Digital Learning Cornwall

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Helping busy schools make informed EdTech choices

Implementation;
Knowledge & Skills curriculum overview
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Implementation Overview

Our fully adaptable, collated Computing curriculum is broad but balanced; ambitious, yet understands the needs of a busy classroom and full teaching week. Materials are made available through the DLCornwall site in a way that provides a simple and accessible route through for teachers. Our **READ FIRST** one-page documents 'cut to the chase' for busy teachers, explaining how to interpret the materials to provide inspiring yet accessible sessions. Schools need to make the most suitable, practical choices, using the hardware and software at their disposal - you will notice within the Easy Access documents that we often suggest alternative options for simpler access and better experiences for both teachers and children.

We suggest that cross-curicular teaching, when possible and appropriate, is vital for bringing subjects to life; for making links to real world practice; for inspiring children; and for making such a busy and full curriculum possible. It is vital that teachers take ownership of the materials to direct progression themselves; that they pick, choose and adapt teaching elements and sequences to work best for individual classes of children and the timetabling restraints that exist. Audio-themed lessons may fit into music, animation can work alongside another's subject theme or topic; written or graphics work can fulfil the needs of another subject.

Furthermore, we know that flexibility in when and how to deliver lessons is key to success within a teacher's exact school and class circumstances. For particular units of work, it may be better to block out afternoons to devote to Computing, or thinking in cross-curricular terms it may be better for the subject to filter across different subject areas. While we do everything we can to strip away the complexity that has thwarted teachers in the past with this subject, Computing can involve equipment and preparation time – being well-prepared for sessions needn't take a lot of time, and may result in much smoother sessions.

Key teaching principles to provide variety and breadth of experience

It's important to recognise that Computing is a vastly broad subject, and different areas of learning will be enhanced by employing different pedagogical approaches. Variety is the key to keeping this subject alive and interesting - while presentations and 'teacher talk' can have their place, Computing has the potential to be one of the most explorative, creative and interesting subject areas that children will encounter at school. Computing is a chance for children to thrive within very hands-on creative tools, and learning that relates directly to the modern world.

Keeping a Computing Journal

As referred to in the guidance on Impact, allocating an area of a class book to written, design and/or sketch Computing work can be beneficial to children's learning process. There is great variety in this area, from storyboards to flow diagrams to printed eBooks, yet it all allows for a fuller picture of Computing's influence in the classroom to be built.

PRIMM

PRIMM was established by an educational researcher, Sue Sentance, in 2017. It stands for **Predict-Run-Investigate-Modify-Check**, and provides a structured process for teachers and children exploring and learning how code works. The different aspects of PRIMM can be really useful for teachers to have in the mind as they deliver Computer Science lessons to classes of children.

The approach runs in stark contrast to a linear, step-by-step process of building code – with PRIMM, children are given finished code to look at initially; to discuss, explain and **Predict** how it will work. It allows children access to code quickly, and promotes understanding rather than simply following step by step instructions. After **Predict**, which could take place as a whole class discussion, the code is **Run** – so that children can see if their predictions were correct. Naturally there is some excitement in children finding out if their predictions are correct. This can then lead to

Investigate: children look at code in further detail to work out how different parts of it work. When children start to carefully **Modify** the code, they further understand how different aspects of it work, and children might take things further with Make: using modified code for their own purposes.

At primary level, it's important to understand that any parts of the process of PRIMM can be taken out and used by themselves quite effectively. There is nothing to stop parts of the process being completed in whole-class discussion, or as quick extra activities to bring children back up to speed and recap on previously learnt coding knowledge.

Unplugged

We believe that there are many advantages to pursuing 'unplugged' activities as much as possible, particularly within the early years and KS1 – where classrooms often act as a well-needed sanctuary away from the bombardment of screen-based activities elsewhere in children's lives. Unplugged activities carry inherent advantages in terms of teacher's perceptions, resource reliability, and practicalities in a classroom. When understanding networks or how computers have infiltrated modern life, so much can be gained away from screens themselves, with discussion, pencil/paper work and design becoming key parts of focused learning. Fun, kinaesthetic activities such as, for example, the use of coloured floor tiles with young children, allow children to explore direction as they build algorithms and improve special awareness.

Stories and Discussion

Computing can be brought to life, especially for the youngest children, through stories around internet safety and discussing the usage of technology in everyday life. All children of primary age are keen to discuss the technology they have experienced both inside and outside of school. Such discussions can further knowledge and understanding, and set the scene for the relevance of further learning.

