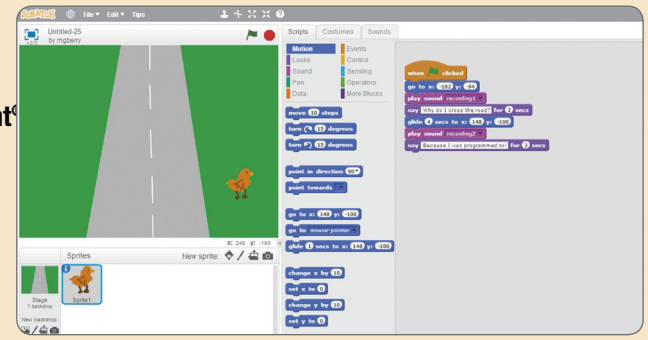
UNIT 3.1 We are programmers

Programming an animation

1 About this unit

Software: Scratch (recommended)/Snap!, Microsoft PowerPoint, Scratch Jr
Apps: Pyonkee
Hardware: Laptop or desktop computers (recommended) or tablets, cameras (optional), microphones (optional)
Outcome: A short, scripted, animated cartoon



UNIT SUMMARY

In this unit, the children create an animated cartoon using characters they design. They use a paint tool to create characters and backgrounds. They then create an animation by translating a storyboard into a series of scripted instructions (program) for graphic objects.

CURRICULUM LINKS

Computing PoS

- Design, write and debug programs that accomplish specific goals; solve problems by decomposing them into smaller parts.
- Use sequence … in programs; work with variables and various forms of input and output.
- Use logical reasoning to detect and correct errors in algorithms and programs.
- Select, use and combine a variety of software … to design and create … content that accomplish(es) given goals, including … presenting … information.

Suggested subject links

- **Art and design:** The children could design characters and backgrounds using art and design techniques such as drawing, painting or sculpture.
- **English:** This unit links to the study of character, dialogue and narrative.
- **Languages:** The children could write or record dialogue for their character in a foreign language.
- **Music:** The children could compose and record backing music for their cartoons.
- Scratch is a flexible programming language with applications right across the curriculum.

TRANSLATING THE COMPUTING PoS

- The animations the children write are *simple programs with specific goals*. The process of breaking a scene down into individual lines of dialogue and actions is *solving a problem by decomposing it into smaller parts*.
- As the children write ordered instructions in their scripts, they're making use of *sequence in programs*. Their projects combine graphics, text and sound, which are *various forms of output*.
- Encourage the children to think through the steps of their animation carefully, so that they start to *use logical reasoning to explain how some simple algorithms work*.
- As the children work to debug their scripts, encourage them to *use logical reasoning to detect and correct errors in algorithms and programs*, rather than taking a trial and error approach.

LEARNING EXPECTATIONS

This unit will enable the children to:

- create an algorithm for an animated scene in the form of a storyboard
- write a program in Scratch to create the animation
- correct mistakes in their animation programs.

The assessment guidance on page 20 will help you to decide whether the children have met these expectations.

VARIATIONS TO TRY

- The children could create an animation with foreign language dialogue to introduce a foreign language to younger children.
- The animation could be a language-support tool for children learning English as an additional language.
- The animation could be used to promote an upcoming school event.
- The animation could be used to give pupils and parents an update on school news, such as a new lunchtime menu or the introduction of a stride-and-ride scheme.
- Animations could be created for a dance, music or drama performance (e.g. by projecting onto a screen). This could link in with *Unit 3.3 – We are presenters*.

