St Mary's Church of England Primary and Nursery School

Computing Skills and Knowledge Progression

Our Intent:

In line with the 2014 National Curriculum for Computing, our aim at St Mary's is to provide a high-quality computing education which equips children to use computational thinking and creativity to understand and change the world.

The curriculum will teach children key knowledge about how computers and computer systems work, and how they are designed and programmed. Learners will have the opportunity to gain an understanding of computational systems of all kinds, whether or not they include computers.

By the time they leave St Mary's, children will have gained key knowledge and skills in the three main areas of the computing curriculum: computer science (programming and understanding how digital systems work), information technology (using computer systems to store, retrieve and send information) and digital literacy (evaluating digital content and using technology safely and respectfully). The objectives within each strand support the development of learning across the key stages, ensuring a solid grounding for future learning and beyond.

Implementation

At St Mary's computing is taught using an ongoing curriculum approach. This ensures children are able to develop depth in their knowledge and skills over the duration of each of their computing topics. Teachers use the Computing scheme developed and provided by the computing subject lead.

We have a set of Chromebooks, iPads and other equipment, such as BeeBots and cameras, to ensure that all year groups have the opportunity to use a range of devices and programs for many purposes across the wider curriculum, as well as in discrete computing lessons. Employing cross-curricular links motivates pupils and supports them to make connections and remember the steps they have been taught.

The implementation of the curriculum also ensures a balanced coverage of computer science, information technology and digital literacy. The children will have experiences of all three strands in each year group, but the subject knowledge imparted becomes increasingly specific and in-depth, with more complex skills being taught, thus ensuring that learning is built upon.

In order to ensure that these skills are successfully learnt by the children at each Key Stage, teachers ensure that the following pedagogical approaches are used when teaching Computing. The first is retrieval practise. Retrieval practise is the act of getting the knowledge that the children have learnt **out** of their brains. This can be done in any number of ways, but is designed by the teacher to explicitly get the children to recall what they have remembered from previous lessons. The benefits of this simple approach are many, such as a formative assessment tool for the teachers. However, the power of this tool is interrupting the process of forgetting. By recalling what you have previously learnt, pupils' strengthen the neural connections and this makes the knowledge easier to remember and therefore harder to forget. The second is interleaving and spacing. This is a two-fold approach whereby you mix up the order of a set of closely related learning intentions (interleaving) and leave an amount of time before revisiting any of the previously taught content (spacing). This is most obvious in the way the whole-school curriculum has been designed: there is a set amount of time before a unit is revisited e.g. between year 4 and 5 when looking at computer science. However, teachers are also

encouraged to continue to revisit knowledge at any point in the children's learning journey. By doing this, the children must then retrieve previously taught knowledge, which then boosts retention. Another tool for boosting retention is ensuring that the retrieval of previously taught material is effortful. This can be achieved by the amount of time left between teaching and retrieving, but it can also be achieved through task design. For example, multiple choice questions as a starter for the children to do as they begin a lesson or a longer explanation of concept in their own words.

In order to ensure that the children are able to understand the concepts that are being taught, teachers at St Mary's ensure that it is the concept that is being made explicit, not the program that is being taught. This is accomplished through the application of similar skills across a range of programs. For example, children will first learn about selection during an 'unplugged' lesson: they will be able to use conditional statements such as 'if...then…' verbally before going on to a computer to apply this knowledge. They will also use this knowledge across a range of programs, so that they know that this is a concept that can be applied anywhere, not just to a specific computer program, like Scratch.

Computing is a subject that is incredibly rich in subject specific vocabulary. Both teachers and pupils are fluent in this vocabulary and it is explicitly taught throughout the curriculum. Again, pedagogical concepts such as retrieval practise are vital in children remembering the meaning of words such as 'algorithm' and 'debugging' and teachers make sure to regularly use the vocabulary in context as well as revisit it frequently. In order to help teachers ensure that they fully understand these concepts, links to various online resources are included in this document.

Nearly every unit in the computing curriculum has been planned by the computing coordinator with the oversight of SLT and alongside classroom teachers: all work is therefore appropriate and deliverable by those who teach it.

