Year 6 – Communication and collaboration

Unit introduction

In this unit learners explore how data is transferred over the internet. Learners initially focus on addressing, before they move on to the makeup and structure of data packets. Learners then look at how the internet facilitates online communication and collaboration; they complete shared projects online and evaluate different methods of communication. Finally, they learn how to communicate responsibly by considering what should and should not be shared on the internet.

Software and Hardware requirements

Learners will need a device with access to the internet. Lesson 3 Involves learners working collaboratively. The screenshots use the platform Google Slides, however alternative collaborative presentation tools are available, such as Microsoft PowerPoint 365 or Padlet.

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
L1 Internet addresses	Learners explore what is necessary for effective communication and the importance of agreed protocols. They apply this understanding to IP addresses and the rules (protocols) that computers have for	To explain the importance of internet addresses • I can recognise that data is transferred using agreed methods

	communicating with one another. Learners also use a Domain Name Server (DNS) to translate web addresses into IP addresses.	• I can explain that internet devices have addresses • I can describe how computers use addresses to access websites
L2 Data packets	Learners are introduced to the concept of packets. They complete an activity based on transferring an image across the internet, to see that as well as messages (text), other types of data (images, video, and audio) are also transferred over the internet. They gain an understanding of the key parts of a packet: the header and the data payload.	To recognise how data is transferred across the internet • I can identify and explain the main parts of a data packet • I can explain that data is transferred over networks in packets • I can explain that all data transferred over the internet is in packets
L3 Working together	Learners consider how people can work together when they are not in the same location. They discuss ways of working and complete 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 can help people to work together • I can recognise how 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
L4 Shared working	Learners are introduced to another approach to online working: reusing and modifying work done by someone else. (**Note:** Using someone else's work needs to be within the bounds of copyright and with the relevant permissions.) This lesson involves 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
L5 How we communicate	Learners deepen their understanding of the term 'communication'. They explore different methods of communication, before they consider internet-based communication in more detail. Finally, learners evaluate which methods of communication suit particular purposes.	To recognise how we communicate using technology • I can explain the different ways in which people communicate • I can identify that there are a variety of ways to communicate over the internet • I can choose methods of communication to suit particular purposes
L6 Communicating responsibly	Learners use information provided in the lesson and their own prior knowledge to categorise different forms of internet communication. They then choose which method(s) they would use for the scenarios discussed in the previous lesson. Through these activities, learners explore issues around privacy, information security and how to report concerns about inappropriate content online.	To evaluate different methods of online communication • I can compare different methods of communicating on the internet • I can decide when I should and should not share information online • I can explain that communication on the internet may not be private • I can explain how to report inappropriate content online

Subject knowledge and CPD opportunities

In this unit, you will need to have an understanding of the way data is sent over the internet. Some key terms you will need to be familiar with are Internet Protocol (IP) addresses; Domain Name Server (DNS); and data packets, including the main parts of a packet (header and data payload). The terms are discussed in more detail within the lesson plans.

Continual Professional Development

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

- Getting started in Year 6
- 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 students' knowledge and understanding of computer systems and networks developed in the Year 5 Systems and Searching unit, looking at how data is transferred and how the internet facilitates communication and collaboration online.

Common misconceptions

Within this unit, pupils work on shared projects, collaborating via the internet. Because pupils are likely in the same room, though not working on the same device, this can create a misconception that to work collaboratively over the internet you still need to be physically close. To prevent this, if an additional adult is available, you may want to split the pairs between two locations so that they cannot physically see each other when working collaboratively. If this is not possible, ensure you keep reminding pupils that they can only communicate over the internet because this way of working together works if you are next to each other, or if you are hundreds of miles apart.

Curriculum links

Computing

- 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

Managing Online Information

- I can identify, flag and report inappropriate content

Self-image and identity

- I can describe issues online that could make anyone feel sad, worried, uncomfortable or frightened. I know and can give examples of how to get help, both on and offline

Relationships Education, Relationships and Sex Education (RSE) and Health Education

Online relationships

- Pupils should know how information and data is shared and used online

Internet safety and Harms

- Pupils should know that for most people the internet is an integral part of life and has many benefits
- Pupils should know where and how to report concerns and get support with issues online

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.

