Progression in Computing

Intent

We aim for children to have acquired the essential characteristics of Computer Scientists:

• Competence in coding for a variety of practical and inventive purposes, including the application of ideas within other subjects.

• The ability to connect with others safely and respectfully, understanding the need to act within the law and with moral and ethical integrity.

• An understanding of the connected nature of devices and their uses.

• The ability to communicate ideas well by using applications and devices throughout the curriculum.

• The ability to collect, organise and manipulate data effectively.

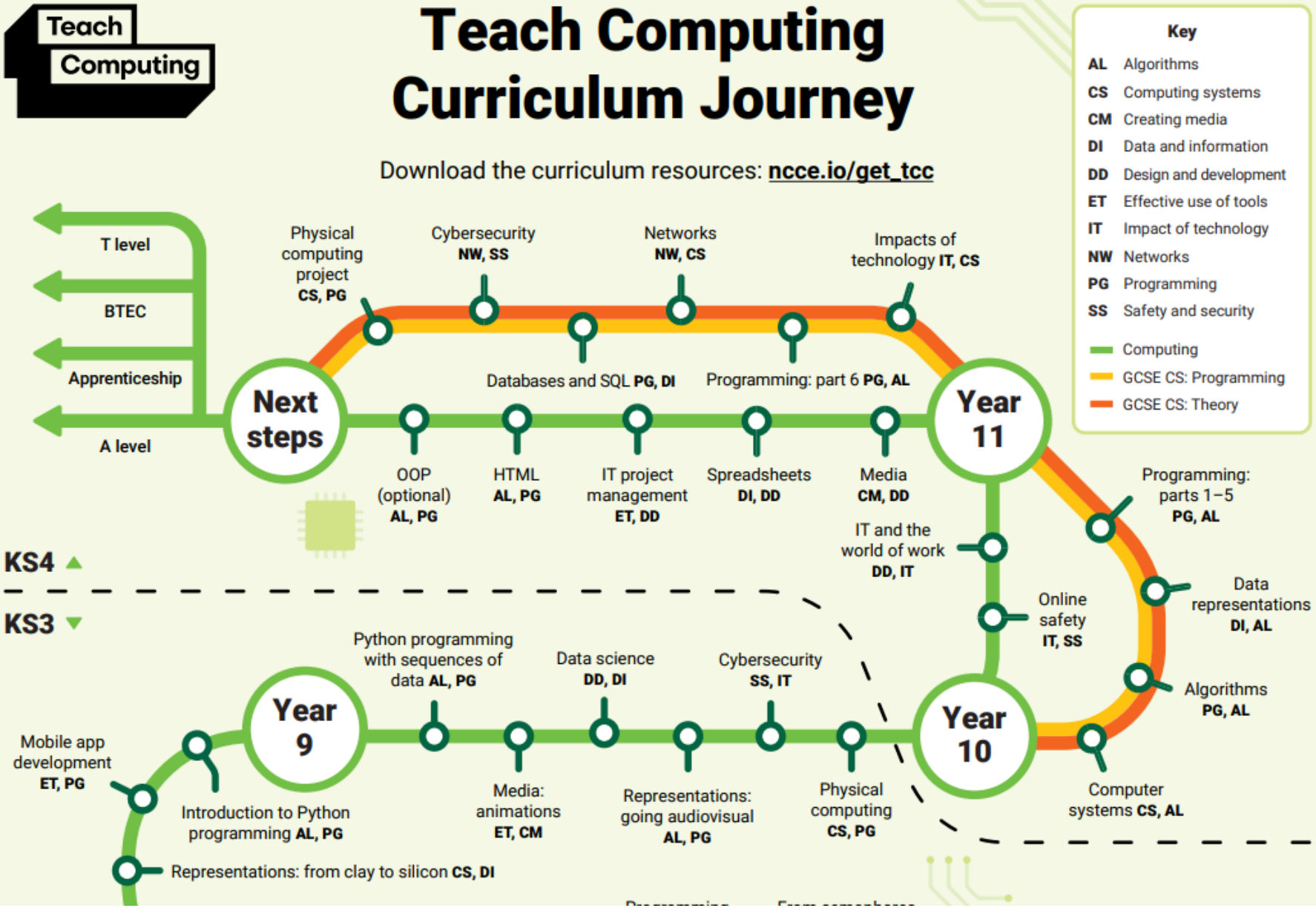
Implementation:

