St Michael's Church of England High School

Curriculum Plan

Computing & ICT

The Aims of the Computing National Curriculum

The national curriculum for computing aims to 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
- are responsible, competent, confident and creative users of information and communication technology

Computing & ICT Intent Statement

The ICT & Computing curriculum is designed to reflect our school values and beliefs as stated out in our mission statement, 'Achievement for All' and that of the LDST, 'Jesus grew in wisdom and stature'.

Technological development in the 21st century has made the world around us an exciting place where distances and circumstances maintain few barriers to the journeys of enquiring minds. At St Michaels we want our learners to develop enquiring minds for them to strive with confidence within the area of ICT. Coupled with this they will develop a skill set to meet life challenges within a digital world whilst embracing the benefits gained and using them to their full potential. We envision a learning environment where the use of digital technology is regarded as an integral part of our everyday practices. By the time our learners leave they will be fully ICT literate and have the knowledge and skill set of safe and effective online etiquette.

Our curriculum is underpinned by a series of key concepts or 'Big Ideas' which are revisited throughout the Key Stages:

- Staying safe online
- Being effective digital citizens
- Knowledge of hardware, software and networks
- Develop coding/programming skills to produce solutions to a range of problems
- Analysing existing artefacts and products
- Understanding and demonstrating principles of good design
- Developing a high level of proficiency across a wide range of software types
- Evaluating own products and artefacts for success, improvements and developments

Underpinning the work we do are the 4 key concepts of:

1. Analyse
2. Design
3. Create
4. Review

Key Stage 3 – How do following these 'Big Ideas' cover the National Curriculum requirements

Year / Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
7	1. Staying Safe Online	2. Modelling	3. Networks and the Internet	4. Programming 1	5. Computing Components	6. Gaining Support for a Cause
8	7. Representations Binary & Denary	8. Developing for the Web	9. Intro to Python Programming	10. Vector Graphics	11. Mobile App Development	12. Advanced Spreadsheets
9	13. Digital 3D Animations	14. Cyber Security	15. Data Science	16. Digital Media - Audiovisual	17. Python Programming & Sequences	18. Physical Computing

Key Stage 3

Pupils should be taught to:

1. Design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems— **Covered 6 times**
2. Understand several key algorithms that reflect computational thinking [for example, ones for sorting and searching]; use logical reasoning to compare the utility of alternative algorithms for the same problem **Covered 6 times**
3. Use 2 or more programming languages, at least one of which is textual, to solve a variety of computational problems; make appropriate use of data structures [for example, lists, tables or arrays]; design and develop modular programs that use procedures or functions **Covered 4 times**
4. Understand simple Boolean logic [for example, AND, OR and NOT] and some of its uses in circuits and programming; understand how numbers can be represented in binary, and be able to carry out simple operations on binary numbers [for example, binary addition, and conversion between binary and decimal] **Covered 4 times**
5. Understand the hardware and software components that make up computer systems, and how they communicate with one another and with other systems **Covered 4 times**
6. Understand how instructions are stored and executed within a computer system; understand how data of various types (including text, sounds and pictures) can be represented and manipulated digitally, in the form of binary digits **Covered 6 times**
7. Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users **Covered 10 times**
8. Create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability **Covered 11 times**
9. Understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct, and know how to report concerns **Covered 18 times**

Key Stage 3 – Brief Overview of each unit – What are they doing and why are they doing it?

Unit 01 - Using the school network and staying safe online

This unit has been designed to ensure that learners are given sufficient time to familiarise themselves with the school network. It also allows the teacher to discuss appropriate use of the school network, and to update and remind learners of important online safety issues. Whilst completing this unit, learners will also learn how to use presentation software effectively. In terms of online safety, this unit focuses on respecting others online, identifying dangers and the effects of cyberbullying.

Big Idea Links

- Staying safe online
- Being effective digital citizens
- Knowledge of hardware, software and networks
- Developing a high level of proficiency across a wide range of software types

Evaluating own products and artefacts for success, improvements and development

Unit 02 – Modelling Data

The spreadsheet unit for Year 7 takes learners from having none/very little knowledge of spreadsheets to being able to confidently model data with a spreadsheet. The unit uses activities to progress learners from using basic formulas to writing their own COUNTIF statements. This unit will give learners a good set of skills that they can use in computing lessons and in other subject areas.