Year 6 – Programming A – Variables in games

Unit introduction

This unit explores the concept of variables in programming through games in Scratch. First, learners find out what variables are and relate them to real-world examples of values that can be set and changed. Then they use variables to create a simulation of a scoreboard. In Lessons 2, 3, and 5, which follow the Use-Modify-Create model, learners experiment with variables in an existing project, then modify them, before they create their own project. In Lesson 4, learners focus on design. Finally, in Lesson 6, learners apply their knowledge of variables and design to improve their games in Scratch.

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 can 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 Introducing variables	Learners are introduced to variables. They see examples of real-world variables (score and time in a football match) before they explore them in a Scratch project. Learners then design and make their own project that includes variables. Finally, learners identify that variables are named and that they can be letters (strings) as well as numbers.	To define a 'variable' as something that is changeable • I can identify examples of information that is variable • I can explain that the way a variable changes can be defined • I can identify that variables can hold numbers or letters
2 Variables in programming	Learners understand that variables are used in programs, and that they can only hold a single value at a time. They complete an unplugged task that demonstrates the process of changing variables. Then, learners explore why it is important to name variables and apply their learning in a Scratch project in which they make, name, and update variables.	To explain why a variable is used in a program • I can identify a program variable as a placeholder in memory for a single value • I can explain that a variable has a name and a value • I can recognise that the value of a variable can be changed
3 Improving a game	Learners apply the concept of variables to enhance an existing game in Scratch. They predict the outcome of changing the same `change score` block in different parts of a program, then they test their predictions in Scratch. Learners	To choose how to improve a game by using variables

	also experiment with using different values in variables, and with using a variable elsewhere in a program. Finally, they add comments to their project to explain how they have met the objectives of the lesson.	• I can decide where in a program to change a variable • I can make use of an event in a program to set a variable • I can recognise that the value of a variable can be used by a program
4 Becoming a games designer	Learners will take on the role of a games designer. They will work at the 'design' level of abstraction, where they create artwork and plan algorithms. Learners first design the sprites and backgrounds for their project, then they design their algorithms to create their program flow.	To design a project that builds on a given example • I can choose the artwork for my project • I can create algorithms for my project • I can explain my design choices
5 Design to code	Continuing to use the work of games designers as a model, learners implement the algorithms that they created in Lesson 4. In doing this, they identify variables in an unfamiliar project and learn the importance of naming variables. They also have the opportunity to add another variable to enhance their project.	To use my design to create a project • I can create the artwork for my project • I can choose a name that identifies the role of a variable • I can test the code that I have written
6 Improving and sharing	Learners build on the project that they created in Lesson 5. They consider how they could improve their own projects and make small changes to achieve this. Learners then have the opportunity to add a variable independently. Finally, learners evaluate each other's projects; they identify features that they liked and features that could be improved. they identify features that they liked and features that could be improved.	To evaluate my project • I can identify ways that my game could be improved • I can use variables to extend my game • I can share my game with others

Request a computing ambassador

This unit is ideal for linking to the world of careers, and a computing ambassador can support this. Through the STEM ambassador platform, you can search for a computing ambassador. If you cannot find a computing ambassador with an offer to support this unit, then the following request will help to match you with the right person. You will need to edit the areas in red to ensure the request is right for your school.

Year 6 (ages 10-11) are learning about variables in programming though the Teach Computing Curriculum unit of six lessons. Within these lessons, pupils will learn the skills needed to design and create a game on Scratch

*Our lessons are taking place from *date* to *date* and we would appreciate someone with skills in this area to offer some real-world experience to this unit. The unit uses the programming interface of Scratch, with pupils coding via drag and drop block-based code, and focuses on the following areas:*

- *understand variables as placeholders and how these can be used to create a score*
- *modify existing animations and games using variables*
- *design a game, including both the artwork and the algorithm for their project*
- *build a game following my design algorithm*

*We require an ambassador who can support in any of these areas. We are hoping for an ambassador who would be willing to join us *in the classroom/virtually* to support our learning by *providing some handy hints and tips for our projects/giving us constructive feedback on our final projects/discussing how programming to create games is used within their profession and in the real-world.**

Subject knowledge and CPD opportunities

This unit focuses on developing learners' understanding of variables in Scratch, a block-based programming language. It emphasises where variables can be used and how they can be set and changed through the running of a program.

