Lower Key Stage 2 – *Bringing Images to Life* – Theme Guide

Children develop understanding of digital images. They transform and edit images, respecting copyright and ownership. They explore stop animation creating their own versions. They produce programmed animations, using sequence, repeat and selection.

Learning objectives for the term
To understand that digital images can be changed and edited and that this can have an impact on how we think and feel.
To understand that most digital images are made up of dots called pixels and that the denser the pixels, the higher quality the image.
To understand computers have internal components to support different processing tasks.
To understand digital image editing software is made up of programs that instruct a computer to carry out specific tasks related to adapting images. *Explore image resizing to decide the best size for screen projection*
To understand the need to seek consent before capturing and/or using the images of others.
To understand that some digital images may not be appropriate and know what to do if such materials are accessed.
To understand that the appearance of movement can be created in inanimate objects using stop-motion animation.
To understand animation can be used to convey a message/idea.
To know animation software includes a range of different features and tools.
To understand the importance of planning an animation project.
To know we can animate objects using a precise sequence of steps.
To know that an algorithm can be used to support us in writing a related computer program.
To know that a program can be used to control the behaviour and appearance of different onscreen objects.
On-going Learning Objectives
To use appropriate file-name conventions and understandable folder structure to save, organise and retrieve their work.
To understand and apply the rules around copyright and ownership for their own and others' work/digital resources.
To know that some digital resources may not be appropriate. Understand what to do if such materials are accessed.
To understand essential eSafety rules and to know what to do in the event of an incident or concern at home or school.

Vocabulary – See Glossary for definitions (for terms in blue)	
• *pixels,* • brightness, contrast, • *tinker,* • *copyright,* • component, • *computer processor,*	• saturation, • *stop-motion animation,* • *storyboard,* • *algorithm,* • *zoetrope,* • *CPU*
Possible resources for this theme (further resources are suggested with the explanatory notes below. Note that these are examples and not formal recommendations.)	
Image / Photo Editing iPad Apps • Doodle Buddy • Drawing Box • BeFunky • Snapseed • PhotostudioHD **Animation Software** • ZU3D • ICanAnimate • Scratch (for programmed animation)	**Image / Photo Editing Software** • Windows Image Editor • Photostory 3 • RM Colour Magic • Paint.Net • Irfanview • PhotoFiltre **Animation iPad Apps** • ICanAnimate • Lego Movie Maker • iMotion

Please note that with any online platform it is essential that you review the privacy policy and terms and conditions of the service. The school is responsible for the protection of data it holds and compliance with current data protection legislation. Always assess both the data protection and safety of the service you are considering using, and ensure any necessary permissions are in place before using with pupils.

Free *Barefoot Computing* activities to support this theme.	
• **ScratchJR (app) Knock-knock Joke Activity.** Link Children program an animated knock-knock joke using the ScratchJR app. • **Scratch Tinkering Activity**. Link Pupils explore Scratch and learn about how it works. • **Fossil Formation Animation Activity**. Link Pupils use Scratch to program an animation that illustrates the steps in fossil formation. • **Viking Raid Animation**. Link Pupils use Scratch to program an animation of a Viking raid.	*Barefoot Computing* provides freely available resources to support teachers in delivering the computer science aspects of the 2014 Primary National Curriculum for Computing. Free registration with the *Barefoot Computing* website is required to view and download these resources. To register, visit: http://barefootcas.org.uk References to these resources and the accompanying links are provided with permission from *Barefoot Computing*.

Primary Computing Scheme online materials that are referenced in this guide can be accessed from: http://www.hertsforlearning.co.uk/user/login

You will need to be logged into your school account and have a current subscription to the Primary Computing Scheme to gain access. The materials can be accessed from the *My Resources* link at the top/right of the screen, once you are logged in.

Key learning objectives **(some objectives might be used for more than one lesson)**
To understand that digital images can be changed and edited and that this can have an impact on how we think and feel.
• Talk about the differences between digital and non-digital images, and how it is much harder to change a non-digital photograph. • Digital images can be easily changed using computer software. Therefore, can we always believe what we see in a photograph? Discuss situations where digital images might be edited to influence the viewers' belief, opinion or understanding. Where possible, create and/or show examples of digital images that have been edited to create the appearance of something that isn't true (e.g. a UFO hovering over your school. The simplest way of doing this is to use a word processor, insert an image of your school onto a page and then place a clipart image of a UFO, easily found online, over the photo of the school.) • On the board/screen, show some digital images and apply different filters to the photos, using image editing software, to change the overall effect and mood of the image. How do the filters affect the photos? How is the mood or atmosphere of the photo changed? (See the accompanying sheet [*Sources of Free Images*] for guidance on finding suitable photos to use.) For example, take a photo of some clouds in the sky and then apply a black and white filter. The effect may make the photo immediately seem 'moodier' or more dramatic. • Children can use image editing software / app to experiment with the tools and apply filters to photos, tinkering with the different effects that can be produced. (For example, colour balance, black and white, chalk and charcoal, sepia, fragmenting). • Talk about the impact of the tools on the images.