Impact

By the end of each Key Stage, pupils are expected to be able to confidently describe, demonstrate and use key skills of computer science, such as being able to describe logical reasoning and then apply it to a problem, such as 'where will the BeeBot stop after this program has been run?', or 'will the order of these instructions give the desired result?'. They are able to create content across a range of programs, carefully selecting appropriate content, ensuring that it is used within the correct context with regard to copyright. For example, a branching database about mini beasts or a digital book linked to their English work. Finally, the children are able to successfully navigate technology in a way that keeps them safe from harm, that they know what constitutes harmful behaviour or material and how to report it.

National Curriculum Statements:

Key Stage 1

Key stage 1 Pupils should be taught to:

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

Key Stage 2

Key stage 2 Pupils should be taught to:

- design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts
- use sequence, selection, and repetition in programs; work with variables and various forms of input and output
- use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs
- understand computer networks including the internet; how they can provide multiple services, such as the world wide web; and the opportunities they offer for communication and collaboration
- use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content
- select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information
- use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.

The full curriculum is available from the Department for Education here:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/239033/PRIMARY_national_curriculum_-_Computing.pdf

Additional Guidance is available here: https://www.computingatschool.org.uk/data/uploads/CASPrimaryComputing.pdf

https://community.computingatschool.org.uk/files/4868/original.pdf

https://community.computingatschool.org.uk/resources/3042/single#v1

Strands

	Computer Science	Information Technology	Digital Literacy
Key Stage 1	• understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions • create and debug simple programs • use logical reasoning to predict the behaviour of simple programs	• use technology purposefully to create, organise, store, manipulate and retrieve digital content	• recognise common uses of information technology beyond school • use technology safely and respectfully, keeping personal information private; identify where to go for help and support when they have concerns about content or contact on the internet or other online technologies.
Key Stage 2	• design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts • use sequence, selection, and repetition in programs; work with variables and various forms of input and output • use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs. • understand computer networks including the internet; how they can provide multiple services, such as the world wide web. • appreciate how results [search] are selected and ranked.	• use search technologies effectively. • 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	• Understand the opportunities [networks] offer for communication and collaboration. • be discerning in evaluating digital content. • use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.

These can be arranged into strands in order to see the progression of skills from Key Stage 1 to Key Stage 2.

	Computer Science	Information Technology	Digital Literacy
Key Stage 1	Upon joining Key Stage 1, Year 1 children are given the opportunity to begin to explore computing through the manipulation of BeeBots and other physical systems. This unit is both fun and lends itself well to a 'continuous provision' style of teaching that is used in the beginning of Year 1. They will begin to be exposed to language such as 'algorithm' and 'debugging' and through exploration of physical systems, be able to see that computers will only do what they are programmed to do. They will also begin to predict outcomes of an algorithm using 'logical reasoning'. This knowledge is then extended by getting the children to apply the same understanding to a basic programming software on Busythings and J2Code. When the children move into Year 2, these skills are reinforced with more exciting work on physical systems (BeeBots and more complex floor robots) before moving onto Busythings and J2Code. The complexity of the tasks increases as the children will begin to create more complex sets of instructions and begin to code things on a laptop that are unlike the floor robots that they have used so far using block coding.	The children are given the opportunity to begin to express themselves using a computer in Year 1. With the support of an adult, the children will be able to create a simple page that combines pictures and text and allows them to communicate important things about themselves using J2Write. Again, this work lends itself well to small group teaching, where an adult can support and guide children through the drafting and writing of a short sentence before going onto a computer to copy what they have written. In Year 2, the children are given the same opportunity using J2Write, but this time the expectation of the writing is higher and the children are also given time to use the software in a more independent manner. They will also be shown how to save and open their work, which is a vital skill. In the Spring term, the Year 1 children are shown how to use simple pictograms and charts in J2Data. This unit will support the children's place value, addition and subtraction learning from earlier Maths lessons and provides them with a platform to practise these skills in more depth and on 'real-life' problems. Building on this work, the Year 2 children will recap this learning; at around this time in the year, children in Year 2 will be studying statistics in maths for the first time, so the opportunity to explore using a computer to generate graphs will	The whole school takes part in 'Safer Internet Day' as a way to maintain awareness of the potential issues that can arise when using information technology. Each year group also works through a website called **'Project Evolve'(https://projectevolve.co.uk/toolkit/).** The aim being to help educate the children on issues of safety when using IT as well as give teachers an overview of what the children do and don't understand and plan accordingly. Children who have joined Year 1 are supported and guided when using computer equipment. Adults act as models of good etiquette and moderators of children's use of technology. This support also allows adults to tackle issues around the use of technology as they arise. Over the course of Year 1, children are exposed to the many uses of technology beyond school; linking in with their history topic about 'changes to our way of life' provides context for this work. During their time in Year 2, children are consistently reminded about how to use technology safely every time it is used as well as who to contact if they have a problem. Again, Year 2 children are given context for how information technology has been used both in history as well as the modern day through history topics such as their work on Neil Armstrong.