Variables

You need to be aware of the concept of variables in programming. In this lesson, a 'variable' is defined as something that can be set and changed throughout the running of a program. You need to know that a variable is a placeholder for a single value in the memory of a computer, and that all variables are uniquely named. You need to know that when the value of a variable is updated, the original value is replaced.

Continual Professional Development

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

- Getting started in Year 6
- Introduction to primary computing
- Teaching programming using Scratch and Scratch Jr
- Introduction to Programming with Scratch

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 prior experience of programming using block-based construction (e.g. Scratch), understand the concepts of 'sequence' (Year 3 units: Sequencing Sounds and Events and actions in programs), 'repetition' (Year 4 units: Repetition in shapes and Repetition in games), and 'selection' (Year 5 units: Selection in Physical Computing and Selection in quizzes). The constructs covered in the previous year groups will include at least one unit that develops the concept through the use of Scratch.

Common Misconceptions

When introducing variables, it is important to ensure that learners understand the meaning of the word within programming, as they are likely already familiar with the word from Science where it has a slightly different meaning. To avoid misconceptions forming, pupils need to know that a variable holds a piece of data, it can only hold one piece of data at once and this can change throughout the program.

The analogy of a small box is often used to help pupils understand variables – the box can hold a piece of data, but because it is small, we have to get rid of the last piece of data to put a new one in. The box can only hold one piece of data. We can replace it, but it can only ever fit one piece of data in. Sticky notes are also used in the unit to demonstrate this. Ensure pupils remove the last sticky note before placing their new one, to demonstrate that the last value is gone.

Score is often used to introduce variables, and is used in this unit. This is because score is a familiar variable that pupils have likely experienced before. However, it is important to emphasise that score is one example of a variable, but that not all variables are 'score'. This is covered in lesson two, but as score is used many times throughout the unit as a familiar example, pupils would benefit from being reminded of this.

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 deck 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.

We recommend the use of teacher accounts in Scratch to help with assessment throughout this unit. For guidance on setting up teacher accounts, please visit the Scratch website (scratch.mit.edu/educators/faq).

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.

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 6 – Introduction to spreadsheets

Unit introduction

This unit introduces the learners to spreadsheets. They will be supported in organising data into columns and rows to create their own data set. Learners will be taught the importance of formatting data to support calculations, while also being introduced to formulas and will begin to understand how they can be used to produce calculated data. Learners will be taught how to apply formulas that include a range of cells, and apply formulas to multiple cells by duplicating them. Learners will use spreadsheets to plan an event and answer questions. Finally, learners will create charts, and evaluate their results in comparison to questions asked.

Software and Hardware requirements

It is recommended that you use laptop or desktop computers which have access to a spreadsheet application. The screenshots and videos in this unit are based on Google Sheets, however the unit can be adapted for other applications, such as Microsoft Excel.

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 Collecting data	Learners will collect and organise data in a format of their choice. They will then explore how data can be structured in a table. Finally they will input data into a spreadsheet.	To create a data set in a spreadsheet • I can collect data

		• I can suggest how to structure my data • I can enter data into a spreadsheet
2 Formatting a spreadsheet	Learners will develop their understanding of the structure of a spreadsheet. They will be introduced to cell references, data items and the concept of formatting cells. Learners will see data items formatted in different ways, they will then choose formats for data items before applying formats in their own spreadsheet.	To build a data set in a spreadsheet • I can explain what an item of data is • I can choose an appropriate format for a cell • I can apply an appropriate format to a cell
3 What's the formula?	Learners will begin to use formulas to produce calculated data. They will understand that the type of data in a cell is important (e.g. numbers can be used in calculations whereas words cannot). Learners will create formulas to use in a spreadsheet using cell references and identify that changing inputs will change the output of the calculation.	To explain that formulas can be used to produce calculated data • I can explain which data types can be used in calculations • I can construct a formula in a spreadsheet • I can identify that changing inputs changes outputs
4 Calculate and duplicate	Learners will calculate data using the operations of multiplication, subtraction, division, and addition. They will use these operations to create formulas in a spreadsheet. Learners will then begin to understand the importance of creating formulas that include a range of cells and the advantage of duplicating in order to apply formulas to multiple cells.	To apply formulas to data • I can calculate data using different operations • I can create a formula which includes a range of cells