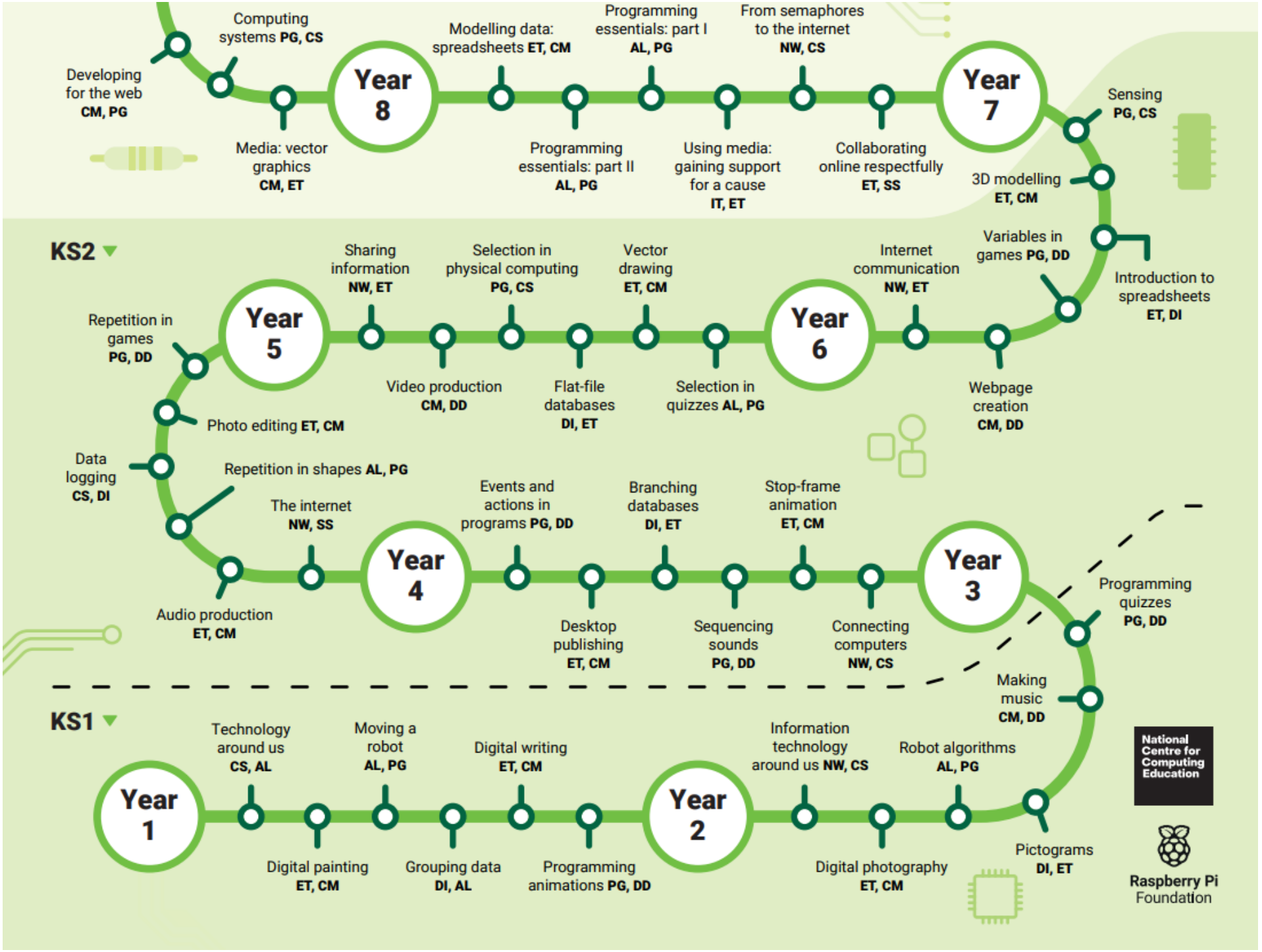
1. Curriculum drivers (Spirituality, Opportunity, Equality, Aspiration and Communication) shape our curriculum breadth in Computing. They are derived from an exploration of the backgrounds of our students, our beliefs about high quality education and our values. They are used to ensure we give our students appropriate and ambitious curriculum opportunities.
2. Cultural capital gives our students the vital background knowledge required to be informed and thoughtful members of our community who understand and believe in British values.
3. Curriculum breadth is shaped by our curriculum drivers, cultural capital, subject topics and our ambition for students to study the best of what has been thought and said by many generations of academics and scholars.
4. Our curriculum distinguishes between subject topics and 'threshold concepts'. Subject topics are the specific aspects of subjects that are studied.
5. **Threshold concepts** tie together the subject topics into meaningful schema. The same concepts are explored in a wide breadth of topics. Through this 'forwards-and-backwards engineering' of the curriculum, students return to the same concepts over and over and gradually build understanding of them. In Computing, these threshold concepts are; **Computing systems and network, Data and information, Programming and Creating Media.**
6. Cognitive science tells us that working memory is limited and that cognitive load is too high if students are rushed through content. This limits the acquisition of long-term memory. Cognitive science also tells us that in order for students to become creative thinkers, or have a greater depth of understanding they must first master the basics, which taken time.
7. **Milestones:** For each of the threshold concepts three Milestones, each of which includes the procedural and Knowledge categories in each subject give students a way of expressing their understanding of the threshold concepts. Milestone 1 is to taught across Years 1 and 2, milestone 2 is taught across Year 3 and 4 and milestone 3 is taught across Year 5 and Year 6
8. **Cognitive Domains:** Within each Milestone, students gradually progress in their procedural fluency and semantic strength through three cognitive domains: basic, advancing and deep. The goal for students is to display sustained mastery at the 'advancing' stage of understanding by the end of each milestone and for the most able to have a greater depth of understanding at the 'deep' stage.

