begin grouping and duplicating them to support the creation of more complex pieces of work.

Overview of lessons

Lesson	Brief overview	Learning objectives
1 The drawing tools	Learners are introduced to vector drawings and begin to understand that they are made up of simple shapes and lines. They use the main drawing tools within the Google Drawings application to create their own vector drawings. Learners discuss how vector drawings differ from paper-based drawings.	To identify that drawing tools can be used to produce different outcomes • I can recognise that vector drawings are made using shapes • I can experiment with the shape and line tools • I can discuss how vector drawings are different from paper-based drawings
2 Creating images	Learners begin to identify the shapes that are used to make vector drawings. They are able to explain that each element of a vector drawing is called an object. Learners create their own vector drawing by moving, resizing, rotating, and changing the colours of a selection of objects. They also learn how to duplicate the objects to save time.	To create a vector drawing by combining shapes • I can identify the shapes used to make a vector drawing • I can explain that each element added to a vector drawing is an object • I can move, resize, and rotate objects I have duplicated
3 Making effective drawings	Learners increase the complexity of their vector drawings and use the zoom tool to add detail to their work. They are shown how grids and resize handles can improve the consistency of their drawings. Learners also use tools to modify objects to	To use tools to achieve a desired effect • I can use the zoom tool to help me add detail to my drawings • I can explain how alignment grids and resize handles can be

	create a new image.	used to improve consistency • I can modify objects to create a new image
4 Layers and objects	Learners gain an understanding of layers and how they are used in vector drawings. They discover that each object is built on a new layer and that these layers can be moved forwards and backwards to create effective vector drawings.	To recognise that vector drawings consist of layers • I can identify that each added object creates a new layer in the drawing • I can change the order of layers in a vector drawing • I can use layering to create an image
5 Manipulating objects	Learners find out how to select and duplicate multiple objects at a single time. They develop this skill further by learning how to group multiple objects to make them easier to work with. Learners then use this knowledge to group and ungroup objects, in order to make changes to and develop their vector drawings.	To group objects to make them easier to work with • I can copy part of a drawing by duplicating several objects • I can recognise when I need to group and ungroup objects • I can reuse a group of objects to further develop my vector drawing
6 Create a vector drawing	Learners use the skills they have gained in this unit to create a vector drawing for a specific purpose. They reflect on the skills they have used to create the vector drawing and think about why they used the skills they did. Learners then begin to compare vector drawings to freehand paint program drawings.	To apply what I have learned about vector drawings • I can create a vector drawing for a specific purpose • I can reflect on the skills I have used and why I have used them • I can compare vector drawings to freehand paint drawings

Progression

This unit progresses learners' knowledge and understanding of digital painting and has some links to the Year 3 'Creating media – Desktop publishing' unit, in which learners used digital images. In this Year 5 unit, learners create images that could be used in desktop publishing documents.

Curriculum links

National curriculum links

- 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.

Year 5 – Video production

Unit introduction

Learners will learn how to create short videos by working in pairs or groups. As they progress through this unit, they will be exposed to topic-based language and develop the skills of capturing, editing, and manipulating video. Learners are guided with step-by-step support to take their idea from conception to completion. At the conclusion of the unit, learners have the opportunity to reflect on and assess their progress in creating a video.

Overview of lessons

Lesson	Brief overview	Learning objectives
1 What is video?	Learners will be introduced to video as a media format. They will see examples of videos featuring production and editing techniques that they will work towards using their own videos. Learners will begin by explaining what the medium of video is before analysing and comparing examples of videos.	To explain what makes a video effective • I can explain that video is a visual media format • I can identify features of videos • I can compare features in different videos
2 Filming techniques	Learners will explore the capabilities of a digital device that can be used to record video. Once they are familiar with their device, learners will experiment with different camera angles, considering how different camera angles can be used for different purposes.	To use a digital device to record video • I can identify and find features on a digital video recording device • I can experiment with different camera angles • I can make use of a microphone
3 Using a storyboard	Learners will use a storyboard to explore a variety of filming techniques, some of which they will use in their own video project later in the unit. They will evaluate the effectiveness of these techniques before offering feedback on others' work.	To capture video using a range of techniques • I can suggest filming techniques for a given purpose • I can capture video using a range of filming techniques • I can review how effective my video is
4 Planning a video	Learners will plan a video by creating a storyboard. Their storyboard ill describe each scene, and will include a script, camera angles, and filming techniques. Learners will use	To create a storyboard • I can outline the scenes of my video • I can decide which filming techniques I will use