		• I can apply a formula to multiple cells by duplicating it
5 Event planning	Learners will plan and calculate the cost of an event using a spreadsheet. They will use a predefined list to choose what they would like to include in their event, and use their spreadsheet to answer questions on the data they have selected. Learners will be reminded of the importance of organising data and will then create a spreadsheet using formulas to work out costs for their event.	To create a spreadsheet to plan an event • I can use a spreadsheet to answer questions • I can explain why data should be organised • I can apply a formula to calculate the data I need to answer questions
6 Presenting data	Learners will gain skills to create charts in Google Sheets. They will evaluate the results from their charts to answer questions. Finally, learners will show they understand that there are different software tools available within spreadsheet applications to present data.	To choose suitable ways to present data • I can produce a chart • I can use a chart to show the answer to a question • I can suggest when to use a table or chart

Subject knowledge and CPD opportunities

It would be beneficial for teachers to have an understanding of the chosen spreadsheet application. An understanding that data can be words, numbers, dates, images, sounds, etc. without context is important. Just as words need to be in a sentence to give them meaning, data items need to be part of a structure. For example, the number 6 isn't data unless it's part of a larger structure, such as included in a spreadsheet with data headings. Understanding that a data set is a collection of related data that can be modified using a computer is helpful, as learners will be creating their own data sets throughout the unit.

Knowledge of why data headings are important and an understanding of how data is organised in columns and rows would be beneficial. Organising data is an important aspect of data and information. It supports the use of calculations and provides the opportunity to use sorting and filtering, which enables ease of use and reduces human error.

This unit focuses on the learners applying number formats to alter cells. It is important to understand that this type of formatting changes how a spreadsheet interacts with the data and is different to applying style formatting (bold, italics, etc.), which only changes the appearance of data.

In Lesson 5 of this unit, learners have been provided with the mathematical calculations they need to complete the activities in the unit, the calculations can be found in the 'Data calculations' handout. It is important that learners are given the opportunity to demonstrate their ability to use the computational skills required, regardless of their mathematical ability.

Continual Professional Development

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

- Getting started in Year 6
- Introduction to primary computing

Teach primary computing certificate

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Progression

This unit progresses students' knowledge and understanding of data and teaches them how to organise and modify data within spreadsheets. Specifically, learners will have experienced data in tables and charts in the Y4 Data Logging unit and Y5 Branching Database unit.

Common Misconceptions

The misconceptions when pupils are first introduced to spreadsheets often come from their expected use of certain symbols from mathematics. For example, pupils can often find the change from using x to * for multiply confusing. It can help to explain that as a person, they know that x can be a letter or a multiply, but a spreadsheet can't know it as two things. Because of this, a spreadsheet only knows it as a letter and another symbol had to be chosen as multiply.

Alongside this, pupils may find using the = symbol at the start of the cell confusing as they are more likely to see it after a calculation. For example, if they want a cell to show the results of adding A1 and B1 together, it may feel more natural to write A1 + B1 =. This can be explained by reminding pupils that calculations in maths can be written either way - 6 = 2 + 4 is the same as 2 + 4 = 6. A spreadsheet only knows it is being asked to do maths (calculate a formula) if the equals is at the start.

Curriculum links

Computing

- 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

Maths

Number

- Solve problems involving addition, subtraction, multiplication, and division

Statistics:

- Interpret and construct pie charts and line graphs, and use these to solve problems
- Calculate and interpret the mean as an average

Education for a Connected World links

Managing information online

- I can describe how I can search for information within a wide group of technologies (e.g. social media, image sites, video sites)
- I can use different search technologies

- I can evaluate digital content and can explain how I make choices from search results

Assessment

Formative assessment

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Summative assessment

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