9. **Pedagogical Content Knowledge and Strategies:** As part of our progression model we use a different pedagogical style in each of the cognitive domains of basic, advancing and deep. This is based on the research of Sweller, Kirschner and Rosenshine who argue to direct instruction in the early stages of learning and discovery based approaches later. We use direct instruction in the basic domain and problem based discovery in the deep domain. This is called the reversal effect.
10. Also as part of our progression model we use POP tasks (Proof of Progress) which shows our curriculum expectations in each cognitive domain.
11. Our curriculum design is based on evidence from cognitive science; three main principles underpin it:
    - Learning is most effective with spaced repetition.
    - Interleaving helps pupils to discriminate between topics and aids long-term retention.
    - Retrieval of previously learned content is frequent and regular, which increases both storage and retrieval strength.
12. In addition to the three principles we also understand that learning is invisible in the short-term and that sustained mastery takes time.
13. Our content is subject specific. We make intra-curricular links to strengthen schema.
14. Continuous provision, in the form of daily routines, replaces the teaching of some aspects of the curriculum and, in other cases, provides retrieval practice for previously learned content.

Teach Computing Curriculum Journey

Download the curriculum resources: **ncce.io/get_tcc**




KS2
KS1
Year 1
Year 2
Year 3
Year 4
Year 5
Year 6
Year 7
Year 8
Developing for the web CM, PG
Computing systems PG, CS
Media: vector graphics CM, ET
Modelling data: spreadsheets ET, CM
Programming essentials: part II AL, PG
Programming essentials: part I AL, PG
Using media: gaining support for a cause IT, ET
From semaphores to the internet NW, CS
Collaborating online respectfully ET, SS
Sensing PG, CS
3D modelling ET, CM
Variables in games PG, DD
Introduction to spreadsheets ET, DI
Repetition in games PG, DD
Photo editing ET, CM
Data logging CS, DI
Repetition in shapes AL, PG
Audio production ET, CM
Sharing information NW, ET
Video production CM, DD
Selection in physical computing PG, CS
Flat-file databases DI, ET
Vector drawing ET, CM
Selection in quizzes AL, PG
Internet communication NW, ET
Webpage creation CM, DD
The internet NW, SS
Events and actions in programs PG, DD
Desktop publishing ET, CM
Branching databases DI, ET
Sequencing sounds PG, DD
Stop-frame animation ET, CM
Connecting computers NW, CS
Programming quizzes PG, DD
Making music CM, DD
Pictograms DI, ET
Technology around us CS, AL
Digital painting ET, CM
Moving a robot AL, PG
Grouping data DI, AL
Digital writing ET, CM
Programming animations PG, DD
Information technology around us NW, CS
Digital photography ET, CM
Robot algorithms AL, PG
National Centre for Computing Education
Raspberry Pi Foundation