2 Getting ready

THINGS TO DO

- Read the *Core steps* sections of *Running the task*.
- Decide which software/tools are most appropriate for use with your class. If you want to use tablets, you could use Snap!
- Check you have access to the Scratch website and online editor: http://scratch.mit.edu. A downloadable version is also available.
- Watch the *Software in 60 seconds* walkthroughs for this unit, and review the Scratch animation, all of which can be found on My Rising Stars.
- Watch the two CPD videos: 'Sequencing instructions' and 'Multithreading'.
- Spend some time familiarising yourself with your chosen software/tools.
- Think about the individuals and groups you have in your class. Could you use any of the *Extensions* on pages 14–19 to extend your more able children? Could you use any of the suggestions in *Inclusion* (see below) to support children with specific needs, e.g. SEN or EAL? Have you considered how a Teaching Assistant will support you and the children, if one is available?
- If you are using PowerPoint, you will also need a paint program, such as Microsoft Paint or Tux Paint, or a set of images (such as the National Education Network Gallery).

THINGS YOU NEED

- Computers/laptops/tablets loaded with the software you have chosen
- Examples of animated cartoons (see *Useful links* below)
- Paper and coloured pencils or felt tips
- Cameras and microphones (optional), and speakers

MY RISING STARS RESOURCES

- *Software in 60 seconds* – Scratch (1–5)
- *Software in 60 seconds* – Introduction to Snap!
- Watch the two CPD videos: 'Sequencing instructions' and 'Multithreading'
- Scratch file – example animation
- Storyboard templates
- Pupil self-assessment information
- Unit poster – How we program

ONLINE SAFETY

- If working in PowerPoint, you might want to use images downloaded from the web. Make sure you follow your school's online safety policy.
- If children are going to upload their animations to the Scratch website, they will need to create accounts: this requires parental permission.
- Exploring online animation galleries may expose the children to inappropriate content. Talk about what to do if they see something inappropriate. Some schools operate a 'turn the screen off/turn the tablet over and put your hand up' system.
- Review the appropriateness of any animations you show, including the related comments. Tools such as quietube (see *Useful links*) or YouTube's own safety mode can be used to remove comments when videos are shown in class.

INCLUSION

- Scratch has several languages built in (use the globe icon at the top of the screen).
- Encourage the children to make their animations accessible to as many people as possible, e.g. by providing both audio and text for dialogue, or creating subtitles in another language for spoken dialogue or narration.

USEFUL LINKS

Software and tools

- Scratch is available at http://scratch.mit.edu. It is free to use and no registration is required. Pupils can access the site from home.
- Snap! is free open source software. Use online at http://snap.berkeley.edu/snapsource/snap.html. Snap! can be used on the iPad.
- Tux Paint (www.tuxpaint.org) is an alternative to Microsoft Paint.
- Quietube is a 'bookmarklet' which can be installed in a modern web-browser via http://quietube.com.

Online tutorials

- Introductory Scratch tutorials: https://scratch.mit.edu/help/videos/.
- Another Scratch tutorial: www.youtube.com/watch?v=TV0MqrmLpgU.
- Tutorials on creating animations in PowerPoint: http://pptheaven.mvps.org/tutorials.html.

Information and ideas

- For images to use in PowerPoint animations, see http://gallery.nen.gov.uk.
- Sites that make extensive use of animation and videos: www.brainpop.co.uk, http://www.bbc.co.uk/education/levels/zbr9wmn, www.explania.com/en and www.thersa.org/events/rsaanimate.
- Advice on sourcing licensed backing music: http://creativecommons.org/legalmusicforvideos.
- There are examples of Scratch animations online at http://scratch.mit.edu/explore/projects/animations. See also http://animation.cs.manchester.ac.uk.

