

TEACHER GUIDE

Unit

Block based programming.

Unit Description

Using visual programming tools to create a program.

Career

I'm a visual programmer.

Every unit is based on a career to help students see the relevance of what they are learning to the real world and to help schools achieve Gatsby benchmarks by linking curriculum learning to careers.

Career overview

As a visual programmer, I create software using tools that connect blocks to create code. My goal is to create simple applications and prototypes quickly.

Key question

How are computer programs created?

Every unit is designed to help students answer one over-arching key question relating to the units four knowledge statements.

Unit objectives: knowledge statements

1. **Know** how to add a backdrop and customised sprites.
2. **Know** how to add user interaction to a program with inputs.
3. **Know** how to use selection and repetition to control the flow of a program.
4. **Know** how to test and debug programs.

Unit outcomes

1. Learn it workbooks evidencing the learning journey.
2. Make it workbook evidencing application of learning with an artefact.
 - a) A two-player Space Pong game made in Scratch.
3. Review it workbook evidencing assessment and review.

Prior learning / spiral curriculum

No previous learning is necessary because all units have been developed in a modular way to allow you to plug them into your existing scheme of learning.

However, if you are following our recommended pathway for curriculum 2028 here is how this unit fits into the year 7 → 9 progression pathway.

The big picture: a three-year progression

Once the national curriculum programme of study has been released, we will update this section with how this unit fits into a progressive pathway across Key Stage 3.

How the three units connect

Once the national curriculum programme of study has been released, we will update this section with how this unit fits into a broader theme of units.

Contents

In addition to this teacher guide this unit also includes the following resources:

- Folder: Extension work. Use these activities to extend any lesson or for 7–8-week terms.
 - 1 teacher extension answers.
 - 1 student extension workbook.
- Folder: Homework. Use these activities for work outside of the lesson. They are independent of the lessons and can be set at any time.
 - 1 teacher presentation.
 - 3 videos.
 - 3 video scripts.
 - 3 worksheets.
- Folder: Lesson 1 – Learn it. This lesson addresses the key question and first knowledge statement.
 - 1 lesson plan.
 - 1 introduction video.
 - 1 teacher presentation.
 - 1 student workbook.
 - Any associated resources required for the lesson.
- Folder: Lesson 2 – Learn it. This lesson addresses the key question and second knowledge statement.
 - 1 lesson plan.
 - 1 teacher presentation.
 - 1 student workbook.
 - Any associated resources required for the lesson.
- Folder: Lesson 3 – Learn it. This lesson addresses the key question and third knowledge statement.
 - 1 lesson plan.
 - 1 teacher presentation.
 - 1 student workbook.
 - Any associated resources required for the lesson.
- Folder: Lesson 4 – Learn it. This lesson addresses the key question and fourth knowledge statement.
 - 1 lesson plan.
 - 1 teacher presentation.
 - 1 student workbook.
 - Any associated resources required for the lesson.
- Folder: Lesson 5 – Make it. This lesson provides an opportunity for students to evidence their learning.
 - 1 lesson plan.
 - 1 teacher presentation.
 - 1 student workbook.
 - Any associated resources required for the lesson.

- Folder: Lesson 6 – Review it. This lesson provides an opportunity for students to check their understanding of the key vocabulary and knowledge statements plus dedicated improvement and reflection time.
 - 1 lesson plan.
 - 1 teacher presentation.
 - 1 student workbook.
- Folder: Reading. Use these activities to support reading initiatives in your school.
 - 3+ two-page reading passages with 5 questions.

PowerPoint format is used for workbooks as it allows for easy sharing on displays, animations, simultaneous collaboration and pasting without disrupting content on other pages. All PowerPoints have been checked for compatibility with Google Slides.

Differentiation

Differentiation should be provided through “adaptive teaching”. This is defined as, “The opportunity for all pupils to experience success, by adapting lessons, whilst maintaining high expectations for all, so that all pupils have the opportunity to meet expectations”. This also meets the expectations of Deborah Eyre’s [High Performance Learning](#) strategy. Differentiation is provided by instruction and support rather than by task.

Vocabulary

Term	Definition
Backdrop	An image behind the sprites.
Block	A puzzle piece that tells your program what to do, like move or say something.
Bug	An error in a computer program.
Condition	What is checked by a selection block. The outcome is either true or false.
Costume	How a character (sprite) looks. It can change to show movement.
Data	A value that can be stored, changed and used by code blocks in a program.
Debugging	Fixing an error/bug in a computer program.
Event	Something that happens, like clicking the green flag, that starts your program.
Flow	The order in which blocks are done, or what block happens next.
Logic	The order of blocks and their conditions that determine the instructions that are followed.
Logic error	When the program runs but doesn't do what you expect.
Loop	A programming structure where one or more blocks are repeated.
Program	A set of instructions that tells the computer what to do to carry out a task.
Programmer	Someone who creates programs by putting blocks together.
Prototype	A first version of your project that you show to a user and improve.
Repeat	A block that does the actions inside it again making a loop.
Repetition	Another word for a loop.
Running	A program that is currently being carried out by the computer. Also known as executing.
Selection	Choosing which block is done next depending on a condition. It is how your program asks a question about data and then does something based on the answer.
Sequence	A set of blocks that are connected and happen one after another.
Sprite	A character or object in your Scratch project that can move, talk, and do things.
Stage	Where the backdrop and sprites exist.
User	Someone who plays with or watches your Scratch project.
Variable	A temporary store for a single item of data when a program is running.
Visual programming	Making programs by snapping blocks together into the correct order.
Wait	A block that repeatedly checks a condition, pausing the running of blocks until an event happens.