- Link to English – take a photograph to illustrate a poem or piece of writing and use an appropriate filter to create a mood/atmosphere suitable for the written work.

To understand that most digital images are made up of dots called pixels and that the denser the pixels, the higher quality the image.

- To show how digital images are made up of pixels, use a digital photograph on the board and gradually zoom in. As the magnification increased, so the individual pixels should become apparent.
- Ask the children what they notice as the magnification increases (the perceived quality decreases.)
- Ask why they think this is. Continue to zoom in until the individual pixels are clearly visible. Note that the photograph is really made up of thousands or millions of dots (pixels,) and that the dots have different colours (most digital image formats can support over 16 million different colours.)
- Talk about how digital image quality can be measured in megapixels, which means 1 million pixels. So a smart phone with an 8 megapixel camera can produce a digital photograph made up of 8 million pixels.
- Older digital cameras had lower megapixel ratings. What are the advantages and disadvantages of larger/smaller megapixel ratings? (Generally, the more pixels that make up a digital photograph, the larger the file size will be. So, for example, sharing a digital image that has a very high megapixel count can be more difficult, and you can fit fewer images on a disk.)
- Use squared paper and coloured pens/pencils to create simple pixel art, by colouring in different squares to create a picture, each square representing a pixel.
- Show some pictures of old game characters where the pixels are more visible (e.g. early Space Invader aliens etc.)
- Try using Microsoft® Excel or other spreadsheet software to create pixel art. See accompanying sheet: [*Using Spreadsheets to create Pixel Art*.]
- This website has some colour-by-numbers downloadable activities to help children understand how images can be made up of pixels: https://abitofcs4fn.org/art/

To understand that computers have internal components to support different processing tasks.

- Build a list of tasks which computers carry out regularly, such as displaying images, playing sounds etc. You could use a mind mapping tool or other way of presenting the sort of tasks that computers commonly carry out. Many domestic computers will have similar functionality. E.g. a desktop computer, laptop, tablet and smart phone will generally all be able to play a sound, display something on a screen etc.
- How do all these things happen? Discuss the fact that all these devices will have components that enable these functions.
- Also talk about the fact that computers will have storage space, to store what it creates, and a central processing unit (CPU) which carries out the instructions made by a program.
- In older desktop computers it is easier to identify the individual internal components, e.g. the soundcard, hard disk, CPU etc. This is much harder inside tablets, smart phones etc. where everything is much smaller and integrated. Show some images of the inside of a computer, identifying some of the internal components.
- If possible **and safe to do so**, with the support of an expert, show the children the inside of a desktop computer, reinforcing that it is not safe to try this at home.
- Discuss how with desktop computers, individual components can usually be replaced. For example you might upgrade a graphics card for better gaming, or put in a larger hard disk. This is usually impossible in tablets and other smaller, more mobile devices. What are the advantages / disadvantages of a system where individual components can be changed and replaced?

To understand that digital image editing software is made up of linked programs which instruct a computer to carry out specific tasks related to adapting images. *Explore image resizing to decide the best size for screen projection.*

- Give children experience of using commonly found image editing tools, ideally using more than one program, e.g. use desktop software and also an app on an iPad/tablet.
- Use tools within the image editing software to change such aspects as:
  - brightness, contrast and saturation, red-eye removal
  - cropping
  - rotating
  - resizing
- What specific tools do the programs/apps have in common? As with word processing formatting tools, most image editing tools will have common functions, as above.

- Choosing a program or app, children write a detailed series of instructions (algorithm) for carrying out one specific task such as resizing an image, applying a filter, cropping a specific area etc.

To understand the need to seek consent before capturing and/or using the images of others.

- Have a discussion about why we should always seek consent before photographing, videoing or recording another person, or using an existing image, video or recording of that person. Think about what happens to our control of an image, video or sound when it is uploaded to the internet.
- Capture images and edit enhance and/or alter them to meet agreed criteria. For example, children take photographs to illustrate a poem, piece of writing, science experiment, PE activity, geography activity.
- Use these photographs in an app or computer software where they can add captions to explain the photo.
- Children should credit the source of the image (which might be their own name or initials.)

To understand that some digital images may not be appropriate and know what to do if such materials are accessed.

- Talk about what we should do if we see a picture on the www, internet service or elsewhere that worries us, upsets us or concerns us in any other way.
- As part of your school's eSafety procedures, and in general, it is essential that children know how to report these incidents.
- Children work in groups to create rules for the safe use of images and could use a piece of creative software / app or non-digital method of making a poster or presentation for their rules. Display these in the school or share in an assembly.

To understand that the appearance of movement can be created in inanimate objects using stop-motion animation.