3 Running the task – We are programmers

Software: Scratch (recommended), Snap!, Microsoft PowerPoint®, Scratch Jr **Apps:** Pyonkee **Hardware:** Laptop or desktop computers, cameras (optional), microphones (optional) **Outcome:** A short, scripted, animated cartoon

Core steps

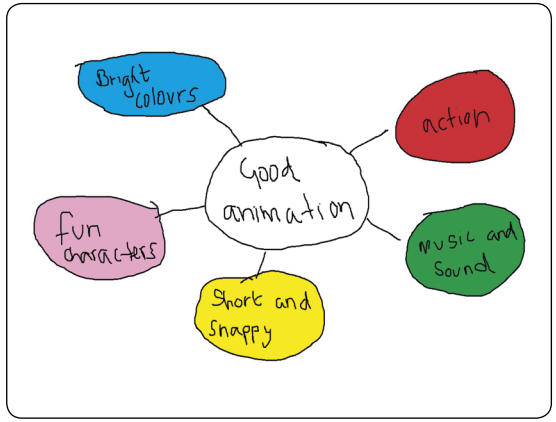
Step 1: Learning about animations

RESOURCES

- Step-by-step poster for Unit 3.1
- Scratch file – example animation

- http://kidsloveshortfilms.com/
- www.brainpop.co.uk

POSSIBLE OUTCOME FOR THIS STEP:



- Start by introducing the unit to the children. Explain that they are going to work with a partner to program a simple animation using Scratch. Display the step-by-step poster for this unit so the children can see the steps involved in creating the animation.
- Share the *Learning expectations* for the unit (see page 12) and explain the success criteria.
- Discuss possible purposes of an animation, such as telling a joke, practising a foreign language, or presenting information on a topic they are studying. If you want the children to decide the purpose of the animation for themselves, spend some time brainstorming ideas.
- Display excerpts from pre-selected animations (see *Useful links* on page 13). You may want to include some examples of Scratch animations (see *Resources*) so that the children get to see what the program can do.
- Ask the children to identify what makes a good animation (perhaps referring to the examples they have just seen). Use the IWB to record the suggestions made, moving these around to create clusters of similar ideas. You might like to use these as a basis for additional success criteria for the children's own animations.
- Finish the session by showing a particularly inspiring animation created in Scratch.

Extensions

SCHOOL

- Ask the children to think carefully about the role played by character, plot and dialogue in the animations they watch.

HOME

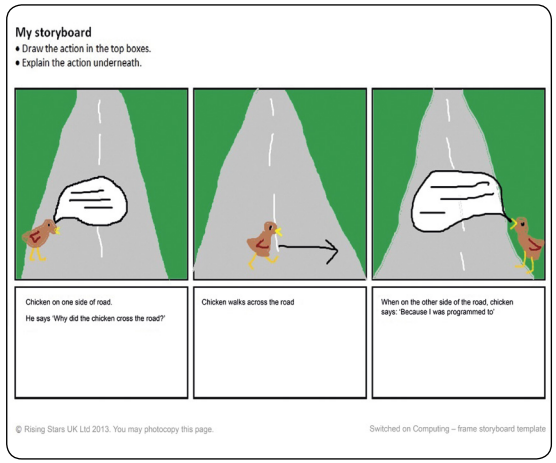
- Encourage the children to analyse other animations they watch at home using a similar approach, perhaps discussing this with their parents.
- Ask the children to think about two characters they will include in their animation.

Step 2: Creating a storyboard

RESOURCES

- Step-by-step poster for Unit 3.1
- Storyboard templates

POSSIBLE OUTCOME FOR THIS STEP:



- Display the step-by-step poster for the unit and remind the children about the purpose of the animations they are going to program.
- Explain to the children that before they can start building their animation, they need to create a storyboard that breaks down what happens in the animation into smaller chunks. Show an example of a storyboard by searching for 'storyboard' in Google Images. Some storyboards are works of art, but they don't need to be; their main purpose is to act as a reference when creating a film or animation.
- Make the connection between the storyboard, which shows the sequence of stages in their story, and an algorithm, which is a set of steps to solve a problem or get something done, such as creating an animation for a particular story. Explain that their storyboard is one way of expressing the algorithm for their animation.
- Group the children in pairs and give them time to discuss what will happen in their animation. Prompt them to consider how easy it might be to create their animation, and suggest that it's better to start simply and then add more detail than to be too ambitious at the start. You could set a time limit for the animations, e.g. one minute.
- When pairs have an idea they agree on, ask them to invite feedback from another pair, providing feedback to them in return.
- Ask pairs to create their storyboard on paper. (There are storyboard templates on My Rising Stars.)
- Ask the children to note down ideas for the characters that will feature in their animations. If there is time, ask a few pairs to present their ideas to the class.
- At this point, you could spend some time exploring the idea of character and discussing how personality might be conveyed effectively.

