PRIMARY COMPUTING PLANNING PROGRESSION MAP REC – Y6

St. Joseph's Catholic Primary School

National Curriculum Programs of Study						
	Rec/ Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
	Pupils should be taught to:		*Pupils should be taught about:*			
Computer Science [CS]	*Early Learning Goals- Recognise that a range of technology is used in places such as homes and schools Select and use technology for particular purposes* • *I can make a floor robot move - I can use simple software to make something happen. - I can make choices about the buttons and icons I press, touch or click on.* • 1a. Understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions. • 1b. Create and debug simple programs. • 1c. Use logical reasoning to predict the behaviour of simple programs.		• 2a. Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts. • 2b. Use sequence, selection, and repetition in programs; work with variables and various forms of input and output. 2c. Use logical reasoning to explain simple algorithms and to detect and correct errors in algorithms and programs. • 2d. 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. • 2e. Appreciate how results are selected and ranked, and be discerning in evaluating digital content.			
Information Technology [IT]	• *- I can tell you about different kinds of information such as pictures, video, text and sound. - I can move objects on a screen. - I can create shapes and text on a screen. - I can use technology to show my learning.* • 1d. Use technology purposefully to create, organise, store, manipulate and retrieve digital content.		• 2f. Use search technologies effectively. • 2g. 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.			
Digital Literacy [DL]	• *I can tell you about technology that is used at home and in school. - I can operate simple equipment* • 1e. Recognise common uses of information technology beyond school. • 1f. 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		• 2h. Understand the opportunities [networks] offer for communication anD collaboration. • 2i. Be discerning in evaluating digital content. • 2j. Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.			

	EYFS/Year 1	Year 2/Year 3		Year 4/Year 5		Year 6
Long Term Planning: Half Termly Units						
	Year A/Year B Revisit	**Year A**	**Year B**	**Year A**	**Year B**	
Unit Focus	**Technology Around Us** **Basic skills** [IT]	**IT Around Us** (DL) 2	**Stop Frame** **Animation** (IT) 3	**The Internet** (CS, IT, DL) 4	**Sharing Information** (CS,IT,DL) 5	**Internet Communication** (CS, IT,DL)
Online safety Focus	*Using Computers Safely* *Smartie The Penguin*	*Be Internet Legends – Be Internet Sharp -Think Before Share – Activity 1 and 4*		*Be Internet Legends – Be Internet Sharp -Think Before Share – Activity 2 and 3*		*Be Internet Legends-* *Be Alert – Check for Real 9-11*
Uni Focus	**Creating Media** **Digital Painting** [IT]	**Connecting Computers** (CS) Messages in Digital Media 3	**Digital Photography** (IT) 2	**Video Production** (CS,IT,DL) 5	**Audio Production** (CS, IT,DL) 4	**Webpage Design** (CS,IT,DL)
Online safety Focus	*Using Computers Safely* *Smartie The Penguin*	*Be Internet Legends – Be Internet Sharp -Think Before Share – Activity 1 and 2*		*Be Internet Legends – Be Internet Alert – Check It's For Real – Activity 1 and 2*		*Be Internet Legends-* *Be Alert – Check for Real 9 -11*
Unit Focus	**Programming A** **Basic algorithms** [CS]	**Programming A** **Basic algorithms** [CS] Robots 2	**Programming A** **Sequencing Sounds** (CS) (IT) 3	**Programming A** **Repetition In Shapes** (CS,IT) 4	**Programming A** **Physical Computing** (CS,IT) 5	**Programming A** **Variables In Games** (CS,IT,DL)
Online safety Focus	*Using Computers Safely* *DigiDuck's Big Decision*	*Be Internet Legends – Be Internet Secure – Protect Your Stuff – Activity 3*		*Be Internet Legends – Be Internet Alert –* *Check It's For Real – Activity 1 and 2*		*Be Internet Legends – Be Internet Kind – Respect Each Other 9-11*
Unit Focus	**Grouping Data**	**Branching Databases** (IT) 3	**Statistics** **Pictograms** (IT, DL) 2	**Flat File Databases** (CS,IT) 5	**Data Logging** (CS, IT) 4	**Introduction to Spreadsheets** (IT)
Online safety Focus	*Using Computers Safely* *DigiDuck's Big Decision*	*Be Internet Legends – Be Internet Sharp – Think Before You Share -Activity 5 and 4*		*Be Internet Legends – Be Internet Sharp – Think Before You Share – AGE 9-11 plans*		*Be Internet Legends – Be Internet Kind – Respect Each Other 9-11*
Uni Focus	**Creating Media** **Digital Writing** (IT)	**Desktop Publishing** (IT) (DL) 3	**Digital Music** [CS] 2	**Vector Drawing** (IT) 5	**Photo Editing** (CS,IT,DL) 4	**3D Modelling** (IT, DL)
Online safety Focus	*Using Computers Safely* *Hanni and The Magic Window*	*Be Internet Legends – Be Internet Kind –* *Respect Each Other – Activity 1 and 2*		*Be Internet Legends – Be Internet Secure –* *Protect Your Stuff – Age 9-11 Plans*		*Be Internet Legends- Internet Brave – When in Doubt,*
Unit Focus	**Programming B** **Programming Animations** [CS]	**Programming B** Quizzes (CS) 2	**Programming B** **Events and Actions in Programs** (CS) (IT) 3	**Programming B** **Repetition In Games** (CS, IT) 4	**Programming B** **Selections in Quizzes** **(CL,IT) 5**	**Programming B** **Sensing** **(CS,IT,DL)**
Online safety Focus	*Using Computers Safely* *Hanni and The Magic Window*	*Be Internet Legends – Be Internet Kind –* *Respect Each Other – Activity 4 and 5*		*Be Internet Legends- Be Internet Brave – When in Doubt,* *Discuss – AGE 9-11 plans*		*Be Internet Legends- Internet Brave – When in Doubt*