- *Stop Motion* is achieved by repeatedly copying the previous image but including a slight change in each new image. When we view each separate image in rapid succession, the appearance of movement is created.
- Begin by looking at some examples of old animations/cartoon and thinking about how they were made. There are plenty of examples available to stream from the web.
- Look at the history of animation and show pictures of old animation devices (e.g. phenakistoscope, zoetrope, old film reels etc.)
- Children make a simple flipbook animation. This can be done using pads of sticky-notes, though this can be expensive with one pad per child. You can make your own with a few pieces of paper, cut up and stapled together to form small booklets.
- Think about how moving through frames creates the appearance of motion. Consider frame rates (how many frames per second are used in animations.) E.g. *Wallace and Gromit* films use 24 frames per second. (Source: Wikipedia) What would be the effect of slowing down or speeding up the frame rate?

To understand that animation can be used to convey a message or idea.

- Discuss where we see animations. They appear in entertainment (animated films, tv shows etc.) and in games, adverts, web pages (often as simple animated gifs,) screensavers and lock screens etc.
- Share different types of animation, for example hand-drawn, digitally drawn, physical object, talking avatars etc. Compare stop motion animations to modern computer generated versions and discuss the effectiveness of the approaches. Also, think about the work involved in making the animations.
- Why might different approaches be used for different purposes? (E.g. using stop motion to give the impression of the animation being older.)
- Identify the key message or idea in the example animations.

To know that animation software/resources include a range of different features and tools.

- Children explore different ways of animating using the tools that are available to you. These might include:
  - apps or desktop/laptop where they draw animations, frame by frame.
  - apps or desktop/laptop software for creating physical stop motion animations.
  - apps or desktop/laptop software for animating stick figures.
  - apps or desktop/laptop software for creating digital puppet shows.
  - apps or desktop/laptop for creating facial animation / talking avatars.
- Compare some these, thinking about how effective they are, how easy to use etc.

To understand the importance of planning an animation project.

- Provide storyboarding templates for the children to use to plan a short, simple animation for a specific purpose. This could be linked to science, for example, to show a life cycle or process.

- With a partner, children can agree the animation software to be used and create the animation.
- The animation the children make could be onscreen, which may be quicker and easier to implement, or using physical objects with a stop-motion app or desktop/laptop software with webcam.

To know we can animate objects using a precise sequence of steps.

- Children create an algorithm to instruct how an animation can be made.
- Decide which technique and/or app or desktop/laptop software the children will write their algorithm for.
- Children work in pairs away from the computer to develop an algorithm to animate an object/character.
- Consider having different groups of children creating their algorithms for different techniques/programs so they can test them out on their peers before debugging and refining them.

To know that an algorithm can be used to support us in writing a related computer program.

- If possible, use their algorithms (from the previous objective) and an onscreen programming language to create a program to animate an object/character.
- This is a good time to introduce Scratch (ideally the offline version) through a simple animation project. E.g. a sprite can be programmed to repeatedly switch between two costumes. This gives the appearance of motion such as walking, swimming etc. Begin by simply animating a sprite to move around the screen (e.g. create a fish-tank screen saver.)
- It may be necessary to create a new algorithm to plan the program, depending on which animation process their original algorithm was written for.
- Introduce *selection* by programming the sprite to behave in a certain way if something happens. For example, if it collides with another sprite, a sound is played.
- See the downloadable activity: [*Debugging Activity – Scratch – Shark Screensaver*]
- See this free Barefoot Computing activities (link above):
  - Scratch Tinkering Activity

To know that a program can be used to control the behaviour and appearance of different onscreen objects.

- Having introduced the children to Scratch or other programming environment, allow them time to explore and tinker further and try out different things through open programming time. For this theme, focus the children's attention on the animation aspects of programming and interaction between sprites.
- See these free Barefoot Computing activities (links above):
  - Fossil Formation Activity
  - Viking Raid Activity
  - ScratchJR Knock-Knock Joke Activity

On-Going Learning Objectives

To use appropriate file-name conventions and understandable folder structure to save, organise and retrieve their work.

To understand and apply the rules around copyright and ownership for their own and others' work/digital resources.

To know that some digital resources may not be appropriate. Understand what to do if such materials are accessed.

To understand essential eSafety rules and to know what to do in the event of an incident or concern at home or school.

Suggested independent task – any open-ended activity (2-3 sessions) enabling the children to demonstrate their computing capability around the knowledge and understanding provided in the term

- Plan and create an animation to convey an idea/message: this should include use of an algorithm and either an onscreen programming language or animation tool.
- Create digital image/s to convey the same idea/message.
- Compare both projects, considering how well each communicates the central idea/message

Other considerations:

Does the task provide for children to work at different levels?
Is there support available for children to select if they wish?
Are there opportunities for the children to review and develop their work?
Is there an opportunity for the children to evaluate the finished task?

For this task you could use Scratch, or another programming environment where sprites can be animated. If you don't want to involve programming (perhaps because you are teaching the *Programming and Games* theme in a parallel term) then you could use an animation specific app or desktop/laptop software. Pupils' animations should convey a particular message or idea, e.g. asking permission before taking a photograph of someone. They should plan their animation though storyboarding and create an algorithm to show the process they use to animate the object.
Pupils then use a digital image (or series of images) to convey the same message and write about which they feel is most effective in this instance.