	their storyboards to film the first scene of their videos.	• I can create and save video content
5 Importing and editing video	Learners will film the remaining scenes of their video, and then import their content to video editing software. They will then explore key editing techniques and decide whether sections of their video can be edited or need to be shot again.	To identify that video can be improved through reshooting and editing • I can store, retrieve, and export my recording to a computer • I can explain how to improve a video by reshooting and editing • I can select the correct tools to make edits to my video
6 Video evaluation	Learners will complete their video by removing unwanted content and reordering their clips. They will then export their finished video and evaluate the effectiveness of their edits. Finally, they will consider how they could share their video with others.	To consider the impact of the choices made when making and sharing a video • I can make edits to my video and improve the final outcome • I can recognise that my choices when making a video will impact the quality of the final outcome • I can evaluate my video and share my opinions

Progression

This unit progresses learners' knowledge and understanding of creating media by guiding them systematically through the process involved in creating a video. The unit builds on the Year 4 unit 'Photo editing' where composition is introduced and the Year 3 unit 'Stop-frame animation' where learners explored some of the features of video production. By the end of this unit, learners will have developed the skills required to plan, record, edit, and share a video.

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

- Use technology safely, respectfully, and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact

Internet safety

- Use technology safely, respectfully, and responsibly; recognise acceptable/unacceptable behaviour

Year 5 – Flat-file databases

Unit introduction

This unit looks at how a flat-file database can be used to organise data in records. Pupils use tools within a database to order and answer questions about data. They create graphs and charts from their data to help solve problems. They use a real-life database to answer a question, and present their work to others.
Overview of lessons

Lesson	Brief overview	Learning objectives
1. Creating a paper-based database	In the first lesson, pupils create a paper version of a record card database. Using a card template, they create a data set, with each pupil creating eight to ten cards linked to a theme, eg animals. They complete records for each of the animals in their database and then physically sort the cards to answer questions about the data.	To use a form to record information • I can create multiple questions about the same field • I can explain how information can be recorded • I can order, sort, and group my data cards
2. Computer databases	In this lesson, pupils use a computer-based database to examine how data can be recorded and viewed. They learn that a database consists of 'records', and that each record contains 'fields'. In addition, they will order records in different ways and compare this database to the paper database they created in lesson 1.	To compare paper and computer-based databases • I can navigate a flat-file database to compare different views of information • I can explain what a 'field' and a 'record' is in a database • I can choose which field to sort data by to answer a given question
3. Using a database	In this lesson, pupils investigate how records can be grouped, using both the paper record cards created in lesson 1 and a computer based database from J2E. They use 'grouping' and 'sorting' to answer questions about the data.	To outline how grouping and then sorting data allows us to answer questions • I can explain how information can be grouped • I can group information to answer questions • I can combine grouping and sorting

		to answer more specific questions
4. Using search tools	In this lesson, pupils develop their search techniques to answer questions about the data. They use advanced techniques to search for more than one field, and practise doing this through both unplugged methods (without using computers), and using a computer database.	To explain that tools can be used to select specific data • I can choose which field and value are required to answer a given question • I can outline how 'AND' and 'OR' can be used to refine data selection • I can choose multiple criteria to answer a given question
5. Comparing data visually	In this lesson, pupils consider what makes a useful chart, and how charts can be used to compare data. They create charts from their data in order to answer questions about it.	To explain that computer programs can be used to compare data visually • I can select an appropriate chart to visually compare data • I can refine a chart by selecting a particular filter • I can explain the benefits of using a computer to create graphs
6. Databases in real life	The final lesson requires pupils to use a real-life database to ask questions and find answers in the context of a flight search based on set parameters. They take on the role of a travel agent and present their findings, showing how they arrived at their chosen options. Presentations may be given between groups of pupils, or by each group to the whole class, depending on the time available.	To apply my knowledge of a database to ask and answer real-world questions • I can ask questions that will need more than one field to answer • I can refine a search in a real-world context • I can present my findings to a group

Progression

This unit progresses pupils' knowledge and understanding of why and how information might be stored in a database, and looks at how tools within a database can help us to answer questions about our data. It moves on to demonstrate how a database can help us display data visually, and

how real-life databases can be used to help us solve problems. Finally, the pupils create a presentation showing understanding and application of all the tools used within the unit.