Primary Computing Progression Map

Computer Science [CS] LANDING POINTS The expectation for knowledge and skills development at end of Year.						
Vertical Links Themes or concepts woven within fabric of subject. They define subject and are revisited across the Year Groups	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Algorithms and Programming	Understand algorithms as sequences of instructions and create a simple algorithm using everyday language or symbols (e.g. instructions for a Lego model). Understand that programs work by following algorithms and create a simple program using algorithms on a digital device (e.g. plan steps to control a Bee Bot).	Understand algorithms as sequences of instructions or sets of rules and create a simple algorithm using everyday language or symbols (e.g. how to share sweets). Create an on-screen program using algorithms (e.g. Scratch). Debug simple errors in own code.	Create a simple program using a block language, without user interaction (e.g. create a simple animation in Scratch with a sprite, dialogue and background) Use sequences of commands or blocks in on-screen programming, producing an output on the screen (e.g. a simple animation in Scratch).	Create a program using a block language, with simple user interaction (e.g. create a simple game involving use of backgrounds, props, sprites, costumes, sound). Use sequences & repetition [e.g. repeat… until…] of commands or blocks in on-screen programming, inc keyboard inputs & on-screen outputs (e.g. write a game using Scratch with repeated commands)	Independently create, test & debug complex programs using a block language (e.g. create, test & debug a Scratch animation with multiple scenes, background, sprites, dialogue, music & costume). Use sequences, selection [e.g. if…then…] and repetition [e.g. repeat… until…] of commands or blocks in on-screen programming, including both keyboard/mouse inputs, and on- screen outputs.	Independently create, test and debug a program using a second programming language (e.g. create, test and debug a Smartphone app) Use sequences, selection [e.g. if…then…], variables & repetition [e.g. repeat… until…] of commands/blocks in on-screen programming, including other types of input/output (e.g. create a Smartphone app). Develop, create & debug computer control applications (e.g. develop use of Lego We Do).
Logical Reasoning	Explain what they think a simple program will do.	Give a logical explanation for predicting the behaviour of programs.	Explain a sequence algorithm in own words. This could be graphical (e.g. explain the reasoning for a Scratch animation). Use logical reasoning to begin to detect errors in their own or others' programs, giving reasons.	Explain an algorithm using sequence and repetition, in their own words (e.g. explain the algorithm for their Scratch game). Use logical reasoning to detect and fix errors in their own or others' programs, giving reasons. Test the program to ensure they are fixed.	Explain a rule-based algorithm game in their own words (e.g. explain the rules for Scratch animation). Use logical reasoning to detect and fix errors in rules-based or sequenced algorithms, giving reasons (e.g. spot and correct errors in the rules of their game).	Give clear & precise logical explanations of algorithms (e.g. explain event-driven algorithms in app). Use logical reasoning to detect and fix errors in rules-based or sequenced algorithms, giving reasons (e.g. spot and correct errors in the rules of their game).
Networks			Understand the basic concept of a network. Understand more about the world wide web, including URLs. Understand that email (using servers) is made possible through the internet.		Understand and explain how data packets are routed on the internet. Understand the basics of a Local Area Network (LAN) and a Wider Area Network (WAN), and that information is sent via the internet using data packets	