SCHOOL

- The children could increase the number of stages in their storyboard to extend the length of the animation.
- Children could scan or take digital photographs of their storyboards and then edit the image files to create sprites to import into Scratch.

HOME

- The children could continue working on their storyboard at home, perhaps using email or the school learning platform to share completed work with their partner.

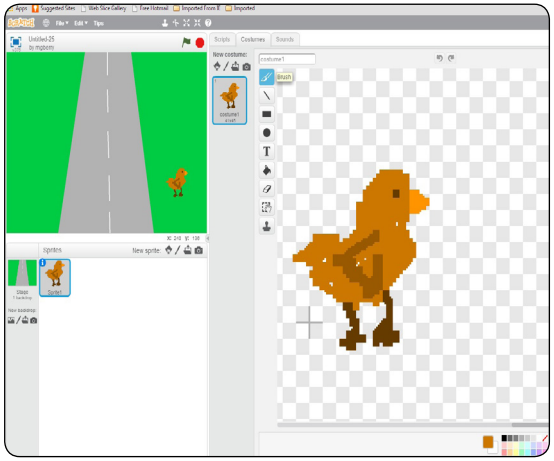
Core steps

Step 3: Creating characters and a background

RESOURCES

- *Software in 60 seconds* – Scratch (1, 2)

POSSIBLE OUTCOME FOR THIS STEP:



- Start the session by introducing Scratch, and telling the children they will be using Scratch to build their animations. Now that they have their character ideas and a storyboard, explain that they need to start by drawing their characters using the sprite editor. ('Sprite' is the term used to describe an object that can be moved in Scratch and other software.)
- Open up Scratch and project this onto the IWB. Model how the sprite editor works, or play the *Software in 60 seconds* Scratch demos (see *Resources*). Draw particular attention to changing the brush size, using the undo button and renaming sprites. Invite volunteers to come up to the board and try out these actions.
- Working in their pairs, ask the children to use the sprite editor to draw two characters for their animation. Remind them to give each sprite a name.
- Encourage the children to reflect on the challenges of using the sprite editor.
- Next, ask the children to use the Scratch background editor (which is very similar to the sprite editor) to create the background scene for their story, and then the sprite editor to create any 'props' that may be required. Ask pairs to review each other's work and give each other feedback on how it might be improved.
- Model order control – bring forward/send backward – explaining that this can be done using Scratch's programming blocks, if needed in the animation to make one sprite appear in front of or behind another.
- Draw the children's attention to the fact that they're creating output from the computer in the form of images. If you think it is appropriate, explain that images on a computer are made up of tiny blocks called pixels.

Extensions

SCHOOL

- Some children could import digital photographs, or use a more sophisticated graphics program to design their sprites or backgrounds.
- Some children could draw their characters in a number of poses using the sprite editor under the *Costumes* tab. This allows for more realistic movements, such as walking.
- Some children could include imported digital photographs of well-known settings. They could display these as extra backgrounds by using the *switch backdrop* block under the *Looks* palette.

HOME

- Some children could continue working on their characters and backgrounds at home, perhaps registering for accounts on the Scratch website to allow for easier online collaboration.