National Curriculum - Key stage 1

Pupils should be taught to:

- understand what algorithms are, how they are implemented as programs on digital devices, and that programs execute by following precise and unambiguous instructions
- create and debug simple programs
- use logical reasoning to predict the behaviour of simple programs
- use technology purposefully to create, organise, store, manipulate and retrieve digital content
- recognise common uses of information technology beyond school
- use technology safely and respectfully, keeping personal information private; identify where to go for help and support when they have concerns about content or contact on the internet or other online technologies

National Curriculum - Key stage 2

Pupils should be taught to:

- 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
- 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

EYFS PITA Statements and ELGS	Teaching Sequence and Learning Objectives					
	Year 1	Year 2	Year 3/4 Cycle A	Year 3/4 Cycle B	Year 5/6 Cycle A	Year 5/6 Cycle B
	Computing systems and networks – Technology around us	**Computing systems and networks – IT around us**	**(Y3 Unit)Computing systems and networks – Connecting computers**	**(Y3 Unit) Data and information – Branching databases**	**(Y5 Unit) Computing systems and networks – Sharing information**	**(Y5 Unit) (Y5 Unit) Data and information – Flat-file databases**
	To identify technology	To recognise the uses and features of information technology	To explain how digital devices function	To create questions with yes/no answers	To explain that computers can be connected together to form systems	To use a form to record information
	To identify a computer and its main parts	To identify the uses of information technology in the school	To identify input and output devices	To identify the object attributes needed to collect relevant data	To recognise the role of computer systems in our lives	To compare paper and computer-based databases
	To use a mouse in different ways	To identify information technology beyond school	To recognise how digital devices can change the way we work	To create a branching database	To recognise how information is transferred over the internet	To outline how grouping and then sorting data allows us to answer questions
	To use a keyboard to type on a computer	To explain how information technology helps us	To explain how a computer network can be used to share information	To explain why it is helpful for a database to be well structured	To explain how sharing information online lets people in different places work together	To explain that tools can be used to select specific data
	To use the keyboard to edit text	To explain how to use information technology safely	To explore how digital devices can be connected	To identify objects using a branching database	To contribute to a shared project online	To explain that computer programs can be used to compare data visually
	To create rules for using technology responsibly	To recognise that choices are made when using information technology	To recognise the physical components of a network	To compare the information shown in a pictogram with a branching database	To evaluate different ways of working together online	To apply my knowledge of a database to ask and answer real-world questions
	Creating media – Digital painting	**Creating media – Digital photography**	**(Y4 Unit) Computing systems and networks – The Internet**	**Y4 (Unit) Data and information – Data logging**	**(Y6 Unit) Computing systems and networks – Communication**	**(Y6 Unit) Data and information – Spreadsheets**
	To describe what different freehand tools do	To use a digital device to take a photograph	To describe how networks physically connect to other networks	To explain that data gathered over time can be used to answer questions	To identify how to use a search engine	To identify questions which can be answered using data
	To use the shape tool and the line tools	To make choices when taking a photograph	To recognise how networked devices make up the internet	To use a digital device to collect data automatically	To describe how search engines select results	To explain that objects can be described using data
	To make careful choices when painting a digital picture	To describe what makes a good photograph	To outline how websites can be shared via the World Wide Web (WWW)	To explain that a data logger collects 'data points' from sensors over time	To explain how search results are ranked	To explain that formulas can be used to produce calculated data
	To explain why I chose the tools I used	To decide how photographs can be improved	To describe how content can be added and accessed on the World Wide Web (WWW)	To use data collected over a long duration to find information	To recognise why the order of results is important, and to whom	To apply formulas to data, including duplicating
	To use a computer on my own to paint a picture	To use tools to change an image	To recognise how the content of the WWW is created by people	To identify the data needed to answer questions	To recognise how we communicate using technology	To create a spreadsheet to plan an event
	To compare painting a picture on a computer and on paper	To recognise that photos can be changed	To evaluate the consequences of unreliable content	To use collected data to answer questions	To evaluate different methods of online communication	To choose suitable ways to present data

