



Raspberry Pi

Year 4 – The Internet

Unit introduction

Learners will apply their knowledge and understanding of networks, to appreciate the internet as a network of networks which need to be kept secure. They will learn that the World Wide Web is part of the internet, and will be given opportunities to explore the World Wide Web for themselves in order to learn about who owns content and what they can access, add, and create. Finally, they will evaluate online content to decide how honest, accurate, or reliable it is, and understand the consequences of false information.

Software and Hardware requirements

You will need digital devices for learners to interact with during this unit, with access to the internet. [Chrome Music Lab](#) is used in one lesson to demonstrate content which can be produced on the World Wide Web.

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 Connecting networks	Learners will explore how a network can share messages with another network to form the internet. They will consider some of the network devices involved in this, such as routers, and will also discuss what should be kept in and out of a network to keep safe.	To describe how networks physically connect to other networks <ul style="list-style-type: none">• I can describe the internet as a network of networks• I can demonstrate how

		<p>information is shared across the internet</p> <ul style="list-style-type: none"> • I can discuss why a network needs protecting
2 What is the internet made of?	<p>Learners will describe the parts of a network and how they connect to each other to form the internet. They will use this understanding to help explain how the internet lets us view the World Wide Web and recognise that the World Wide Web is part of the internet which contains websites and web pages.</p>	<p>To recognise how networked devices make up the internet</p> <ul style="list-style-type: none"> • I can describe networked devices and how they connect • I can explain that the internet is used to provide many services • I can recognise that the World Wide Web contains websites and web pages
3 Sharing information	<p>Learners will explore what can be shared on the World Wide Web and where websites are stored. They will also explore how the World Wide Web can be accessed on a variety of devices.</p>	<p>To outline how websites can be shared via the World Wide Web (WWW)</p> <ul style="list-style-type: none"> • I can explain the types of media that can be shared on the WWW • I can describe where websites are stored when uploaded to the WWW • I can describe how to access websites on the WWW
4 What is a website?	<p>Learners will analyse a website and identify the key parts. They will then consider what content can be added to websites and what factors they should consider before adding content to a website. Finally, they will use a website which enables them to create their own content online.</p>	<p>To describe how content can be added and accessed on the World Wide Web (WWW)</p> <ul style="list-style-type: none"> • I can explain what media can be found on websites

		<ul style="list-style-type: none"> • I can recognise that I can add content to the WWW • I can explain that internet services can be used to create content online
5 Who owns the web?	Learners will explore who owns the content on the World Wide Web (or 'web' for short). They will explore a variety of websites and will investigate what they can and cannot do with the content on them. They will also relate this to principles of ownership and sharing in the real world.	<p>To recognise how the content of the WWW is created by people</p> <ul style="list-style-type: none"> • I can explain that websites and their content are created by people • I can suggest who owns the content on websites • I can explain that there are rules to protect content
6 Can I believe what I read?	Learners will gain an appreciation of the fact that not everything they see on the internet is true, honest, or accurate. They will review images and decide whether or not they are real, before looking at why web searches can return ambiguous (and sometimes misleading) results. Finally, learners will complete a practical activity, demonstrating how quickly information can spread beyond their control.	<p>To evaluate the consequences of unreliable content</p> <ul style="list-style-type: none"> • I can explain that not everything on the World Wide Web is true • I can explain why some information I find online may not be honest, accurate, or legal • I can explain why I need to think carefully before I share or reshare content

Subject knowledge and CPD opportunities

Teachers will need a knowledge of computer networks, including how data is routed around the internet. Teachers will need to be aware that the World Wide Web is one of many services which are offered over the internet. They will need to know the difference between a web page and a website, and a knowledge of where websites are stored. A knowledge of what content you can find on websites will also be useful. An awareness of copyright (and the reasons for it) and that people create and share false and inaccurate information is important for the last two lessons in this unit.

The YouTube video titled '[A Packet's Tale](https://www.youtube.com/watch?v=ewrBaIT_eBM)' (www.youtube.com/watch?v=ewrBaIT_eBM) provides an overview of networks and the internet. That the [World Wide Web is part of the internet](#) is explained in this video: www.bbc.co.uk/newsround/47523993

Continual Professional Development

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

- [Getting started in year 4](#)
- [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 students' knowledge and understanding of networks from that developed in the [Year 3 Connecting Computers unit](#). In Year 5, they will continue to develop their knowledge and understanding of computing systems and understand how search engines work via the internet and the world wide web.