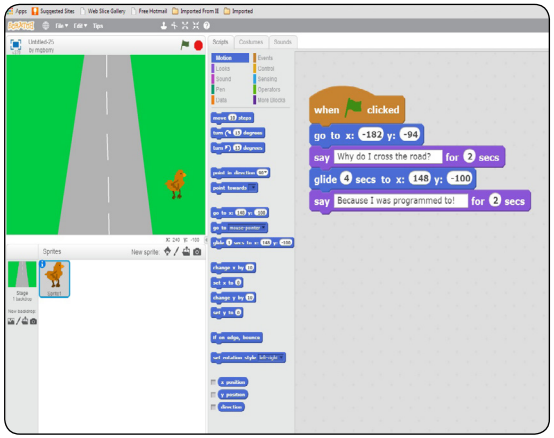
Step 4: Starting to animate the characters

RESOURCES

- *Software in 60 seconds* – Scratch (3)
- Unit poster reverse – How we program

- Video tutorials at https://scratch.mit.edu/help/videos/

POSSIBLE OUTCOME FOR THIS STEP:



- Explain that the children are now at the point where they will start to program their animations in Scratch, and that this involves converting the storyboard algorithm into a program using Scratch blocks. Each of the steps in their storyboard algorithm needs to be implemented as a sequence of Scratch programming blocks. For example, if their character moves in the storyboard algorithm, they'll need to use *move* or *glide* programming blocks to implement this in Scratch.
- Project Scratch onto the IWB. Show the children how to drag and clip together different programming blocks to start building an animation script. Draw particular attention to the blocks *wait* (in the *Control* palette), *glide* (in the *Motion* palette), *say* and *think* (both in the *Looks* palette). Ensure the children understand how to make the scripts run (by double clicking).
- Invite the children to spend some time exploring Scratch before they start to script their animations. Ask questions such as 'What happens if ...?' and 'Why did it do that?' Encourage the children to use logical reasoning in their explanations, considering their own algorithms and drawing on their understanding of how Scratch works.
- Display the How we program poster. Discuss the steps involved in programming and the questions the children should ask themselves if they come across a problem.
- Give the children time to start programming their animations, referring to their storyboard algorithm created in Step 2. Encourage the children to solve any problems themselves, without much input from you.
- At the end of the session, bring the class back together and ask the children to share their successes and difficulties. If possible, project some of the animations onto the IWB, discussing how successful they are.

SCHOOL

- Some children could simplify their scripts by creating a new block, using the *Make a Block* button on the *More Blocks* palette.

HOME

- Some children could continue working on their Scratch scripts at home, perhaps registering for accounts on the Scratch website to allow for easier online collaboration.

Core steps

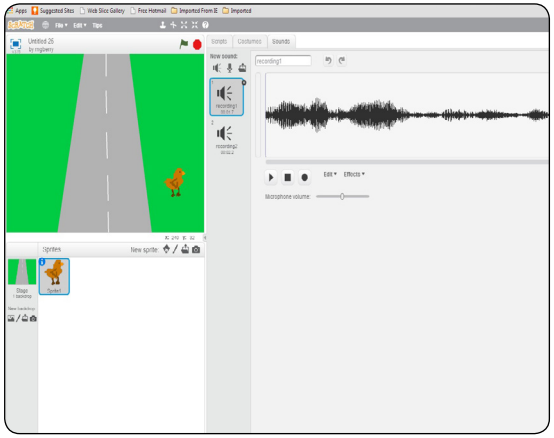
Step 5: Adding sounds to the animations

RESOURCES

- *Software in 60 seconds* – Scratch (4)
- *Software in 60 seconds* – Scratch (5)

- Video tutorials at https://scratch.mit.edu/help/videos/

POSSIBLE OUTCOME FOR THIS STEP:



