Computing
INTENT - to what do we aspire for our children?

A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science, and design and technology, and provides insights into both natural and artificial systems. The core of computing is computer science, in which pupils are taught the principles of information and computation, how digital systems work, and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computing also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

Source: National Curriculum (updated Jan 21)

At HPPS computing develops the school's 4 key drivers in the following ways:

Excellence

- Proud of their learning in computing
- Able to articulate their successes and learning journey; showcase their ideas and creativity

Equity

We believe that all children regardless of need will engage in a curriculum that will enable them to become competent and responsible users of technology;

- Spiral curriculum with key knowledge made explicit and building complexity over time
- Explicit scaffolding of oracy
- Knowledge organisers used to reduce split attention effect
- Explicit teaching of tier 2 and subject specific vocabulary
- Make reasonable adaptations to computing lessons and resources

Character

- Respectful use of resources and equipment
- Be aware of online safety issues and be able to deal with any problems in a responsible and appropriate manner
- Use technology responsibly
- Understanding the impact of their words and actions on others
- Work collaboratively to use technology successfully

Community

- **B**uild and participate in a safe and responsible online community
- Understand the importance that computing will have in their social and personal futures; education and working life
- Be critical thinkers and be able to understand how to make informed digital choices in the future

Aims of the Computing Curriculum

Our aims, inline with the national curriculum, ensure that all pupils:

- can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation;
- can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems;
- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems; and
- are competent, confident and creative users of information and communication technology
- are responsible users of technology and recognise the risks associated with an online presence
- are critical consumers of online information

Curriculum Overview

Kapow computing scheme of work has been deliberately chosen as our scheme of work for the following reasons:

- Authored by primary computing specialists using free readily-available software
- In-built CPD for teachers: learn as you plan

- A full scheme of work, easily adaptable to individual teaching needs
- Clear progression of skills and learning throughout EYFS, KS1 & KS2
- Relevant cross-curricular opportunities
- Content mapped to Education for a Connected World framework

There are **three core strands** that run throughout the Kapow Computing Scheme of work:

- Computer science
- Information technology
- Digital literacy

Long term sequence

The Kapow Primary scheme is organised into 5 key areas, creating a cyclical route through which pupils can develop their computing knowledge and skills, by revisiting and building on previous learning:

- Computer Systems and networks
- Programming
- Creating media
- Data handling
- Online safety

Kapow Primary — Suggested long-term plan: Computing - Overview (EYFS and KS1)

Years 1-6 include an Online Safety unit each. See the: Guidance: How to fit in our Online safety units for information about how to include these in your curriculum time. All units have five lessons unless otherwise stated.

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2	Online safety
EYFS	Set up continuous provision in your classroom: Computing through continuous provision	**Computing systems and networks** Using a computer Learning about the main parts of a computer and how to use the keyboard and mouse. Learning how to log in and out.	**Programming 1** All about instructions The children learn to receive and give instructions and understand the importance of precise instructions.	**Computing systems and networks** Exploring hardware Tinkering and exploring with different computer hardware and learning to operate a camera.	**Programming 2** Programming Bee-Bots Children learn about directions, experiment with programming a Bee-bot/Blue-bot and tinker with hardware.	**Data handling** Introduction to data Children sort and categorise data and are introduced to branching databases and pictograms.	
Year 1	**Computing systems and networks** Improving mouse skills	**Programming 1** Algorithms unplugged	**Skills showcase** Rocket to the moon	**Programming 2** Programming Bee-bots Option 1: Bee-Bots Option 2: Virtual Bee-bots	**Creating media** Digital imagery Option 1: Google Option 2: Microsoft Office 365	**Data handling** Introduction to data	**Online safety** Online safety Y1 (4 lessons)
Year 2	**Computing systems and networks 1** What is a computer?	**Programming 1** Algorithms and debugging	**Computing systems and networks 2** Word processing Option 1: Google Option 2: Microsoft Office 365	**Programming 2** Programming: ScratchJr	**Creating media** Stop Motion Option 1: Using tablet devices Option 2: Using cameras Option 3: Devices without cameras	**Data handling** International Space Station	**Online safety** Online safety Y2

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Kapow Primary — Suggested long-term plan: Computing - Overview (Lower and upper KS2)