	Programming A – Moving a robot	**Programming A – Robot algorithms**	**(Y3 Unit) Creating media – Animation**	**(Y3 Unit) Creating media – Desktop publishing**	**(Y5 Unit) Creating media – Video editing**	**(Y5 Unit) Creating media – Vector drawing**
	To explain what a given command will do	To describe a series of instructions as a sequence	To explain that animation is a sequence of drawings or photographs	To recognise how text and images convey information	To explain what makes a video effective	To identify that drawing tools can be used to produce different outcomes
	To act out a given word	To explain what happens when we change the order of instructions	To relate animated movement with a sequence of images	To recognise that text and layout can be edited	To identify digital devices that can record video	To create a vector drawing by combining shapes
	To combine forwards and backwards commands to make a sequence	To use logical reasoning to predict the outcome of a program (series of commands)	To plan an animation	To choose appropriate page settings	To capture video using a range of techniques	To use tools to achieve a desired effect
	To combine four direction commands to make sequences	To explain that programming projects can have code and artwork	To identify the need to work consistently and carefully	To add content to a desktop publishing publication	To create a storyboard	To recognise that vector drawings consist of layers
	To plan a simple program	To design an algorithm	To review and improve an animation	To consider how different layouts can suit different purposes	To identify that video can be improved through reshooting and editing	To group objects to make them easier to work with
	To find more than one solution to a problem	To create and debug a program that I have written	To evaluate the impact of adding other media to an animation	To consider the benefits of desktop publishing	To consider the impact of the choices made when making and sharing a video	To evaluate my vector drawing
	Data and information – Grouping data	**Creating media – Making music**	**(Y4 Unit) Creating media – Audio editing**	**(Y4 Unit) Creating media – Photo editing**	**(Y6 Unit) Creating media – Web page creation**	**(Y6 Unit) Creating media – 3D Modelling**
	To label objects	To say how music can make us feel	To identify that sound can be digitally recorded	To explain that digital images can be changed	To review an existing website and consider its structure	To use a computer to create and manipulate three-dimensional (3D) digital objects
	To identify that objects can be counted	To identify that there are patterns in music	To use a digital device to record sound	To change the composition of an image	To plan the features of a web page	To compare working digitally with 2D and 3D graphics
	To describe objects in different ways	To show how music is made from a series of notes	To explain that a digital recording is stored as a file	To describe how images can be changed for different uses	To consider the ownership and use of images (copyright)	To construct a digital 3D model of a physical object
	To count objects with the same properties	To show how music is made from a series of notes	To explain that audio can be changed through editing	To make good choices when selecting different tools	To recognise the need to preview pages	To identify that physical objects can be broken down into a collection of 3D shapes
	To compare groups of objects	To create music for a purpose	To show that different types of audio can be combined and played together	To recognise that not all images are real	To outline the need for a navigation path	To design a digital model by combining 3D objects
	To answer questions about groups of objects	To review and refine our computer work	To evaluate editing choices made	To evaluate how changes can improve an image	To recognise the implications of linking to content owned by other people	To develop and improve a digital 3D model