- Show the children more of the Scratch scripting blocks and demonstrate how to use them. For example, you could use the *broadcast* and *when I receive* blocks (both in the *Events* palette), which allow two sprites to have a conversation. When one sprite has finished talking, it can broadcast to the other sprite that it has finished, and it is their turn to talk. When it receives the broadcast signal, the second sprite can start to talk. See the *Software in 60 seconds* walkthrough (Scratch 5) for more information.
- Also demonstrate how to use the *Sounds* tab to record dialogue or sound effects using a microphone, and how to use the *play sound until done* block in the *Sound* palette under the *Scripts* tab to play the sound back. Note that recordings can be given names, to make it easier to remember which is which.
- If the children have created multiple costumes for their sprites, demonstrate how to change between them using the *switch costume to* and *next costume* blocks on the *Looks* palette (see *Software in 60 seconds* – Scratch 4). For example, you could use a *repeat* block to create the illusion of walking as a sprite moves by repeatedly swapping between costumes.
- Encourage the children to continue to develop their scripts. Engage them in a discussion about ways they can improve how their scripts work, and any aspects that have not worked as anticipated.
- If possible, help the children to upload their animations to the Scratch community for feedback. If this is not possible, encourage the children to show their animations to parents at home, or to friends at school, and gather feedback.

Extensions

SCHOOL

- Some children could program more complex movements and interactions between characters, as well as recording sound effects and/or adding background music.

HOME

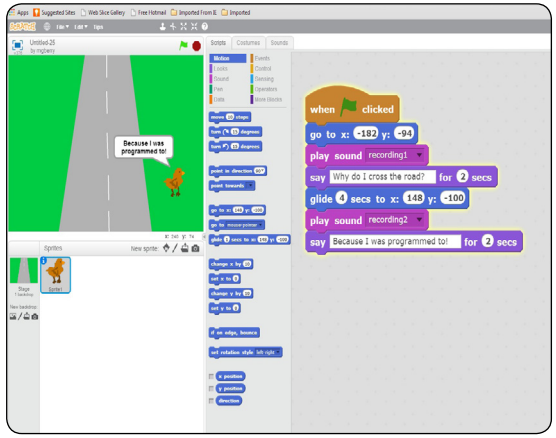
- Some children could continue working on their Scratch scripts at home, using the extra blocks introduced in this step, or exploring further functionality for themselves.

Step 6: Reviewing and improving the animations

RESOURCES

- Pupil self-assessment information

POSSIBLE OUTCOME FOR THIS STEP:



NB: This step may take more than one session to complete.

- In their pairs, ask the children to review any feedback they have received from other people, such as members of their family or the Scratch community.
- Project Scratch onto the IWB and ask each pair to present their animation to the class. Ask the children to explain how their programs work. Encourage the rest of the class to give constructive feedback.
- Depending on the purpose of the animations, and if time permits, the children could also test their animations with their target audience.
- Give the children the opportunity to make changes to their animations on the basis of the feedback they have received.
- Ask the children to evaluate the success of their work. If you established additional success criteria for the contents of the animation, ask the children to evaluate their animations against them.
- The children could publish their completed animations to a shared area of the school's learning platform, or the Scratch community site (subject to the school's online safety policy). Make sure the children do not put their full names on any work they share publicly; they should use first names only.
- The children may be interested in exploring the work others have uploaded to the Scratch site, perhaps adapting it and/or uploading further examples of their own work.

SCHOOL

- Some children could be encouraged to participate in the Scratch community, subject to parental permission.

HOME

- Some children could play their animations to family members and get further feedback on what they have made.

4 Assessment guidance

Use this page to assess the children's computing knowledge and skills. You may wish to use these statements in conjunction with the badges provided on My Rising Stars or community site and/or with your own school policy for assessing work.