Common Misconceptions

A key misconception pupils face within this unit is that the internet and the World Wide Web are the same thing, which they are not. The internet is a global system of computer networks, whereas the World Wide Web is an application that runs on the internet, which can be accessed through websites. When looking at the World Wide Web, learners may confuse search engines and browsers. Some learners may confuse Google as a browser, that 'Google' is needed to access the internet. However, a browser is a piece of software that retrieves and displays web pages, such as Chrome, Firefox, etc. In contrast, Google is a search engine that uses crawlers to find specific information on the web.

You may also need to address the many misconceptions around trusting what learners see on the internet, and the issues of fake news. There is a high volume of inaccurate, misleading, or false content on the internet, which learners need to be aware of, alongside the fact search results can be influenced by adverts and sponsored content.

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
- 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.

Education for a Connected World links

Managing online information

- I can analyse information to make a judgement about probable accuracy, and I understand why it is important to make my own decisions regarding content and that my decisions are respected by others.
- I can explain what is meant by fake news, e.g. why some people will create stories or alter photographs and put them online to pretend something is true when it isn't.

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 how to be a discerning consumer of information online
- Pupils should know that for most people the internet is an integral part of life and has many benefits

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.

Resources are updated regularly — the latest version is available at: ncce.io/tcc.

Attribution statement

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The original version can be made available on request via info@teachcomputing.org.



Year 4 — Repetition in games

Unit introduction

Learners will explore the concept of repetition in programming using the Scratch environment. The unit begins with a Scratch activity similar to that carried out in Logo in Programming unit A, where learners can discover similarities between two environments. Learners look at the difference between count-controlled and infinite loops and use their knowledge to modify existing animations and games using repetition. Their final project is to design and create a game which uses repetition, applying stages of programming design throughout.

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.

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](#).

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 Using loops to create shapes	In the first lesson, learners look at real-life examples of repetition, and identify which parts of instructions are repeated. Learners then use Scratch, a block-based programming environment, to create shapes using count-controlled loops. They consider what the different values in each loop signify, then use existing code to modify and create new code, and work on reading code and predicting what the output will be once the code is run.	To develop the use of count-controlled loops in a different programming environment <ul style="list-style-type: none"> I can list an everyday task as a set of instructions including repetition I can predict the outcome of a snippet of code I can modify a snippet of code to create a given outcome
2 Different loops	In this lesson, learners look at different types of loops: infinite loops and count-controlled loops. They practise using these within Scratch and think about which might be more suitable for different purposes.	To explain that in programming there are infinite loops and count-controlled loops <ul style="list-style-type: none"> I can modify loops to produce a given outcome I can choose when to use a count-controlled and an infinite loop I can recognise that some programming languages enable more than one process to be run at once

3 Animate your name	In this lesson, learners create designs for an animation of the letters in their names. The animation uses repetition to change the costume (appearance) of the sprite. The letter sprites will all animate together when the event block (green flag) is clicked. When they have designed their animations, the learners will program them in Scratch. After programming, learners then evaluate their work, considering how effectively they used repetition in their code.	To develop a design that includes two or more loops which run at the same time <ul style="list-style-type: none"> • I can choose which action will be repeated for each object • I can explain what the outcome of the repeated action should be • I can evaluate the effectiveness of the repeated sequences used in my program
4 Modifying a game	In this lesson, learners look at an existing game and match parts of the game with the design. They make changes to a sprite in the existing game to match the design. They then look at a completed design, and implement the remaining changes in the Scratch game. They add a sprite, re-use and modify code blocks within loops, and explain the changes made.	To modify an infinite loop in a given program <ul style="list-style-type: none"> • I can identify which parts of a loop can be changed • I can explain the effect of my changes • I can re-use existing code snippets on new sprites
5 Designing a game	In this lesson, learners look at a model project that uses repetition. They then design their own games based on the model project, producing designs and algorithms for sprites in the game. They share these designs with a partner and have time to make any changes to their design as required.	To design a project that includes repetition <ul style="list-style-type: none"> • I can evaluate the use of repetition in a project • I can select key parts of a given project to use in my own design • I can develop my own design explaining what my project will do
6 Creating your games	In this lesson, learners build their games, using the designs they created in Lesson 5. They follow their algorithms, fix mistakes, and refine designs in their work as they build. They evaluate their work once it is completed, and showcase their games at the end.	To create a project that includes repetition <ul style="list-style-type: none"> • I can refine the algorithm in my design • I can build a program that follows my design • I can evaluate the steps I followed when building my project

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 4 (ages 8-9) are learning about repetition 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:*

- *look at the difference between count-controlled and infinite loops in programming*
- *modify existing animations and games using repetition*
- *design a game, producing designs and algorithms for sprites*
- *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 is used within their profession and in the real-world of game design.****

Subject knowledge and CPD opportunities

This unit focuses on developing learners' understanding of repetition within the Scratch programming environment. Repetition is where actions or commands in programming are repeated. The repeating commands can also be referred to as a 'loop'. Loops can be repeated indefinitely (known as 'infinite loops'), or for a set number of times (known as 'count-controlled loops').