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2	Online safety
Year 3	**Computing systems and networks 1** Networks and the internet Option 1: Google) Option 2: Microsoft Office 365	**Programming** Programming: Scratch	**Computing systems and networks 2** Emailing Option 1: Google Option 2: Microsoft Office 365	**Computing systems and networks 3** Journey inside a computer	**Creating media** Video trailers Option 1: Using devices other than iPads, Option 2: Using iPads	**Data handling** Comparison cards databases Option 1: Google Option 2: Microsoft Office 365	**Online safety** Online safety Y3 (4 lessons)
Year 4	**Computing systems and networks** Collaborative Learning Option 1: Google Option 2: Microsoft Office 365	**Programming 1** Further coding with Scratch Option 1: Google Option 2: Microsoft Office 365	**Creating media** Website design Option 1: Google Option 2: Microsoft Office 365	**Skills showcase** HTML	**Programming 2** Computational thinking	**Data handling** Investigating weather Option 1: Google Option 2: Microsoft Office 365	**Online safety** Online safety Y4 (6 lessons)
Year 5	**Computing systems and networks** Search engines Option 1: Google Option 2: Microsoft Office 365	**Programming 1** Programming music Option 1: Sonic Pi, Option 2: Scratch	**Data handling** Mars Rover 1	**Programming 2** Micro:bit	**Creating media** Stop motion animation Option 1: Stop motion studio Option 2: Using cameras	**Skills showcase** Mars Rover 2	**Online safety** Online safety Y5
Year 6	**Computing systems and networks** Bletchley Park Option 1: Google Option 2: Microsoft Office 365	**Programming** Intro to Python	**Data handling** Big data 1	**Creating media** History of computers Option 1: Google Option 2: Microsoft Office 365	**Data handling** Big data 2	**Skills showcase** Inventing a product Option 1: Google Option 2: Microsoft Office 365	**Online safety** Online safety Y6 (6 lessons)

Progression of Skills

The Progression of Skills document shows how understanding and application of key concepts and skills builds year on year. An example for the unit on Programming is shown below:

Progression of knowledge — **Programming**

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
To know that being able to follow and give simple instructions is important in computing. To understand that it is important for instructions to be in the right order. To understand why a set of instructions may have gone wrong. To know that you can program a Bee-Bot with some simple commands. To understand that debugging means how to fix some simple programming errors. To understand that an algorithm is a set of clear and precise instructions.	To understand that an algorithm is when instructions are put in an exact order. To know that input devices get information into a computer and that output devices get information out of a computer. To understand that decomposition means breaking a problem into manageable chunks and that it is important in computing. To know that we call errors in an algorithm 'bugs' and fixing these 'debugging'. To understand the basic functions of a Bee-Bot. To know that you can use a camera/tablet to make simple videos. To know that algorithms move a bee-bot accurately to a chosen destination.	To understand what machine learning is and how that enables computers to make predictions. To know that loops in programming are where you set a certain instruction (or instructions) to be repeated multiple times. To know that abstraction is the removing of unnecessary detail to help solve a problem. To know that coding is writing in a special language so that the computer understands what to do. To understand that the character in ScratchJr is controlled by the programming blocks. To know that you can write a program to create a musical instrument or tell a joke.	To know that Scratch is a programming language and some of its basic functions. To understand how to use loops to improve programming. To understand how decomposition is used in programming. To understand that you can remix and adapt existing code.	To understand that a variable is a value that can change (depending on conditions) and know that you can create them in Scratch. To know what a conditional statement is in programming. To understand that variables can help you to create a quiz on Scratch. To know that combining computational thinking skills (sequence, abstraction, decomposition etc) can help you to solve a problem. To understand that pattern recognition means identifying patterns to help them work out how the code works. To understand that algorithms can be used for a number of purposes e.g. animation, games design etc.	To know that a soundtrack is music for a film/video and that one way of composing these is on programming software. To understand that using loops can make the process of writing music simpler and more effective. To know how to adapt their code while performing their music. To know that a Micro:bit is a programmable device. To know that Micro:bit uses a block coding language similar to Scratch. To understand and recognise coding structures including variables. To know what techniques to use to create a program for a specific purpose (including decomposition).	To know that there are text-based programming languages such as Logo and Python. To know that nested loops are loops inside of loops. To understand the use of random numbers and remix Python code.

IMPLEMENTATION - how will we deliver the curriculum?