Curriculum links

National curriculum links

- 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

Year 5 – Programming A – Selection in physical computing

Unit introduction

In this unit, learners will use physical computing to explore the concept of selection in programming through the use of the Crumble programming environment. Learners will be introduced to a microcontroller (Crumble controller) and learn how to connect and program it to control components (including output devices — LEDs and motors). Learners will be introduced to conditions as a means of controlling the flow of actions in a program. Learners will make use of their knowledge of repetition and conditions when introduced to the concept of selection (through the 'if...then...' structure) and write algorithms and programs that utilise this concept. To conclude the unit, learners will design and make a working model of a fairground carousel that will demonstrate their understanding of how the microcontroller and its components are connected, and how selection can be used to control the operation of the model. Throughout this unit, learners will apply the stages of programming design.

Overview of lessons

Lesson	**Brief overview**	**Learning objectives**
1 Connecting Crumbles	In this lesson, your learners will become familiar with the Crumble controller and the programming environment used to control it. Learners will connect a Sparkle to a Crumble and then program the Crumble to make the Sparkle flash different colour patterns. Learners will also use infinite loops, which were introduced to the learners in the previous school year.	To control a simple circuit connected to a computer • I can create a simple circuit and connect it to a microcontroller • I can program a microcontroller to make an LED switch on • I can explain what an infinite loop does
2 Combining output components	In this lesson, learners will connect a Sparkle and a motor to the Crumble controller. Learners will design sequences of actions for these components. They will then apply their understanding of repetition by using count-controlled loops when implementing their design as a program.	To write a program that includes count-controlled loops • I can connect more than one output component to a microcontroller • I can use a count-controlled loop to control outputs • I can design sequences that use count-controlled loops
3 Controlling with conditions	In this lesson, learners will be introduced to conditions, and	To explain that a loop can stop when a condition is met

	how they can be used in programs to control their flow. They will identify conditions in statements, stating if they are true or false. Learners will be introduced to a Crumble switch, and learn how it can provide the Crumble controller with an input that can be used as a condition. They will explore how to write programs that use an input as a condition.	• I can explain that a condition is either true or false • I can design a conditional loop • I can program a microcontroller to respond to an input
4 Starting with selection	In this lesson, learners will develop their understanding of how the flow of actions in algorithms and programs can be controlled by conditions. They will be introduced to selection and then represent conditions and actions using the 'if…then…' structure. Learners will create algorithms that include selection. They will use their algorithms to guide their program writing. Learners will see that infinite repetition is required to repeatedly check if a condition has been met.	To explain that a loop can be used to repeatedly check whether a condition has been met • I can explain that a condition being met can start an action • I can identify a condition and an action in my project • I can use selection (an 'if…then…' statement) to direct the flow of a program
5 Drawing designs	In this lesson, learners will apply their understanding of microcontrollers and selection when designing a project to meet the requirements of a given task. To support their understanding, learners will identify how selection might be used in real-world situations, then they will consider how they can apply this knowledge to design their project. Learners will produce design sketches to show how their model will be made and how they will connect the microcontroller to its components.	To design a physical project that includes selection • I can identify a real-world example of a condition starting an action • I can describe what my project will do • I can create a detailed drawing of my project

6 Writing and testing algorithms	In this final lesson of the unit, learners will develop Crumble programs to control the model of a fairground ride they built in Lesson 5. First, learners will identify how they are going to use selection before writing an algorithm to meet the requirements of the given task. They will then implement their algorithms as code. Learners will run their programs to identify any bugs, and then return to the code or algorithm to debug it where necessary. Finally, to conclude the unit, learners will evaluate their designs.	To create a program that controls a physical computing project • I can write an algorithm that describes what my model will do • I can use selection to produce an intended outcome • I can test and debug my project

Progression

This unit assumes that learners will have prior experience of programming using a block-based language (eg Scratch) and understand the concepts of sequence and repetition. The National Centre for Computing Education key stage 1 units focus on floor robots and ScratchJr, however, experience of other languages or environments may also be useful.