Repetition

You will need to know that repetition is used in programming to give the same instruction or set of instructions several times. Repetition uses loops as the means to give these instructions. This unit makes use of two types of loops: infinite and count-controlled, which have been defined below:

- **Infinite loop:** An infinite loop is a loop that commands the instruction/set of instructions to repeat forever. When an infinite loop is used in a program, there is no way of ending the program, as the command(s) within the loop will be repeated endlessly. For this reason, infinite loops should only be used when writing a program that is intended to run forever. The exception to this is when using selection in physical computing, as you will see throughout this unit.
- **Count-controlled loop:** A count-controlled loop is a form of repetition in which a set of commands are carried out a specific number of times. Count-controlled loops should only be used when it is known how many times a set of commands needs to be repeated.
- **Condition-controlled loop:** A condition-controlled loop is a form of repetition in which a set of commands stop being carried out when a condition is met. The condition could be anything from when the 'score' in a game reaches a certain value to when a key on a keyboard has been pressed.

Continual Professional Development

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

- [Getting started in year 4](#)
- [Teaching programming using Scratch and Scratch Jr](#)
- [Introduction to primary computing](#)
- [Introduction to Programming with Scratch](#)

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Progression

This unit assumes that learners will have some prior experience of programming. The KS1 NCCE units cover floor robots and ScratchJr, and Scratch, and the skill of sequence, is introduced in the Year 3 programming units: [Sequencing Sounds](#) and [Events and actions in programs](#). However, experience of other languages or environments may also be useful.

Common Misconceptions

Learners may have misconceptions around the language used within this unit. They may believe that ‘repetition’ and ‘loop’ are different entities, but repeating commands can also be referred to as a ‘loop’. They may also get confused between infinite loops and count-controlled loops, as both have different outcomes. Infinite loops can be repeated without an end (forever loop), whereas count-controlled loops will run for a set number of times (repeat _ times). Learners may believe that infinite loops are the easiest to use, however you may want to share that programmers do not actually use infinite loops very often as they can get stuck, and the only way to stop them is to close the program and start again.

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 lessons 5 and 6.

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.

Resources are updated regularly — the latest version is available at: ncce.io/tcc.

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Year 4 – Photo editing

Unit introduction

Learners will develop their understanding of how digital images can be changed and edited, and how they can then be resaved and reused. They will consider the impact that editing images can have and evaluate the effectiveness of their choices.

Software and Hardware requirements

The suggested software for this unit is Paint.net: <https://www.getpaint.net/download.html> which requires a download and is compatible with Windows devices. Other image editing software is available such as Pixlr or PhotoPea. When using alternate software, please ensure you check your school policies and procedures, as image searching may be possible, and there may be adverts on the website.

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 Changing digital images	In this lesson, you will introduce learners to the concept of editing images and discuss whether or not editing is ethical. They will go on to explore when we need to rotate and crop an image as well as how to use an image editor to make these changes. Learners will then discuss image composition. Learners will relate this to the role of a photographer, appreciating how this knowledge and skill helps them to effectively edit their photos in this way.	To explain that the composition of digital images can be changed <ul style="list-style-type: none">• I can improve an image by rotating it• I can explain why I might crop an image• I can use photo editing software to crop an image