ALL CHILDREN SHOULD BE ABLE TO:	BADGE	COMPUTING PoS REFERENCE
Create an algorithm for an animated scene in the form of a storyboard	PROBLEM SOLVER 2	Design programs that accomplish specific goals
Break the scene down into small sections of action and dialogue	PROBLEM SOLVER 2	Solve problems by decomposing them into smaller parts
Write a program in Scratch to create the animation	PROBLEM SOLVER 2	Write programs that accomplish specific goals
Put the blocks of their Scratch script into order	PROGRAMMER 2	Use sequence in programs

MOST CHILDREN WILL BE ABLE TO:		
Correct mistakes in their animation programs	PROBLEM SOLVER 2	Debug programs that accomplish specific goals
Create their own sound and graphics for the sprites and the backdrop	PROGRAMMER 2	Work with various forms of output
Explain the connection between their storyboard and the scene they're animating	LOGICAL THINKER 2	Use logical reasoning to explain how some simple algorithms work

SOME CHILDREN WILL BE ABLE TO:		
Use a *repeat* block to switch between costumes to create the illusion of movement	PROGRAMMER 2	Use repetition in programs
Think logically to detect and correct errors in their animation program	LOGICAL THINKER 2	Use logical reasoning to detect and correct errors in algorithms and programs
Publish their animations on the Scratch community website	ONLINE SAFETY 2	Use technology safely and responsibly
Glean ideas from others' work on the Scratch website	SEARCHER	Be discerning in evaluating digital content

PROGRESSION

The following units will allow your children to develop their knowledge and skills further.

- *Unit 3.2 – We are bug fixers*
- *Unit 4.1 – We are software developers*

5 Classroom ideas

Practical suggestions to bring this unit alive!

DISPLAYS AND ACTIVITIES

- You could show the children's animations during break time, as part of a school assembly, or on display screens in the school entrance hall.
- You could display the children's animation storyboards and scripts before and after receiving feedback, highlighting the importance of the review and revision process.
- If the cartoons have a suitable theme, they might provide useful material for a class assembly.
- Children could run an animation club at break time or after school.

WEBLINKS

- The BBC's *Cracking the Code* has a short video on how computer visual effects are used with live video in *Doctor Who*: www.bbc.co.uk/programmes/p016616g.
- Wikipedia provides a good introduction to computer animation at http://en.wikipedia.org/wiki/Computer_animation.
- Pixar is one of the leading computer animation studios. Their website has a behind-the-scenes section at www.pixar.com/behind_the_scenes.

VISITS

- The children may enjoy a visit to a local cinema, or perhaps even an IMAX screen, to see feature-length animations. See www.filmclub.org for ways of using film to enrich the curriculum.
- A visit to an animation studio may be difficult to arrange, but parents or former pupils working as graphic artists may be willing to visit the school to talk about, and perhaps demonstrate, aspects of their work.

BOOKS

- Amidi, A. *The Art of Pixar: 25th Anniversary edition*. (Chronicle Books, 2011)
- Badger, Michael. *Scratch 1.4: Beginner's Guide*. (Packt Publishing, 2009)
- Ford, Jerry Lee. *Scratch Programming for Teens*. (Delmar, 2008)
- Hahn, D. *The Alchemy of Animation*. (Disney Editions, 2011)
- LEAD Project, The. *Super Scratch Programming Adventure!* (No Starch Press, 2012)
- Sito, T. *Moving Innovation: A History of Computer Animation*. (MIT Press, 2013)

6 Taking it further

When you've finished, you might want to extend the project in the following ways.

- Some or all pupils could submit their work to Manchester University's UK Schools Animation Competition: http://animation.cs.manchester.ac.uk.
- The children may be interested to learn more about traditional hand-drawn animation techniques, stop-motion animation and the key-frame approach to computer animation. Open source software such as Pencil (www.pencil2d.org) and Google Web Designer (www.google.com/webdesigner) allow children to explore these.
- The work covered in this unit on analysing aspects of narrative structure (character, dialogue and plot) can have wider applications across the curriculum. The children could use the skills they have developed to explore aspects of the English curriculum or narrative forms in other subject areas.
- The children could use Scratch to create simple interactive educational resources and games, perhaps using the characters they created in this project.
- The children will return to Scratch for programming projects in later units.