		give them an experience of how computers can be used in 'real-life' situations and to see their practical application. Similarly, when the learning is extended into branching databases, the children can use a computer to help them to identify and differentiate living creatures and their habitats.	
Key Stage 2	Children enter Key Stage Two with a good grounding in the basics of computer science and this is built on over time. Each year group takes a specific focus from the computer science strand of the Key Stage Two Curriculum and they are sequenced in such a way that they build upon each other over time. This allows the children to expand their understanding. For example, children in Year 3 learn about repetition but children in Year 5 and 6 will learn to use events, meaning that they will be able to code something to repeat only if an input or output has occurred. All of this work gives the children the opportunity to design and write programs that achieve specific goals as well as debug their code using logical reasoning. The organisation of their units works by introducing the skill early on in the year and then revisiting the skill later with a specific project in mind. This builds in opportunities for spaced retrieval practise, discussed earlier. Understanding the physicality of the internet and the World Wide Web can be incredibly abstract for younger children, so this element of	Upon entering Key Stage Two, children have already been given the grounding in creating, organising, storing, manipulating and retrieving digital content and are well-prepared to take these skills further. Over the course of Key Stage Two, children will create increasingly complex content using a range of software in order to meet specific goals. The majority of this work is cross-curricular and this gives meaning, context and purpose to the work, as well as helping to decide what is taught when. For example, creating databases about different types of animals is a fortuitous, positive and purposeful link to make between Computing and science and could only be possible in the summer term, when these creatures are able to be observed in their natural habitat. In creating digital content, children are shown how to successfully search for things using the internet and appreciate how these results have been ranked. They can then appropriately choose the ideal content for their project as well as understand that they should be discerning about what they can use with regard to copyright law.	Understanding how networks can improve collaboration and communication is worked in through the IT projects they complete; The school uses G Suite and Google Classroom to create and share work and these products offer a real-life example as to how we can work together using networks. Completed projects are shared amongst the class as well as with parents via ParentMail and Google Classroom, again demonstrating how networks offer the ability to share work in a way that is not otherwise possible. It also allows the children to take pride in work they've created by sharing it with those they care about. As the use of computers increases across the Key Stage, the children are constantly reminded of how to use equipment safely, respectfully and responsibly and know what unacceptable behaviour looks like. Teachers and SLT are always approachable if a child has a concern about any content or contact they have had. In addition to this, teachers make use of the assessment information they gain from Project Evolve to target any specific gaps in children's understanding as soon as it arises.

	Computer Science is left until Upper Key Stage Two, as the children will have a better understanding of the world as a whole.		

Rationale

In order to understand the curriculum, the below table explains the rationale of what is being taught and when. This then allows us to see and demonstrate the progression of skills across the school as a whole. Space across each year group is left intentionally so that teachers have time to either reinforce or even extend pupil's understanding, if they wish.

Curriculum Overview

Year Group	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 1	Teach Computing - Moving a robot *KS1 Computing Curriculum Links:* Understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions Create and debug simple programs Use logical reasoning to predict the behaviour of simple programs Recognise common uses of information technology beyond school	J2Write - All About Me *KS1 Computing Curriculum Links:* Use technology purposefully to create, organise, store, manipulate and retrieve digital content	Computing Spotlight - sequence *KS1 Computing Curriculum Links:* Understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions Create and debug simple programs Use logical reasoning to predict the behaviour of simple programs	J2Data - Using pictograms and bar charts. *KS1 Computing Curriculum Links:* Use technology purposefully to create, organise, store, manipulate and retrieve digital content		Busy Things/ Teach Computing Writing *KS1 Computing Curriculum Links:* Use technology purposefully to create, organise, store, manipulate, and retrieve digital content Use technology safely and respectfully, keeping personal information private