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

Science – Electricity (Year 4)

- Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches, and buzzers

Design and Technology (Key stage 2)

Design

- Generate, develop, model, and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces, and computer-aided design

Make

- Select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining, and finishing], accurately
- Select from and use a wider range of materials and components, including construction materials, textiles, and ingredients, according to their functional properties and aesthetic qualities

Evaluate

- Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work

Technical knowledge

- Understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers, and motors]
- Apply their understanding of computing to program, monitor, and control their products

Year 5 – Programming B – Selection in quizzes

Unit introduction

Learners will develop their knowledge of 'selection' by revisiting how 'conditions' can be used in programming, and then learning how the 'if… then… else...' structure can be used to select different outcomes depending on whether a condition is 'true' or 'false'. They represent this understanding in algorithms, and then by constructing programs in the Scratch programming environment. They learn how to write programs that ask questions and use selection to control the outcomes based on the answers given. They use this knowledge to design a quiz in response to a given task and implement it as a program. To conclude the unit, learners evaluate their program by identifying how it meets the requirements of the task, the ways they have improved it, and further ways it could be improved.

Overview of lessons

Lesson	Brief overview	Learning objectives
Exploring conditions	In this lesson, learners revisit previous learning on 'selection' and identify how 'conditions' are used to control the flow of actions in a program. They are introduced to the blocks for using conditions in programs using the Scratch programming environment. They modify the conditions in an existing program and identify the impact this has.	To explain how selection is used in computer programs • I can recall how conditions are used in selection • I can identify conditions in a program • I can modify a condition in a program
Selecting outcomes	In this lesson, learners will develop their understanding of selection by using the 'if… then… else...' structure in algorithms and programs. They will revisit the need to use repetition in selection to ensure that conditions are repeatedly checked. They identify the two outcomes in given programs and how the condition informs which outcome will be selected. Learners use this knowledge to write their own programs that use selection with two outcomes.	To relate that a conditional statement connects a condition to an outcome • I can use selection in an infinite loop to check a condition • I can identify the condition and outcomes in an 'if… then… else…' statement • I can create a program that uses selection to produce different outcomes
Asking questions	In this lesson, learners consider how the 'if… then... else…' structure can be used to	To explain how selection directs the flow of a program

	identify two responses to a binary question (one with a 'yes or no' answer). They identify that the answer to the question is the 'condition', and use algorithms with a branching structure to represent the actions that will be carried out if the condition is true or false. They learn how questions can be asked in Scratch, and how the answer, supplied by the user, is used in the condition to control the outcomes. They use an algorithm to design a program that uses selection to direct the flow of the program based on the answer provided. They implement their algorithm as a program and test whether both outcomes can be achieved.	• I can explain that program flow can branch according to a condition • I can design the flow of a program that contains 'if… then… else…' • I can show that a condition can direct program flow in one of two ways
Designing a quiz	In this lesson, learners will be provided with a task: to use selection to control the outcomes in an interactive quiz. They will outline the requirements of the task and use an algorithm to show how they will use selection in the quiz to control the outcomes based on the answer given. Learners will complete their designs by using design templates to identify the questions that will be asked, and the outcomes for both correct and incorrect answers. To demonstrate their understanding of how they are using selection to control the flow of the program, learners will identify which outcomes will be selected based on given responses.	To design a program that uses selection • I can outline a given task • I can use a design format to outline my project • I can identify the outcome of user input in an algorithm
Testing a quiz	In this lesson, learners will use the Scratch programming environment to implement the first section of their algorithm as a program. They will run the	To create a program that uses selection • I can implement my algorithm to create

	first section of their program to test whether they have correctly used selection to control the outcomes, and debug their program if required. They will then continue implementing their algorithm as a program. Once completed, they will consider the value of sharing their program with others so that they can receive feedback. Learners conclude the lesson by using another learner's quiz and providing feedback on it.	the first section of my program • I can test my program • I can share my program with others
Evaluating a quiz	In this lesson, learners will return to their completed programs and identify ways in which the program can be improved. They will focus on issues where answers similar to those in the condition are given as inputs, and identify ways to avoid such problems. Learners will also consider how the outcomes may change the program for subsequent users, and identify how they can make use of 'setup' to provide all users with the same experience. They will implement their identified improvements by returning to the Scratch programming environment and adding to their programs. They conclude the unit by identifying how they met the requirements of the given task, and identifying the aspects of the program that worked well, those they improved, and areas that could improve further.	To evaluate my program • I can identify ways the program could be improved • I can identify the setup code I need in my program • I can extend my program further

Progression

This unit assumes that learners will have prior experience of programming using block-based construction (e.g. Scratch), understand the concepts of 'sequence' and 'repetition', and have some experience of using 'selection'. Ideally, learners will have completed 'Programming A – Selection in

physical computing' before undertaking this unit, as this will provide them with the required knowledge of 'selection'.

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