Linking curriculum and pedagogy

The Kapow modules enable pupils to study in depth key computational understanding, digital skills and vocabulary. Each module aims to activate and build upon prior learning, including EYFS, to ensure better cognition and retention. Each module is carefully sequenced to enable pupils to purposefully layer learning from previous sessions to facilitate the acquisition and retention of key knowledge. Individual modules and lessons build on knowledge that has previously been taught. Outcomes are revisited either later in the year or in the following year as part of a spaced retrieval practice method to ensure pupils retain key knowledge and information.

Year 1 - Year 6

Computing is taught in a modular approach with each year group from Year 1 to Year 6 having 3 module sessions each week on a 3-week rotation (see below), meaning there is more frequent teaching of Computing over the course of a year. This takes into account some key research and evidence including:

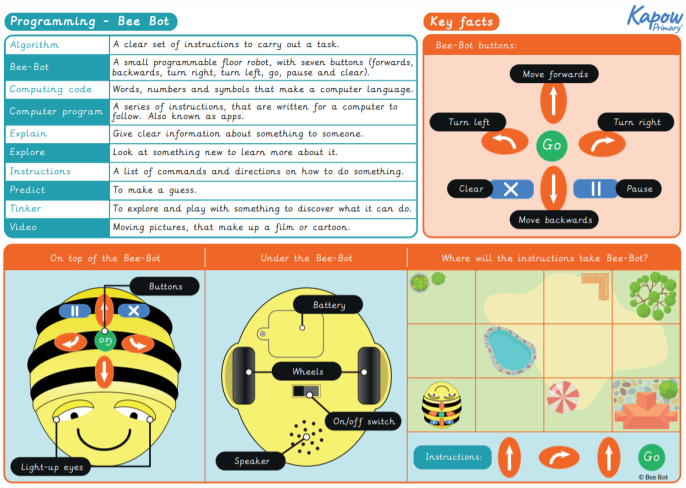
- Forgetting curve - we want to make sure we ease the forgetting curve by coming back to those key learning points after a shorter period of time
- Retrieval and spaced retrieval practice - powerful toolkit to strengthen learning and memory

Week 1		Week 2		Week 3	
PE	Geography	PE	History	PE	Computing
Music	RE	Music	RE	Music	RE
Geography	PE	History	PE	Computing	PE
Art	Art	Art	Art	Art	Art
Maths	Geography	Maths	History	Maths	Computing

Week 4		Week 5		Week 6	
PE	Geography	PE	History	PE	Computing
Music	RE	Music	RE	Music	RE
Geography	PE	History	PE	Computing	PE
DT	DT	DT	DT	DT	DT
Maths	Geography	Maths	History	Maths	Computing

Knowledge Organisers

Accompanying each module is a Knowledge Organiser which contains key vocabulary, information and concepts which all pupils are expected to understand and retain. Knowledge organisers help pupils acquire the content of each module and are continually referenced through planning and in the classroom. Knowledge Organisers from each unit should be displayed in the classroom when teaching each unit. Examples from Year 1 and 5 are shown below.



Programming - Bee Bot

Algorithm	A clear set of instructions to carry out a task.
Bee-Bot	A small programmable floor robot, with seven buttons (forwards, backwards, turn right, turn left, go, pause and clear).
Computing code	Words, numbers and symbols that make a computer language.
Computer program	A series of instructions, that are written for a computer to follow. Also known as apps.
Explain	Give clear information about something to someone.
Explore	Look at something new to learn more about it.
Instructions	A list of commands and directions on how to do something.
Predict	To make a guess.
Tinker	To explore and play with something to discover what it can do.
Video	Moving pictures, that make up a film or cartoon.

Key facts

Bee-Bot buttons:

Move forwards, Turn left, Go, Turn right, Clear, Pause, Move backwards

On top of the Bee-Bot: Buttons, Light-up eyes

Under the Bee-Bot: Battery, Wheels, On/off switch, Speaker

Where will the instructions take Bee-Bot?

Instructions: Go

Mars Rover 1

Binary code	A code used in computers, based around the binary values of 0 and 1.
Data	Information used for a specific purpose or investigation.
Data transmission	The movement of information from one or more points to another.
Discovery	When something is intentionally or unintentionally found.
Distance	The amount of space between two places or objects.
Input	Information sent to a computer by an input device such as a keyboard or mouse for processing.
Mars Rover	A robotic vehicle, that explores, investigates and returns data about the terrain on Mars.
Moon	Orbits round planet Earth and is Earth's only natural satellite.
Numerical data	Information that is based on numbers and digits.
Output	Information or data that is sent by the computer to an output device such as a printer or speakers.
Planet	A large natural object that orbits around a star.
Radio signal	A radio wave that is sent or received to somewhere.
Scientist	A person who studies within the fields of Science, such as Physics, Biology and Chemistry.
Sequence	A set order or pattern for something to follow.
Signal	A voltage, current or electromagnetic wave that is either sent or obtained.
Computer simulation	Computer generated imitation of something such as a program, test or product prototype.
Space (astronomy)	A vast area around and beyond planet Earth, which is not inhabited.