Primary Computing Progression Map

	Information Technology [IT]					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Using and Creating	Use digital technology to store and retrieve content (e.g. store and access saved work on laptops and tablets) Create original content using digital technology (e.g. filming digital video, creating a greetings cards).	Store, organise and retrieve content on digital devices for a given purpose, naming my files meaningfully. Create and edit original content thinking about the audience, using digital technology (e.g. take and edit a digital photo/video, create and edit a presentation, create and edit a word document).	Use a range of computer software (e.g. video editing, presentation, spreadsheets). Design and create content on a computer (e.g. take photos and use in a Comic Strip). Collect and present information (e.g. Create an online poll at present the information in Powerpoint.)	Use and combine a variety of software on a computer (e.g. analyse data in a spreadsheet and present using presentation software). Design and create content on a computer (e.g. plan, shoot and edit a video, plan and create a presentation) Collect and present data, including numerical data (e.g. collect weather data and create charts in Excel).	Use and combine a variety of software on multiple devices. Design and create programs on a computer in response to a given goal (e.g. design and write a simple computer program in a block-based language such as Scratch). Analyse and evaluate information from text, audio, images or video, including analysing the quality of information (e.g. evidence of bias or assumptions).	Use and combine a variety of software on multiple devices. Design and create systems in response to a given goal, with multiple, interrelated components (e.g. develop an App, considering input, output and connectivity, the operating system, algorithms, code and user interface Use spreadsheet formulae to calculate and present numerical data (e.g. design a maths quiz in Excel)
Searching			Search for information within a single site, using browser-specific tools (e.g. 'find,, 'back') & site-specific tools (e.g. 'search', 'autocomplete'). Understand that search engines select pages according to index of keywords found in the content, and that they rank pages according to relevance.		Use a range of search engines appropriate to finding information that is required. Understand that search engines can employ in-depth filters such as usage rights.	