Embedding in Creative Processes and Business links

Children thrive when online, digital tools are embedded into creative projects, and/or the design of products and services that relate heavily to real world opportunities, such as business plans and technology-infused ventures. Giving Computing grounding in action outside All areas of the country have tech and businesses communities that are often keen to forge links with schools to promote relevant knowledge and skills.

Linking to Maths

Whether its directional motion, programming the creation of shapes, or following logical processes, computer science and information technology often make significant links with maths learning. Data focused learning around pictograms, databases or spreadsheets also provide scope to work in a cross-curricular fashion with maths learning.

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	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Computer Science: **Programming Concepts and Controlling Hardware**	**Computational thinking** Children explore a range of computational thinking, featuring lots of non-screen, practical activities. Key concepts that such activities relate to include: logic, debugging, algorithms, repetition, modifying and commands.	**Programming Concepts: Introduction to Animation** Children are introduced to on-screen programming. Children explore the way a project looks by investigating sprites and backgrounds. They use programming blocks to use, modify, and create programs. Children will also be introduced to the early stages of program design through the introduction of algorithms. **Hardware: Moving a Robot** Children are introduced to early programming concepts. Children explore using individual commands, both with other children and as part of a computer program. They will identify what each floor robot command does and use that knowledge to start predicting the outcome of programs. Time is spent on a broad range of programming aspects, and builds knowledge in a structured manner. Children are also	**Programming Concepts: Scratch Jr** Children take on-screen programming further. Children continue to use programming blocks to use, modify, and create programs. Children create algorithms or multiple algorithms. They practise predicting the behaviour of simple programs. They practise debugging (finding and fixing problems) within programs they have created. **Controlling Hardware: Robot Algorithms** Pupils develop their understanding of instructions in sequences and the use of logical reasoning to predict outcomes. Pupils use given commands in different orders to investigate how order can affect outcome. They will design algorithms and then test those algorithms	**Programming Concepts: Sequence in Music** Children explore the concept of sequencing in programming. Children are introduced to a programming environment, which will be new to most children. They will be introduced to a selection of motion, sound, and event blocks which they will use to create their own programs, featuring sequences. Children will explore all aspects of sequences, building knowledge incrementally.	**Programming Concepts: Repetition with shapes** Children will create programs by planning, modifying, and testing commands to create shapes and patterns. Children will use a text-based programming language. *Alternative with Hardware:* **Sphero Programmable Hardware** Children programme Sphero programmable hardware. Children will create programs by planning, modifying, and testing commands to create shapes and patterns. Children will use block-based coding.	**Programming Concepts: Selection in Quizzes** Pupils develop their knowledge of 'selection' by revisiting how 'conditions' can be used in programming, and then learning how the 'if… then… else...' structure can be used to select different outcomes depending on whether a condition is 'true' or 'false'. They represent this understanding in algorithms, and then by constructing programs using an on-screen programming environment. They learn how to write programs that ask questions and use selection to control the outcomes based on the answers given. They use this knowledge to design a quiz in response to a given task and implement it as a program. To conclude the unit, children evaluate their program by identifying how it meets the requirements of the task, the ways they have improved it, and further ways it could be improved.	**Programming Concepts: Variables in games** Children explore the concept of variables in programming. First, pupils will learn what variables are, and relate them to real-world examples of values that can be set and changed. Children will then use variables to create a simulation of a scoreboard. With the *Use-Modify-Create* model, children will experiment with variables in an existing project, then modify them. They will create their own project and apply their knowledge of variables and design to improve a created game.

		introduced to the early stages of program design through the introduction of algorithms.	as programs and debug them.	**Programming Concepts: Events and Actions** Children explore the links between events and actions, while consolidating prior learning relating to sequencing. Children begin by moving a sprite in four directions (up, down, left, and right). They then explore movement within the context of a maze, using design to choose an appropriately sized sprite. Children design and code their own maze-tracing program. *Alternative with Hardware:* **Sphero first Use** Children programme Sphero programmable hardware. Children will explore directional movement of the Sphero devices, using drawn programming before moving to block-based work.	**Programming Concepts: Repetition with games** Children will continue to explore the concept of repetition in programming using an on-screen coding environment. Children will compare and contrast this coding environment with the one they explored previously, noting similarities and differences between the two environments. Children look at the difference between count-controlled and infinite loops, and use their knowledge to modify existing animations and games using repetition. Children will design and create a game which uses repetition, applying stages of programming design throughout.	**Controlling Hardware: First use Microbits** Children will use physical computing to explore programming concepts. Children will be introduced to a microcontroller (Microbit) and learn how to connect and program components (including output devices such as built-in LEDs). Children will be introduced to conditions as a means of controlling the flow of actions, and explore how these can be used in algorithms and programs through the use of input devices (physical switches / tilts). Children will make use of their knowledge of repetition and conditions when introduced to the concept of selection (through the 'if... then...' structure) and write algorithms and programs that utilise selection.	**Controlling Hardware: Sensing with Microbits** Children will bring together elements of all the four programming constructs: sequence from Year 3, repetition from Year 4, selection from Year 5, and variables (introduced in Year 6). Children will have the opportunity to use all of these constructs in a different but still familiar environment, while also utilising a physical device — the micro:bit. Children begin with a simple program for children to build in and test in the programming environment, before transferring it to their micro:bit. Children take on increasingly difficult projects as their skills heighten and progress.