		<ul style="list-style-type: none"> I understand that editing images can be unethical
2 Recolouring	<p>In this lesson, learners will look at the effect that different colours and filters can have on an image. They will choose appropriate effects to fit a scenario, and explain how they made their choices. They will then edit the images using different effects to suit two different scenarios. Learners will relate this to the role of a photographer, appreciating how this knowledge and skill helps them to effectively edit their photos in this way.</p>	<p>To explain that colours can be changed in digital images</p> <ul style="list-style-type: none"> I can explain that different colour effects make you think and feel different things I can experiment with different colour effects I can explain why I chose certain colour effects
3 Cloning	<p>In this lesson, learners will be introduced to the cloning tool and its use in both changing the composition of a photo and photo retouching.</p> <p>They will see how parts of a photo can be removed or duplicated using cloning. Learners will consider what parts of an image can be retouched and learn techniques to make this as unnoticeable as possible. Finally, they will consider when it is necessary to edit photographs in this way.</p> <p>Learners will relate this to the role of a photographer, appreciating how this knowledge and skill helps them to effectively edit their photos in this way.</p>	<p>To explain how cloning can be used in photo editing</p> <ul style="list-style-type: none"> I can add to the composition of an image by cloning I can identify how a photo edit can be improved I can remove parts of an image using cloning
4 Combining	<p>In this lesson, students learn how to use different tools to select areas of an image. Learners then use copy and paste within one image and between two images to produce a combined image. Finally, learners will consider when it's</p>	<p>To explain that images can be combined</p> <ul style="list-style-type: none"> I can experiment with tools to select and copy part of an image

	appropriate to edit an image and discuss some of the ethics around retouching photos.	<ul style="list-style-type: none"> • I can use a range of tools to copy between images • I can explain why photos might be edited
5 Creating	In this lesson, learners will apply all the skills they have learnt in the unit so far. They will start by reviewing some images and considering what makes an image look real or made up. Learners will then plan their own image. They will choose from a selection of images, open them and edit them to create their own project.	<p>To combine images for a purpose</p> <ul style="list-style-type: none"> • I can describe the image I want to create • I can choose suitable images for my project • I can create a project that is a combination of other images
6 Evaluating	This lesson is the final lesson in the unit on photo editing. Learners will review the image that they created in Lesson 5. After they have reviewed their image, they will have the opportunity to make changes to their image based on their review. Learners will then add text to their image to complete it as a publication.	<p>To evaluate how changes can improve an image</p> <ul style="list-style-type: none"> • I can review images against a given criteria • I can use feedback to guide making changes • I can combine text and my image to complete the project

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Year 4 (ages 8-9) are learning about photo editing through the [Teach Computing Curriculum unit of six lessons](#). Within these lessons, pupils will learn techniques to change and edit digital images.

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 [Paint.net](#) *change software if required* on *insert devices* and focuses on the following areas:

- editing digital images using rotation, cropping
- changing the composition of digital images through changing colours, or cloning parts of an image
- combining images using tools to select and copy between images
- understand how fake images can be created

*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 photo editing is used within their profession and in the real-world.**

Subject knowledge and CPD opportunities

You will need to be familiar with the tools used throughout the unit in paint.net or your chosen image editor, and know how to save a new version of an image from within the editor. You can find a guide to all tools in paint.net at www.getpaint.net/doc/latest/index.html. You should consider how the learners will access the editor. For example, you may wish to create a shortcut to the program for them. You will need to be familiar with a range of photo editing techniques, and should watch the embedded video guides before the lesson to familiarise yourself with these on Paint.net:

- Guide to all tools in Paint.net: www.getpaint.net/doc/latest/index.html
- Information on cropping: www.dpreview.com/forums/post/56318241
- Information on the 'clone stamp': www.getpaint.net/doc/latest/CloneStamp.html
- Information on the text tool: www.getpaint.net/doc/latest/TextShapeTools.html

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Progression

This unit progresses students' knowledge and understanding of digital photography and using digital devices to create media. Learners will have had some exposure to images and their manipulation through the Teach Computing [Digital Photography- Year 2](#) unit. Following this unit, learners will further develop their image editing skills in Year 5 – Vector drawing.

Common Misconceptions

When looking at digital photos, misconceptions may arise about what has or has not been edited. In the same way that they need understand 'fake news', they need to understand that images are not static and that what they see online may have, and can be, manipulated using photo editing software. The ethical implications should be questioned, as editing can alter reality or give a misrepresentation of things. Learners may see photo editing as just a way to make photos look 'prettier', however this unit will show how editing can be used for various purposes, including correcting errors, enhancing details, adding creative effects, and conveying messages.

When looking at editing skills, learners may have the misconception that cropping and resizing are the same process. Cropping changes the image composition by removing parts of it, while resizing changes the image dimensions. They may also assume that more filters and effects always improve an image, however overuse can lead to unnatural results. When working on their projects, they may think that saving and exporting are the same actions, however saving refers to keeping the project in a format that can be re-edited, while exporting creates a final image file that is often not easily editable.

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

- 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](#)

Self-image and identity

- I can explain how my online identity can be different to my offline identity

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 5 and 6.

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