Primary Computing Progression Map

	Digital Literacy [DL]					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Self-image and identity	Recognise that there may be people online who could make them feel sad, embarrassed or upset. Give examples of when and how to speak to a trusted adult.	Explain and describe how other people's identity online can be different to their identity in real life. Give examples of issues online that might make them feel sad, worried, uncomfortable or frightened; give examples of how they might get help.	Understand 'identity' and explain they can represent themselves online in different ways; explain ways in which and why they might change their identity depending on what they are doing online (e.g. gaming; using an avatar; social media).	Explain how their online identify can be different to the identity they present in 'real life'; knowing this, describe the right decisions about how to interact with others and how others perceive them.	Explain how identity online can be copied, modified or altered.	Describe ways that media can shape ideas about gender. Identify messages about gender roles and make judgements based on them. Describe issues online that might make them or others feel sad, worried, uncomfortable or frightened and give examples of how they might get help, both on and offline. Explain why they should keep asking until they get the help I need.
Online relationships	Use the internet with adult support to communicate with people they know. Explain why it is important to be considerate and kind to people online.	Use and exemplify ways that the internet can be used to communicate with people they don't know well (e.g. email a penpal in another school/ country).	Describe ways people who have similar likes and interests can get together online. Give examples of technology-specific forms of communication (e.g. emojis, acronyms, text speak). Explain why they should be careful who they trust online and what information they give, and explain some risks communicating online with others they don't know well. Explain what it means to 'know someone' online and why this might be different from knowing someone in real life. Explain what is meant by 'trusting someone online' and explain why this is different from 'liking someone online'.	Describe strategies for safe and fun experiences in a range of online social environments. Give examples of how to be respectful to others online.	Explain that there are some people they communicate with online who may want to do them or their friends harm, and recognise that this is not their fault. Make positive contributions and be part of online communities.	Understand their responsibilities for the well-being of others in their online social group. Demonstrate how they would support others (including those who are having difficulties) online. Demonstrate ways of reporting problems online for both them and their friends.

Online reputation	Recognise that information can stay online and could be copied. Describe what information they should not put online without asking a trusted adult first.	Explain how information put online can last a long time. Know who to talk to if they think someone has made a mistake about putting something online.	Able to search for information about themselves online. Recognise they need to be careful before putting information and themselves of others online. Know who to ask if they are not sure if they should put something online.	Describe how others can find out information about them by looking online. Explain ways that some of the information about them online could have been created, copied or shared by others.	Search for information about an individual online and create a summary report of the information I find. Describe ways that information about people online can be used by others to make judgments about an individual.	Explain how they are developing an online reputation which will allow other people to form an opinion of them. Describe some simple ways that help build a positive online reputation.

Primary Computing Progression Map

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Online bullying	Describe how to behave online in ways that do not upset others and give examples.	Give examples of bullying behaviour online, understand how it can make people feel and talk about how someone could get help online or offline.	Explain what bullying is and can describe how people may bully others. Describe rules about how to behave online and how they follow them.	Identify some online technologies where bullying might take place and describe ways people can be bullied through a range of media (e.g. image, video, text, chat). Explain why they need to think carefully about how content they post might affect others, their feelings and how it may affect how others feel about them (their reputation).	Recognise when someone is upset, hurt or angry online. Describe how to get help for someone that is being bullied online and assess when they need to do or say something or tell someone. Explain how to block abusive users. Explain how they would report online bullying on the apps and platforms they use. Describe the helpline services who can support them and what they would say and do if they needed their help (e.g. Childline).	Describe how to capture bullying content as evidence (e.g. screen- grab, URL, profile) to share with others who can help me. Identify a range of ways to report concerns both in school and at home about online bullying.
Managing online information	Describe and demonstrate how to get help from a trusted adult or helpline if they find content that makes them feel sad, uncomfortable worried or frightened.	Explain the difference between things that are imaginary, 'made up' or 'make believe' and things that are 'true' or 'real', and explain why some information they find online may not be true.	Explain the difference between a 'belief', an 'opinion' and a 'fact'.	Differentiate between opinions, beliefs and facts, and know what criteria have to be met for something to be fact. Describe and recognise some of the methods used to encourage people to buy things online (e.g. advertising offers; in-app purchases, pop-ups). Explain that some people met online may be computer programmes pretending to be real people. Explain why lots of people sharing the same opinions or beliefs online does not make those opinions or beliefs true.	Evaluate digital content and explain how they make choices from search results. Explain key concepts including: data, information, fact, opinion belief, true, false, valid, reliable and evidence. Understand the difference between online mis-information (inaccurate information distributed by accident) and dis-information (inaccurate information deliberately distributed and intended to mislead). Explain what is meant by 'being sceptical' and understand why it is important to be 'sceptical'. Explain what is meant by a 'hoax' and explain why it is important to think carefully before forwarding anything. Explain why information that is on a large number of sites	Demonstrate strategies for being discerning in evaluating digital content. Describe how some online information can be opinion and can offer examples. Explain how and why some people may present 'opinions' as 'facts'. Define the terms 'influence', 'manipulation' and 'persuasion' and explain how these can be encountered online (e.g. advertising and 'ad targeting'). Demonstrate strategies to analyse and evaluate the validity of 'facts' and explain why using these strategies are important. Identify, flag and report inappropriate content.

					may still be inaccurate or untrue.	