Year 2	Teach Computing - Robot Algorithms *KS1 Computing Curriculum Links:* Understand what algorithms are, how they are implemented as programs on digital devices, and that programs execute by following precise and unambiguous instructions Create and debug simple programs Use logical reasoning to predict the behaviour of simple programs Use technology 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.	J2Write - All About Me *KS1 Computing Curriculum Links:* Use technology purposefully to create, organise, store, manipulate and retrieve digital content	J2Data - Using a branching database *KS1 Computing Curriculum Links:* Use technology purposefully to create, organise, store, manipulate and retrieve digital content.	Busy Things/ Teach Computing Writing *KS1 Computing Curriculum Links:* Use technology purposefully to create, organise, store, manipulate, and retrieve digital content Use technology safely and respectfully, keeping personal information private		Computing Spotlight - sequence (blocks) *KS1 Computing Curriculum Links:* Understand what algorithms are, how they are implemented as programs on digital devices, and that programs execute by following precise and unambiguous instructions Create and debug simple programs Use logical reasoning to predict the behaviour of simple programs

Year 3	J2write - Information text. *KS2 Computing Curriculum Links:* use search technologies effectively. 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. Understand the opportunities [networks] offer for communication and collaboration. use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.	Computing Spotlight - Repetition *KS2 Computing Curriculum Links:* design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts. use sequence, selection, and repetition in programs; work with variables and various forms of input and output.	J2Data - Branching Database. *KS2 Computing Curriculum Links:* 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.		Teach Computing - Repetition Logo unit. *KS2 Computing Curriculum Links:* design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts use sequence, selection, and repetition in programs; work with variables and various forms of input and output use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs .	

Year 4	Computing Spotlight - Selection *KS2 Computing Curriculum Links:* design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts use sequence, selection, and repetition in programs; work with variables and various forms of input and output use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs.		J2Write - Explanation text on the digestive system (Linked to science). *KS2 Computing Curriculum Links:* use search technologies effectively. 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. Understand the opportunities [networks] offer for communication and collaboration. use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report	Teach Computing - Magazine Cover with Adobe Spark (Link with History: Hampton Court Trip). *KS2 Computing Curriculum Links:* use search technologies effectively. 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. Understand the opportunities [networks] offer for communication and collaboration. use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a	Barefoot Computing - Selection Scratch unit. *KS2 Computing Curriculum Links:* design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts use sequence, selection, and repetition in programs; work with variables and various forms of input and output use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs.	J2Data - Database on animals (Linked to science). *KS2 Computing Curriculum Links:* 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.

			concerns about content and contact.	range of ways to report concerns about content and contact.		
Year 5	Computing Spotlight - Events *KS2 Computing Curriculum Links:* design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts use sequence, selection, and repetition in programs; work with variables and various forms of input and output use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs.		J2E5 - Creating an advert (Linked with Science - Forces) *KS2 Computing Curriculum Links:* use search technologies effectively. 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. Understand the opportunities [networks] offer for communication and collaboration. use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.	Adobe Spark Page - The Planets (Linked to Science and the Planets) *KS2 Computing Curriculum Links:* use search technologies effectively. 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. Understand the opportunities [networks] offer for communication and collaboration. use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.	Teach Computing - Computing systems and networks – Sharing information *KS2 Computing Curriculum Links:* understand computer networks including the internet; how they can provide multiple services, such as the world wide web.	Creating a book using Google Drawing and Book Creator (Linked with English). *KS2 Computing Curriculum Links:* use search technologies effectively. 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. Understand the opportunities [networks] offer for communication and collaboration. use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.

Year 6	Computing Spotlight - Variables *KS2 Computing Curriculum Links:* design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts use sequence, selection, and repetition in programs; work with variables and various forms of input and output use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs.	Adobe Spark Video *KS2 Computing Curriculum Links:* use search technologies effectively. 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. Understand the opportunities [networks] offer for communication and collaboration. use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.		Teach Computing - Variables Scratch unit *KS2 Computing Curriculum Links:* design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts use sequence, selection, and repetition in programs; work with variables and various forms of input and output use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs.	J2Data - Creating a Database (Linked with Geography - Going Global) *KS2 Computing Curriculum Links:* 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.	Adobe Spark Collage - My Time in St Marys. *KS2 Computing Curriculum Links:* use search technologies effectively. 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. Understand the opportunities [networks] offer for communication and collaboration. use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.

	Computer Science - 12 units		**Information Technology - 17 units**