Key facts

The Mars Rover had to travel 380,000km to get to Mars, it took eight and a half months.

It is approximately 31,666,666 double-decker buses in distance!

Binary:

When a robot thinks independently, it needs to be able to calculate a range of data. All decisions carried out by a robot, or any computer, are done in binary - including the Mars Rover.

Binary value	Decimal value
0 0 0 0	0 zero
0 0 0 1	1 one
0 0 1 0	2 two
0 0 1 1	3 three
0 1 0 0	4 four
0 1 0 1	5 five
0 1 1 0	6 six
0 1 1 1	7 seven
1 0 0 0	8 eight
1 0 0 1	9 nine
1 0 1 0	10 ten

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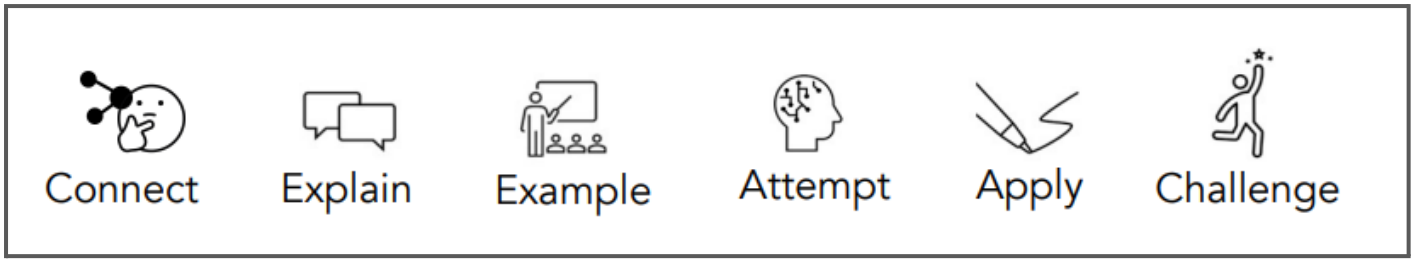
Lesson Design



Each lesson follows the model above.

- CONNECT to prior knowledge
- EXPLAIN new content
- give an EXAMPLE of new learning
- Pupils ATTEMPT new learning with scaffolding
- APPLY new learning independently
- Pupils are CHALLENGED to integrate learning with prior knowledge

In every computing lesson you would expect to see;

- Vocabulary explicitly taught and used by the pupils
- Knowledge organisers on display to scaffold the learning
- Success criteria made clear at start of each lesson
- Respectful use of materials and technology

We aim to **enrich the curriculum** with:

- Annual online safety day
- Anti-bullying week, which includes an online safety focus
- Visits from external providers, such as the PCSO to promote e-safety
- Additional clubs and opportunities

SEND

The curriculum at HPPS is inherently designed to support pupils with SEND through universal quality first teaching. This includes:

- High expectations and aspirations for all learners
- A carefully structured and sequenced curriculum
- Pre-planned and focused direct vocabulary instruction
- Modelling and demonstration
- Chunked instructions which are supported by visuals and gestures
- Review, recall, repetition and retrieval
- Frequent formative assessment as teachers check for understanding
- Accurate and regular feedback

However, we recognise some pupils need provision 'additional to' quality first teaching in order to reach their potential. This includes:

- Carefully considered scaffolding
- Explicit instruction and modelling
- Pre-planned and carefully considered use of devices and equipment
- Additional targeted adult support

IMPACT - how do we know our curriculum is effective?

Pupil Voice:

- use computing vocabulary
- talk about computing skills
- talk about the 'why' behind the work i.e. why online is vital to their safety

- explain how current learning builds on previous knowledge
- explain how they have made progress regardless of starting point

High quality outcomes: Book study…

- demonstrates pride and effort
- captures increasing understanding of computing concepts and knowledge
- demonstrates a clear sequence of learning
- vocabulary used correctly where appropriate