Primary Computing Progression Map

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Health, well-being and lifestyle	Describe and explain rules to keep them safe when using technology both in and beyond the home.	Describe and explain rules to keep them safe when using technology both in and beyond the home, and say how these rules guide them	Explain why spending too much time using technology can sometimes have a negative impact on themselves, and give some examples of activities where it is easy to spend a lot of time engaged (e.g. games, films, videos).	Explain how using technology can distract from other things that should or need to be done. Identify times and situations when technology use may need to be limited, and suggest strategies for doing this.	Describe ways technology can affect healthy sleep and describe advice to promote healthy sleep accordingly.	Describe common systems that regulate age-related content (e.g. PEGI, BBFC, parental warnings) and describe their purpose. Assess and action different strategies to limit the impact of technology on health (e.g. nightshift mode, regular breaks, correct posture, sleep, diet and exercise). Explain the importance of self-regulating use of technology and demonstrate strategies do this (e.g. monitoring time online, avoiding accidents).
Privacy and security	Recognise examples of personal information (e.g. name, date of birth, family's names, school). Explain why they should always ask a trusted adult before sharing any personal information online and explain how passwords can be used to protect information and devices.	Describe how online personal information could be seen by others. Describe and explain some rules for keeping information private. Explain what passwords are and use passwords for accounts and devices.	Explain why they should only share information with people they choose to and can trust, and explain that if not sure or feeling pressured, a trusted adult should be asked.	Explain what a strong password is. Explain that others online can pretend to be them or other people, including friends, and suggest reasons why they might do this.	Create, use and secure passwords. Explain how many free apps or services may read and share private information (e.g. friends, contacts, likes, images, videos, voice, messages, geolocation) with others. Explain how and why some apps may request or take payment for additional content (e.g. in-app purchases) and explain why they should seek permission from a trusted adult before purchasing.	Use different passwords for a range of online services, and describe effective strategies for managing those passwords (e.g. password managers, acronyms, stories). Explain what app permissions are and give some examples from the technology or services they use. Describe simple ways to increase privacy on apps and services that provide privacy settings. Describe ways in which some online content targets people to gain money or information illegally and describe strategies to help identify such content (e.g. scams, phishing).
Copyright and ownership	Explain why work they create belongs to them and save it so that others know it belongs to them.	Describe why other's work belongs to them, and recognise that content on the internet may belong to other people.	Explain why copying someone else's work from the internet without permission can cause problems, and give examples of these problems.	Explain why they need to consider who owns content that is searched for, whether they have the right to use it, and give examples.	Assess and justify when its acceptable to use the work of others, and give examples of content where it is permitted to be re-used.	Demonstrate the use of search tools to find and access online content which can be reused by others, and demonstrate how to make references to and acknowledge sources they have used from the internet.

Communication and Collaboration	Show an awareness of how IT is used for communication beyond school (e.g. email, video calls, greetings cards).	Show an awareness of how IT is used for a range of purposes beyond school (e.g. editing and sharing digital photos, collecting and analysing data, communicating using email) and start to consider their advantages and disadvantages.	Use email, videoconferencing and/or class blogs.	Work collaboratively with classmates on a shared project such as a class Wiki.	Work collaboratively with classmates on a class website or blog.	Use online tools to plan and carry out a collaborative project (e.g. plan App development project using online tools)

Primary Computing Progression Map

Subject Knowledge and Terminology Required for Understanding National Curriculum Statements

Key Stage 1 Computer Science [CS]

Understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions.: An *algorithm* is a precisely defined procedure – a sequence of instructions for performing a specific task. *Computer programs*, like *algorithms*, are comprised of sets of rules or instructions, but they differ in that they need to be written in a precise language a computer can 'understand'. A computer's central processor understands a very limited set of simple instructions written in *machine code*. Very few programmers work at this level, so computer scientists have developed *programming languages*, which sit somewhere between the ideas in the algorithm and the computer's machine code. There are many different programming languages, each having their own vocabulary, grammar and features that make them good for particular tasks. The current favourites in primary schools are *Scratch, Logo and Kodu.*

Create and debug simple programs: The best way for pupils to learn what an algorithm is, and how it can be implemented as a program, is to write some programs. Programming involves taking an idea for doing something and turning it into instructions the computer can understand. In the infant classroom this could be writing a set of commands for a Bee-Bot, ProBot or Roamer, or snapping on-screen program building blocks together in Scratch. When you write a program you need to have a clear idea of what it will do and how it should do it. This is where algorithms come in, and thinking algorithmically is an integral part of the craft of programming. Most programs don't work as they should first time round; professional programmers have this experience all the time! One of the most rewarding aspects of programming is finding and fixing these mistakes. Mistakes in programs are called *'bugs',* and finding and fixing them is *'debugging'.* The process of debugging often involves identifying that there is a fault, working out which bit of the program (or underlying algorithm) has caused the problem, and then thinking logically about how to fix it. In the classroom, this can provide a great opportunity for collaborative work. As a teacher, you should identify clear steps that pupils can follow so that they can fix their code. These might involve identifying what the fault is, finding out which part of the code is creating the problem, and then working towards a fix.

Use logical reasoning to predict the behaviour of simple programs: Computers are deterministic machines. We can predict exactly how they'll behave through repeated experience or by developing an internal model of how a piece of software works. Stepping through the program can give a clear sense of what it does, and how it does it, giving a feel for the algorithm that's been implemented. In the classroom, getting one pupil to role-play a floor turtle or screen sprite while another steps through the program can give a far more immediate sense of what's going on. When working with a computer, encourage pupils to make a prediction about what the program will do before they press return or click the button, and to explain their prediction logically; this is part of computer science. *Logical reasoning* also implies that pupils are following a set of rules when making predictions.

Key Stage 1 Information Technology [IT]

Use technology purposefully to create, organise, store, manipulate and retrieve digital content: *Creating digital content* has many practical possibilities. These include commonplace tasks such as word-processing, creating pictures using paint packages, working with digital photographs and video, writing computer programs, and creating online content such as blog posts, forum contributions, wiki entries and social network updates. This creative work is digitised (i.e. converted to numbers) once it's on the computer. The sheer quantity of digital information makes the skill of *organising digital content* more important than ever. In more practical terms, we might think of how to bring together different digital media, how to order a series of paragraphs, how to organise the files in our documents directory, or how to tag photos and posts online. Knowing where a file is saved in the directory structure is important. It's vital to be able to distinguish between the hard disk (or solid state storage) inside the computer itself, the school's network server, USB disks or memory cards, and online storage via the internet. *Manipulating digital content* is likely to involve using one or more application programs, such as word-processors, presentation software, or image-, audio- or video-editing packages. The pupil makes changes to the digital content. The skill here is not just using the software tools, but also knowing how best to change the content for the audience and purpose, and to take into account principles of good design. *Retrieving digital content* could be seen as the reverse of storing: the skills of opening and saving documents are similar. Retrieving content requires you to know what you called the file, what file type it is, and where you stored it. Finding files can be time-consuming, especially when the filing system is not well organised. Computer filing systems have search features to make this easier, but are reliant on the user remembering enough about the file to be able to search.

Key Stage 1 Digital Literacy [DL]

Recognise common uses of information technology beyond school: Digital technology is a part of all our lives. A key stage 1 pupil might be woken by a digital alarm clock, have a bowl of microwaved porridge for breakfast, and then watch digital TV or play an iPad game. While they're at school, their attendance, progress and lunch are tracked through the management information system, they engage in activities on tablets, and research things on the web. The ingredients for the evening meal may have been ordered online, or a parent may have scanned them at the supermarket. There are many opportunities for pupils to consider the applications of algorithms, programs and systems.