Lesson overview

Detailed lesson plans for each lesson are provided in the relevant lesson folder.

Lesson	Lesson Type	Phase 1	Phase 2	Phase 3
1	Learn it	Career overview	Use a backdrop, sprites and costumes.	Use code blocks to add animation and interactivity.
		Students consider what a block-based programmer does and what skills / knowledge they need.	Students create a forest theme selecting a backdrop, sprites and costumes.	Students make a dragonfly and frog sprites move when a key is pressed.
2	Learn it	Retrieval	Use a selection with a condition to change what blocks are followed next.	Use a variable to keep a score.
		Students decode anagrams, identify 3 key words and write definitions of each key term.	Students program a soccer player to kick a ball.	Students program a simple mouse control game.
3	Learn it	Retrieval	Use a repeat loop to run the same blocks again a given number of times.	Use a wait condition to pause until something happens.
		Students decode anagrams, identify 3 key words and write definitions of each key term.	Students program a ballerina dance routine.	Students program an owl to fly between two trees.

4	Learn it	Retrieval	Investigate errors in Scratch programs and fix them.	Investigate a Pong game.
		Students identify sequence, selection and repetition in two programs.	Students fix errors in 5 programs.	Students begin to make a Pong game.
5	Make it	Retrieval	Make a two-player Pong game.	
		Students decode anagrams, identify 3 key words and write definitions of each key term.	Students continue to make a Pong game.	
6	Review it	Assess	Self/Peer review.	Reflect and improve.
		Students complete a multiple-choice quiz.	Students mark each other's answers to the quiz and self-assess or peer-review work from lesson 5.	Students RAG rate themselves against a series of "I can" statements. Students improve their work or undertake extension activities.

Homework

3 activities provided.

Students watch up to a 5-minute video about the hinterland (discovering), real-world application (exploring) or consolidation (revisiting) related to the unit. Students complete a simple sheet, with all the information required to complete it included within the video.

Homework is designed to require no parental support and is independent of any lesson.

Homework	Title
1	The history of block based programming.
2	Block based Programming in the real world.
3	Catch the bugs.

Extension activities in the student extension workbook could also be used for homework.

Assessment

Students are graded intern, junior, associate and senior to reflect the careers-oriented approach.

Artefact

It is recommended that the Learn it workbook is used for students to record their development in learning, new knowledge and skills. They may need help with these activities in order to make progress, and therefore it is not the best work for assessment.

Instead, assess the Make it artefact workbook. This should be the best work the student can produce and will allow you to judge their independence.

 Intern	- At least one knowledge statement is achieved. - Backdrop changed. - Alien ship sprite added.
 Junior	- At least two knowledge statements are achieved. - User can move the spaceship and the costume changes to show ship thrust. - Alien ship moves around the screen using a repeat block.
 Associate	- At least three knowledge statements are achieved. - Missile bounces off alien ship using an if block. - Second player ship that moves and can lose. - Random missile direction when the game starts and increases in speed.
 Senior	- All four knowledge statements are achieved. - Game does not end when a player loses. - A variable to keep score that is shown to the players. - Additional game elements added.

Tick the statements that best apply to the student when making their artefact. Award a best-fit mark of intern, junior, associate or senior.

Multiple-choice quiz

A 24-question multiple-choice quiz assesses the 4 knowledge statements and vocabulary of the unit. Award intern for 0-9 marks, junior for 10-16 marks, associate for 17-21 marks and senior for 22-24 marks.

You may choose to put the quiz into Microsoft Forms or equivalent for automatic marking.

Students should not open their Learn it workbook or Make it artefact workbook when completing the quiz.

Reflection

Lesson 6 provides an opportunity for students to review the work of their peers, identify and carry out improvements to their own work. It may not be necessary for teachers to mark the artefact for every unit for every student. Instead, you could take a moderation approach instead, sampling just a few pieces of work.

It is suggested that peers highlight statements on the assessment grid in yellow and teachers highlight in green to distinguish the two markers.

Grading

Consider both the mark for the artefact and the mark for the quiz to award a best-fit judgement.

National curriculum links

These will be populated when the new National Curriculum is released.