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Information Technology: Knowledge & Understanding	Children explore a range of mostly non-screen based activities that relate to: devices, word recognition and data.	**IT Around us: Technology Around Us** Children develop their understanding of technology and how it can help us. They will start to become familiar with the different components of a computer by developing their keyboard and mouse skills. Children will also consider how to use technology responsibly. **Data & information: Grouping Data** Pupils are introduced to labelling, grouping and searching - important aspects of data and information. Pupils will begin by using labels to put objects into groups, and labelling these groups. They will demonstrate that they	**IT Around us: Computer Systems & Networks** Children will look at information technology at school and beyond, in settings such as shops, hospitals, and libraries. Children will investigate how information technology improves our world, and they will learn about using information technology responsibly. **Data & information: Pictograms** Children will begin to understand what the term data means and how data can be collected in the form of a tally chart. They will learn the term	**IT Around Us: Connecting Computers** Children develop their understanding of digital devices, considering inputs, processes, and outputs. Children compare digital and non-digital devices. Following this, children are introduced to computer networks, including devices that make up a network's infrastructure, such as wireless access points and switches. The unit concludes with children discovering the benefits of connecting devices to a network. **Data & Information: Branching Databases** Children develop their understanding of what	**IT Around Us: The Internet** Children will apply their knowledge and understanding of networks, to appreciate the internet as a network of networks which needs to be kept secure. They will learn that the World Wide Web is part of the internet, and be given opportunities to explore the World Wide Web for themselves to learn about who owns content and what they can access, add, and create. Finally they will evaluate online content to decide how honest, accurate, or reliable it is, and understand the consequences of false information.	**IT Around Us: Systems & Searching** Children develop their understanding of computer systems and how information is transferred between systems and devices. Children consider small-scale systems as well as large-scale systems. They explain the input, output, and process aspects of a variety of different real-world systems. Children discover how information is found on the World Wide Web, through learning how search engines work (including how they select and rank results) and what influences searching, and through comparing different search engines. **Data & Information: Flat-file Databases**	**IT Around Us: Communication & Collaboration** Children learn about the World Wide Web as a communication tool. First, they will learn how we find information on the World Wide Web, through learning how search engines work (including how they select and rank results) and what influences searching, and through comparing different search engines. They will then investigate different methods of communication, before focusing on internet-based communication. Finally, they will evaluate which methods of internet communication to use for particular purposes. **Data & Information: Spreadsheets** Children are introduced to the fundamental operations

		can count a small number of objects, before and after the objects are grouped. Pupils will begin to demonstrate their ability to sort objects into different groups, based on the properties they choose. Finally, pupils will use their ability to sort objects into different groups to answer questions about data.	'attribute' and use this to help them organise data. They will then progress onto presenting data in the form of pictograms and finally block diagrams. Children will use the data presented to answer questions.	a branching database is and how to create one. They will gain an understanding of what attributes are and how to use them to sort groups of objects by using yes/no questions. The children will create physical and on-screen branching databases. Finally, they will evaluate the effectiveness of branching databases and will decide what types of data should be presented as a branching database.	**Data & Information: Data Logging** Children will consider how and why data is collected over time. Children will consider the senses that humans use to experience the environment and how computers can use special input devices called sensors to monitor the environment. Children will collect data as well as access data captured over long periods of time. They will look at data points, data sets, and logging intervals. Children will spend time using a computer to review and analyse data. Towards the end of the unit, children will pose questions and then use data loggers to automatically collect the data needed to answer those questions.	Children look at how a flat-file database can be used to organise data in records. Children use tools within a database to order and answer questions about data. They create graphs and charts from their data to help solve problems. They use a real-life database to answer a question, and present their work to others.	of spreadsheets. They will be supported in organising data into columns and rows to create their own data set. Children will be taught the importance of formatting data to support calculations, while also being introduced to formulas and will begin to understand how they can be used to produce calculated data. Children will be taught how to apply formulas that include a range of cells, and apply formulas to multiple cells by duplicating them. Children will use spreadsheets to plan an event and answer questions. Finally, children will create graphs and charts, and evaluate their results in comparison to questions asked.