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: This statement covers the key principles of pupils' online safety. Pupils should be aware of the main risks associated with the internet, and recognise that they should not share certain types of personal information online. Pupils should have an age-appropriate understanding of their responsibilities under the school's acceptable use policy.

Subject Knowledge and Terminology Required for Understanding National Curriculum Statements

Key Stage 2 Computer Science [CS]

Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts: The focus on algorithms at key stage 1 leads pupils into the design stage of programming at key stage 2. Algorithms are the necessary start of the process of creating working code, and identifying the steps needed to solve any problem is essential. Splitting problems into smaller parts is part of computational thinking. For example, designing a game in Scratch will involve thinking about algorithms, programming, drawing sprites and backgrounds, making animations, and even composing music or recording sound effects.

Computing Concepts - Use sequence, selection, and repetition in programs; work with variables and various forms of input and output:

- Sequence in this context is the step-by-step nature of computer programs, mirroring the sequence of steps the algorithm would list.
- *Selection* refers to instructions such as if ... then ... otherwise decisions in which the operation (what the program does) depends on whether or not certain conditions are met. For example, a quiz provides different feedback if the player answers the question correctly or incorrectly. It is helpful to refer pupils to selections (choices) they make in everyday life; for example, if it rains in the morning, then I will wear my anorak to school, otherwise I won't.
- *Repetition* is a programming structure such as a repeat ... until loop in which the computer runs part of the program a certain number of times or until a particular condition is met. In the case of the quiz, we might want to ask ten questions, or keep going until the player has scored five correct answers. Again, it is useful to refer pupils to loops or repetition in daily routines. For example, the traffic lights on a pelican crossing will stay green until someone presses the button to cross the road.
- *Variables* are used to keep track of the things that can change while a program is running. They are a bit like x or y in algebra, in that the values may not initially be known. Variables are not just used for numbers. They can also hold text, including whole sentences ('strings'), or the logical values 'true' or 'false'. For our quiz we would use variables to keep track of the player's score and the number of questions they attempt. Variables are like boxes, in that the computer can use them to store information that can be changed by the user, the program or by another variable.

We may think of input as keyboard and mouse (or touch screen), and output as the computer display, but pupils' experiences should be widened beyond this. Working with sound is straightforward, as laptops have built-in microphones and speakers. The latest version of Scratch provides support for using webcams. Digital cameras allow interesting work using image files. The reference in the programme of study to 'controlling physical systems' implies the use of sensors, motors and perhaps robotics. Midi instruments like an electronic keyboard, and devices such as Lego WeDo, MaKey MaKey and Microsoft Kinect provide yet further experience of working with various forms of input.

Use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs: Key stage 2 pupils should be able to explain the thinking behind their algorithms, talking through the steps and explaining why they've solved a problem the way they have. They also need to be able to look at a simple programming project and explain what's going on. This is made easier with languages like Scratch, Kodu and Logo, which feature an on-screen sprite or turtle. The immediate feedback helps pupils to understand and debug their programs. Pupils might also be expected to look at someone else's algorithm and explain how it does what it does.