	Creating media – Digital writing	**Data and information – Pictograms**	**(Y3 Unit) Programming A – Sequence in music**	**(Y3 Unit) Programming B – Events and actions**	**(Y5 Unit) Programming A – Selection in physical computing**	**(Y5 Unit) Programming B – Selection in quizzes**
	To use a computer to write	To recognise that we can count and compare objects using tally charts	To explore a new programming environment	To explain how a sprite moves in an existing project	To control a simple circuit connected to a computer	To explain how selection is used in computer programs
	To add and remove text on a computer	To recognise that objects can be represented as pictures	To identify that commands have an outcome	To create a program to move a sprite in four directions	To write a program that includes count-controlled loops	To relate that a conditional statement connects a condition to an outcome
	To identify that the look of text can be changed on a computer	To create a pictogram	To explain that a program has a start	To adapt a program to a new context	To explain that a loop can stop when a condition is met	To explain how selection directs the flow of a program
	To make careful choices when changing text	To select objects by attribute and make comparisons	To recognise that a sequence of commands can have an order	To develop my program by adding features	To explain that a loop can be used to repeatedly check whether a condition has been met	To design a program which uses selection
	To explain why I used the tools that I chose	To recognise that people can be described by attributes	To change the appearance of my project	To identify and fix bugs in a program	To design a physical project that includes selection	To create a program which uses selection
	To compare typing on a computer to writing on paper	To explain that we can present information using a computer	To create a project from a task description	To design and create a maze-based challenge	To create a program that controls a physical computing project	To evaluate my program
	Programming B – Introduction to animation	**Programming B – An introduction to quizzes**	**(Y4 Unit) Programming A – Repetition in shapes**	**(Y4 Unit) Programming B – Repetition in games**	**(Y6 Unit) Programming A – Variables in games**	**(Y6 Unit) Programming B – Sensing**
	To choose a command for a given purpose	To explain that a sequence of commands has a start	To identify that accuracy in programming is important	To develop the use of count-controlled loops in a different programming environment	To review an existing website and consider its structure	To create a program to run on a controllable device
	To show that a series of commands can be joined together	To explain that a sequence of commands has an outcome	To create a program in a text-based language	To explain that in programming there are infinite loops and count controlled loops	To plan the features of a web page	To explain that selection can control the flow of a program
	To identify the effect of changing a value	To create a program using a given design	To explain what 'repeat' means	To develop a design that includes two or more loops which run at the same time	To consider the ownership and use of images (copyright)	To update a variable with a user input
	To explain that each sprite has its own instructions	To change a given design	To modify a count-controlled loop to produce a given outcome	To modify an infinite loop in a given program	To recognise the need to preview pages	To use an conditional statement to compare a variable to a value
	To design the parts of a project	To create a program using my own design	To decompose a task into small steps	To design a project that includes repetition	To outline the need for a navigation path	To design a project that uses inputs and outputs on a controllable device
	To use my algorithm to create a program	To decide how my project can be improved	To create a program that uses count-controlled loops to produce a given outcome	To create a project that includes repetition	To recognise the implications of linking to content owned by other people	To develop a program to use inputs and outputs on a controllable device

EYFS	Progression of Vocabulary					
	Year 1	Year 2	Year 3/4 Cycle A	Year 3/4 Cycle B	Year 5/6 Cycle A	Year 5/6 Cycle B
	Computing systems and networks – Technology around us	**Computing systems and networks – IT around us**	**(Y3 Unit)Computing systems and networks – Connecting computers**	**(Y3 Unit) Data and information – Branching databases**	**(Y5 Unit) Computing systems and networks – Sharing information**	**(Y5 Unit) (Y5 Unit) Data and information – Flat-file databases**
	Tier 2					
	Tier 3					
	Creating media – Digital painting	**Creating media – Digital photography**	**(Y4 Unit) Computing systems and networks – The Internet**	**Y4 (Unit) Data and information – Data logging**	**(Y6 Unit) Computing systems and networks – Communication**	**(Y6 Unit) Data and information – Spreadsheets**
	Tier 2					
	Tier 3					
	Programming A – Moving a robot	**Programming A – Robot algorithms**	**(Y3 Unit) Creating media – Animation**	**(Y3 Unit) Creating media – Desktop publishing**	**(Y5 Unit) Creating media – Video editing**	**(Y5 Unit) Creating media – Vector drawing**
	Tier 2					

	Tier 3					
	Data and information – Grouping data	**Creating media – Making music**	**(Y4 Unit) Creating media – Audio editing**	**(Y4 Unit) Creating media – Photo editing**	**(Y6 Unit) Creating media – Web page creation**	**(Y6 Unit) Creating media – 3D Modelling**
	Tier 2					
	Tier 3					
	Creating media – Digital writing	**Data and information – Pictograms**	**(Y3 Unit) Programming A – Sequence in music**	**(Y3 Unit) Programming B – Events and actions**	**(Y5 Unit) Programming A – Selection in physical computing**	**(Y5 Unit) Programming B – Selection in quizzes**
	Tier 2					
	Tier 3					
	Programming B – Introduction to animation	**Programming B – An introduction to quizzes**	**(Y4 Unit) Programming A – Repetition in shapes**	**(Y4 Unit) Programming B – Repetition in games**	**(Y6 Unit) Programming A – Variables in games**	**(Y6 Unit) Programming B – Sensing**
	Tier 2					

	Tier 3					