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Information Technology: Media & Sound	**Media & Sound Foundations** Children explore a range of mostly non-screen based activities that relate to: painting, pattern making, real / not real, sound making and music.	**Digital Design: Digital Painting** Children develop their understanding of a range of tools used for digital painting. They use these tools to create their own digital paintings, while gaining inspiration from a range of artists' work. Children consider their preferences when painting with and without the use of digital devices.	**Digital Design: Digital Photography** Children will learn to recognise that different devices can be used to capture photographs and will gain experience capturing, editing, and improving photos. Finally, they will use this knowledge to recognise that images they see may not be real.	**Digital Design: Animation** Children will use a range of techniques to plan and create stop-frame animations. Next, they will apply those skills to create a story-based animation. Children will add other types of media to their animation, such as music and text.	**Digital Design: Photo Manipulation** Children will develop their understanding of how digital images can be changed and edited, and how they can then be resaved and reused. They will consider the impact that editing images can have, and evaluate the effectiveness of their choices.	**Digital Design: Vector Graphics** Children will find out that vector images are made up of shapes. They will learn how to use the different drawing tools and how images are created in layers. They will explore the ways in which images can be grouped and duplicated to support them in creating more complex pieces of work.	**Digital Design: 3D Modelling** Children will develop their knowledge and understanding of using a computer to produce 3D models. Children will initially familiarise themselves with working in a 3D space, including combining 3D objects to make a house and examining the differences between working digitally with 2D and 3D graphics. Children will progress to making accurate 3D models of physical objects, such as a pencil holder, which include using 3D objects as placeholders. Finally, children will examine the need to group 3D objects, then go on to plan, develop, and evaluate their own 3D model.
		Digital Design: Digital Writing Children will develop their understanding of the various aspects of using a computer to create and manipulate text. Children will become familiar with using a keyboard and trackpad/mouse to enter and remove text. Children will also consider how to change the look of their text, and will be able to justify their reasoning in making these changes.	**Digital Sound: Making Music** Children will use a computer to create music. They will listen to a variety of pieces of music and consider how music can make them think and feel. Children will compare creating music digitally and non-digitally. Children will look at patterns and purposefully create music.	**Digital Design: Book Creator** Children will develop their understanding of the creation and manipulation of text. Children will increase their confidence and abilities with keyboard typing, including grammar and punctuation. Children will experiment with pictorial elements and design features. Children will have the opportunity to publish	**Digital Sound: Audio Editing** Children will examine devices capable of recording digital audio, which will include identifying the input device (microphone) and output devices (speaker or headphones) if available. Children will discuss the ownership of digital audio and the	**Digital Design: Video Editing** Children have the opportunity to learn how to create short videos in groups. As they progress, they will develop the skills and processes of capturing, editing, and manipulating video. Active learning is encouraged through guided questions and by working in small groups to investigate the use of devices and software.	**Digital Design: Web Page Creation** Children learn how to create websites for a chosen purpose. Children identify what makes a good web page and use this information to design and evaluate their own website. Throughout the process, children pay specific attention to copyright and fair use of media, the aesthetics of the site, and navigation paths.

				their work to the world wide web.	copyright implications of duplicating the work of others. In order to record audio themselves, children will use software to produce a podcast, which will include editing their work, adding multiple tracks, and opening and saving the audio files. Finally, children will evaluate their work and give feedback to their peers.	Children are guided to take their idea from conception to completion. The use of green screen may be incorporated into this sequence of learning, giving an opportunity for children to use cross-curricular knowledge and giving extra purpose to the main video project.	