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: This is a challenge because most of us have not thought about how these ever-present technologies do what they do. *Computer networks*, including the internet, are made up of computers connected together. The computers include fast, dedicated machines that pass on data that's not intended for them (called 'routers', 'gateways', 'hubs' or 'switches', depending on particular roles), and 'servers' (always-on machines looking after emails, web pages and files that other computers might ask for from time to time). The connections between the computers in a network may consist of radio or satellite signals, copper wires or fibre-optic cables. Information stored on computers and information travelling over networks must be digitised (i.e. represented as numerical data). The computer network in your school and the internet use the same method or 'protocol' to send and receive this data. The data is broken up into small 'packets', each with identifying information, which includes the IP (internet protocol) address of the sender and recipient. These packets of information make their way across the internet from source to recipient. At the far end, the packets get stitched back together in the right order and the email is delivered, the website is accessed, or the Skype call gets connected. Many of these packets, travelling at near light-speed, are generated by web servers returning web pages to the browser requesting them. By connecting people around the world and passing on packets of data from sender to recipient, the internet has created many opportunities. These range from communication (such as email, video conferencing, blogs, forums, social networks) and collaboration, such as wikis (including Wikipedia), to real-time collaborative editing, Creative Commons media (permission to share and use creative work with conditions stated by the creator) and open-source software, which is available for us to use and change.

Subject Knowledge and Terminology Required for Understanding National Curriculum Statements

Key Stage 2 Information Technology [IT]

Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content: Using search technologies involves aspects of computer science, information technology and digital literacy. Effective use of search engines gets the results you want. It relies on specifying the right keyword, skimming and scanning the results to see which seems most relevant, and distinguishing between the main results and adverts presented as sponsored results. It may also involve using other features of the search engine, including searching for phrases rather than keywords, or limiting searches to a particular time frame, language, reading level or website. Search engines take many factors into account. At the heart of Google's algorithms8 is 'PageRank', which determines the quality and rank of a page based on the quality of the pages that link to it. Their quality is, in turn, determined by the quality of the pages that link to them, and so on. Just because a page has a high rank in Google or another search engine for a particular query, it doesn't mean that the content is true, age appropriate or relevant to a particular project. Pupils need to develop skills in evaluating digital content, including how trustworthy the information is (perhaps by verifying it with another independent source), whether it's something that the audience for a project would be able to grasp, and why the content was posted in the first place (e.g. to give a balanced overview, or simply to advance one side of an argument).

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: This is something of a catch-all requirement, bringing together various aspects of the computing curriculum. Pupils might typically be expected to demonstrate progression by: using software under the control of the teacher; moving onto using software with increasing independence; then, combining software (e.g. importing an edited image or video into a presentation or web page); and then, selecting software themselves (perhaps from the full range of applications installed on computers, smartphones and tablets at home or at school, or available to them via the web). Internet services might include, for example, learning platforms, school, class or individual blogs, and cloud-based tools such as Google Drive, Office 365 or image-editing sites.
The reference to 'a range of digital devices' encompasses using both fixed and mobile technologies. It also includes running software (such as that described in the previous paragraph) on web servers via the internet. There is also recognition that design and creativity in computing encompass many forms, from the content familiar to many from the old ICT programme of study, the programming as required by earlier statements in the new programme of study, to more complex, system-level ideas, combining software and hardware to achieve a well-defined goal with a particular audience in mind. At key stage 2 it might be more helpful to think of *data* as numbers and *information* as richer media such as text, images, audio, and video or 3D representations. However, it is worth remembering that both data and information are digitised by computers (i.e. stored in the form of numbers). Collecting, analysing, evaluating and presenting data is an important application of computers. Pupils should gain experience of working with data they have generated or collected for themselves, as well as big, public datasets.

Key Sage 2 Digital Literacy [DL]

Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact: Safe and responsible use of technology at key stage 2 builds on skills learned in key stage 1. As well as requiring pupils to keep themselves safe and to treat others with respect, the programme of study at key stage 2 introduces an emphasis on responsible use of technology. Pupils need to consider how their online actions impact other people. They need to be aware of their legal and ethical responsibilities, such as showing respect for intellectual property rights (e.g. musical, literary and artistic works), keeping passwords and personal data secure, and observing the terms and conditions for web services they use (such as the 13+ age restriction on Facebook). Pupils should also develop some awareness of their *digital footprint*: the data automatically generated when they use the internet and other communication services, and how this is, or could be, used. Pupils should be aware of, and abide by, the school's acceptable use policy, as well as the requirements of any other services they use. Encourage pupils to think twice, and to check terms and conditions, before signing up for internet-based services.