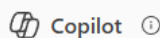
Applications of AI

Students could use AI to help them complete activities or explore how AI could be used in the software development process. There are two approaches:

1. Use an online tool to convert saved Scratch files with a .sb3 extension to text so that a program can be copied as text and input into an LLM. One example is: rokcode.com/sb3-to-txt/
2. Take a screenshot of the blocks, paste them into an LLM and ask it to change the program. E.g.



Can you improve this Scratch program so the bear walks to the right edge of the screen before walking back, animating by changing costume as it goes?



Your current Scratch script moves the bear only a few steps and then turns around, so it doesn't reach the screen edge or animate. Here's how you can improve it:

✓ What to Change:

1. **Walk to the edge:** Use repeat until <touching edge> instead of a fixed repeat count.
2. **Animate costumes:** Add next costume inside the loop so the bear changes costumes as it walks.
3. **Smooth movement:** Add a short wait after each step for visible animation.
4. **Walk back:** After reaching the edge, turn 180° and repeat the same logic.

🔍 Improved Script:

```
when green flag clicked
set rotation style [left-right]
go to x: -100 y: -80
point in direction (90)
repeat 2
  repeat until <touching edge>
    move (10) steps
    next costume
```

```
        wait (0.2) seconds
    end
    turn (180) degrees
end
```

Students will need to interpret the text code into the relevant blocks.

For assessment improvement 10, ask AI how the game can be improved further to make it more fun. Beware that AI may make suggestions that are quite complicated to implement. There is an opportunity for some vibe coding experience here.

Software

PowerPoint or equivalent for students to complete the workbook and teachers to show class presentation.

Web browser to provide them with access to the online tools required for completion of this unit.

Online and unfiltered sites required

<https://scratch.mit.edu/projects/editor/>

Optional:

<https://www.rokcode.com/sb3-to-txt/>

The following site is used to host our homework videos for this unit:

- <https://www.tella.tv>

Extension activities

These can be used as additional activities in 7–8-week terms, for alternative homework, or for additional activities in lessons.

Extension activities are included in a separate workbook for students “Student Extension workbook.pptx”

The complete steps that a student must follow to create a working solution to each game are presented.

To increase the challenge, you might use one of these three differentiation strategies:

1. Just give the students the brief and video clip on the first slide of the project and nothing else.
2. Remove some of the steps shown from stage 5 onwards of a project. Students must complete the code.
3. Remove all of the steps shown on the left from stage 5 onwards of a project, keeping only the detailed pseudocode on the right.

Extension answers are included as solution.sb3 files.

Extension 1	Archery
Activity	In a game of archery, the player uses the mouse to point to a target. When the space key is pressed the arrow moves towards the target. The game is made more difficult because the wind will also affect where the arrow lands. The player scores points depending on where the arrow landed. How many points can you score with 5 arrows? Follow the steps to create an archery game.
Extension 2	Car racing
Activity	A race starts when five red lights go out. The red car accelerates with w, and turns left and right with a and d. The blue car is controlled with the arrow keys up, left and right. Directions are from the driver perspective. A car can accelerate to speed 5 and reduces speed until it reaches 0 if the accelerator key is not pressed. If a car goes off the track its speed is reduced to 1 until it gets back on to the track. A lap is counted when a car reaches the chequered flag. Who can complete 3 laps first? Follow the steps to create a car racing game.
Extension 3	Whack a mole
Activity	In a game of whack a mole two moles appear in random positions on the lawn. The player must use the mouse and click them as quickly as possible to score a point and put them back in the ground. Once a mole has been whacked it appears in a new random location. After 10 seconds when they have been whacked for the last time, the moles give up and find a new garden. How many points can you score? Follow the steps to create a whack a mole game.
Extension 4	Flapping parrot
Activity	In a game of flapping parrot, a bird must avoid hitting obstacles coming towards it from right to left on the screen. The player can only make the bird fly higher by pressing the up-arrow key. Gravity brings the bird slowly down to earth. A point is scored for every obstacle that is avoided and leaves the screen. How long can your parrot fly? Follow the steps to create a flapping parrot game.

Reading

This unit includes a folder titled, “Reading”. The files in this folder contain passages of text about scenarios related to the topic and each include five questions. These resources can be used in many ways. For example:

- Guided reading and oracy activities in terms of more than six weeks.
- Cover work.
- Work for students disapplied from the lesson.
- Alternative homework.

Guided reading is where the teacher reads the text to the students who follow along with a ruler on the line being read. To support literacy, it is important that students are both supported and challenged with text that is accessible and in places more demanding. The text has been checked that it meets these criteria and is suitable for a reading age of 11–14.

The associated questions go beyond simple comprehension using a framework that provides progression from basic understanding to deeper analytical thinking. Either moving students through increasingly demanding reading skills—retrieval, vocabulary, connection, inference and evaluation or encouraging students to identify and critique the structure of an argument or explanation.