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Digital Literacy	**Operational Core Skills** Children *use hand-eye coordination to operate devices such as touch-screens and touchpads*	**Operational Core Skills** Children will use websites and apps to aid their learning. Children are able to save and retrieve work they have produced. Children learn to move a cursor with the trackpad on a laptop,	**Operational Core Skills** Children will develop their understanding of creating and manipulate text further. Children will become familiar with using a keyboard to enter, edit and remove text. Children will also consider how to change the appearance of text, and will be able to justify their reasoning in making such changes. Children will consider the differences between using a computer to create text, and handwritten approaches. Children practise key skills such as two-finger scrolling, use of the shift key for capital letters, and deleting chosen parts of on-screen text.	**Operational Core Skills** Children use software to edit and improve written work from a cross-curricular subject. Children develop their use of the shift key, using numerous basic punctuation marks correctly within their on-screen writing. Children type to achieve a completed written piece that can be printed or published directly to the internet. Children use specific typing software to improve keyboard skills and awareness.	**Operational Core Skills** Children further improve their ability to type towards completed work, including more advanced punctuation marks and accuracy. Children use digital spell-check facilities to locate and correct spelling mistakes. Children will use multiple tabs within a web browser or move between different apps as part of a task.	**Operational Core Skills** Children will become confident and competent users of web-based programs and apps, combining numerous web-based programs and/or apps to accomplish goals. Children hone and improve their ability to type and improve on-screen written work, and continue to access typing practise software to develop this area. Children use digital thesaurus facilities to replace words and phrases with better choices.	**Operational Core Skills** Children will look critically at their written on-screen pieces, and re-order on-screen sentences for clarity, purpose or effect. They will be able to type at speed, with accurate spelling and a range of correctly incorporated punctuation. Children will use digital spelling checkers and thesaurus facilities with confidence.

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	Internet Safety Children explore internet safety concepts at an appropriate level through retelling of stories and discussion. Children explore safe use of technology along with other physical items within their settings,	**Internet Safety** Children give examples of when and how to speak to an adult when they need to. Children recognise some ways in which the internet can be used to communicate. Children describe what information I should not put online without asking a trusted adult first. Children describe how to behave online in ways that do not upset others Children identify devices they could use to access information on the internet. Children explain rules to keep us safe when we are using technology both in and beyond the home. Children identify some simple examples of personal information (e.g. name, address, birthday, age, location). Children name their work so that others know it belongs to them.	**Internet Safety** Children describe ways in which people might make themselves look different online. Children explain some risks of communicating online with others they don't know well. Children explain how information put online about them can last for a long time. Children describe how to behave online in ways that do not upset others. Children demonstrate how to navigate a simple webpage to get to information they need (e.g. home, forward, back buttons; links, tabs and sections). Children create rules for using technology safely Children explain why they should always ask a trusted adult before they share information about themselves online. Children recognise that content on the internet may belong to other people.	**Internet Safety** Children describe ways in which media can shape ideas about gender. Children explain how their own and other people's feelings can be hurt by what is said or written online. Children know who they should ask if they are not sure if they should put something online. Children describe rules about how to behave online and how to follow them. Children evaluate digital content and can explain how to make choices from search results. Children identify situations where they might need to limit the amount of time they use technology. Children describe simple strategies for creating and keeping passwords private. Children explain why copying someone else's work from the internet without permission can cause problems.	**Internet Safety** Children explain how their online identity can be different to the identity they present in 'real life'. Children explain what it means to 'know someone' online and why this might be different from knowing someone in real life. Children describe how they can find out information about someone by looking online. Children 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). Children analyse information and differentiate between 'opinions', 'beliefs' and 'facts'. Children understand what criteria have to be met before something is a 'fact. Children describe ways technology can affect healthy sleep and can describe some of the issues. Children explain how internet use can be monitored. Children assess and justify when it is acceptable to use the work of others.	**Internet Safety** Children explain how identity online can be copied, modified or altered. Children explain how impulsive and rash communications online may cause problems. Children describe ways that information about people online can be used by others to make judgments about an individual.) Children explain how they would report online bullying on the apps and platforms that they use. Children explain why lots of people sharing the same opinions or beliefs online does not make those opinions or beliefs true. Children describe common systems that regulate age-related content (e.g. PEGI, BBFC, parental warnings) and describe their purpose. Children explain how lots of free apps or services may read and share private information (e.g. friends, contacts, likes, images, videos, voice, messages, geolocation) with others. Children demonstrate the use of search tools to find and access online content which can be reused by others.	**Internet Safety** Children explain how they can represent themselves in different ways online. Children demonstrate how they would support others (including those who are having difficulties) online. Children describe some simple ways that help build a positive online reputation. Children identify a range of ways to report concerns both in school and at home about online bullying. Children demonstrate strategies to enable them to analyse and evaluate the validity of 'facts. Children explain why using these strategies are important. Children assess and action different strategies to limit the impact of technology on their health (e.g. nightshift mode, regular breaks, correct posture, sleep, diet and exercise). Children describe ways in which some online content targets people to gain money or information illegally; children describe strategies to help them identify such content (e.g. scams, phishing). Children demonstrate how to make references to and acknowledge sources they have used from the internet.