Big Idea Links

- Developing a high level of proficiency across a wide range of software types
- Develop coding/programming skills to produce solutions to a range of problems
- Evaluating own products and artefacts for success, improvements and development

Unit 03 – Networks and the Internet

This unit progresses students' knowledge and understanding of networks and associated hardware. The unit will establish a foundation understanding of how data is transmitted across networks, as well as exploring the factors that can affect performance. The unit will spend time focussing on the internet and services provided over the internet.

Big Idea Links

- Developing a high level of proficiency across a wide range of software types
- Knowledge of hardware, software and networks

Unit 04 – Programming 1

This unit is the first programming unit of KS3. The aim of this unit and the following unit ('programming 2') is to build learners' confidence and knowledge of the key programming constructs.

Big Idea Links

- Knowledge of hardware, software and networks
- Develop coding/programming skills to produce solutions to a range of problems
- Developing a high level of proficiency across a wide range of software types
- Evaluating own products and artefacts for success, improvements and developments

Unit 05 - Computing Components

Knowing about the core components that make up digital devices is essential if you want to understand what you are using, if you want to make good decisions when you choose new tech and if you want to fix problems. This module explores what is inside a computer as well as how a computer's performance can be measured. It also looks at computer peripherals and types of storage and culminates in an examination of the latest technology available with the Internet of Things.

Big Idea Links

- Knowledge of hardware, software and networks
- Staying safe online
- Develop coding/programming skills to produce solutions to a range of problems
- Developing a high level of proficiency across a wide range of software types
- Evaluating own products and artefacts for success, improvements and developments

Unit 06 - Gaining Support for a Cause

During this unit, learners develop their understanding of information technology and digital literacy skills. They will use the skills learnt across the unit to create a blog post about a real-world cause that they would like to gain support for. Learners will develop software formatting skills and explore concerns surrounding the use of other people's work, including licensing and legal

Big Idea Links

- Knowledge of hardware, software and networks
- Analysing existing artefacts and products
- Being effective digital citizens
- Developing a high level of proficiency across a wide range of software types
- Understanding and demonstrating principles of good design
- Evaluating own products and artefacts for success, improvements and developments

Unit 07 – Binary and Denary

This unit conveys essential knowledge relating to binary representations. The activities gradually introduce learners to binary digits and how they can be used to represent text and numbers. The concepts are linked to practical applications and problems that the learners are familiar with.

Big Idea Links

- Knowledge of hardware, software and networks
- Analysing existing artefacts and products
- Being effective digital citizens

Unit 08 – Developing for the Web

In this unit, learners will explore the technologies that make up the internet and World Wide Web. Starting with an exploration of the building blocks of the World Wide Web, HTML, and CSS, learners will investigate how websites are catalogued and organised for effective retrieval using search engines. By the end of the unit, learners will have a functioning website.

Big Idea Links

- Knowledge of hardware, software and networks
- Analysing existing artefacts and products
- Developing a high level of proficiency across a wide range of software types
- Evaluating own products and artefacts for success, improvements and developments
- Staying safe online
- Being effective digital citizens

Unit 09 – Intro to Python Programming

This unit introduces learners to text-based programming with Python. The lessons form a journey that starts with simple programs involving input and output, and gradually moves on through arithmetic operations, randomness, selection, and iteration. Emphasis is placed on tackling common misconceptions and elucidating the mechanics of program execution.

Big Idea Links

- Knowledge of hardware, software and networks
- Develop coding/programming skills to produce solutions to a range of problems
- Developing a high level of proficiency across a wide range of software types
- Evaluating own products and artefacts for success, improvements and developments

Unit 10 – Vector Graphics

This unit offers students the opportunity to design graphics using vector graphic editing software..

Vector graphics can be used to design anything from logos and icons to posters, board games, and complex illustrations. Through this unit, students will be able to better understand the processes involved in creating such graphics and will be provided with the knowledge and tools to create their own.

One of the most interesting and challenging aspects of creating vector graphics is their unlikely link to computational thinking. Creating a complex design is a multi-step process that starts with elementary shapes and involves combining them into more intricate ones using operations such as union, difference, and intersection. There are usually multiple paths to achieving the goal and the process involves decomposition, evaluation, and plenty of inventiveness!

Big Idea Links

- Knowledge of hardware, software and networks
- Developing a high level of proficiency across a wide range of software types
- Evaluating own products and artefacts for success, improvements and developments

Unit 11 – Vector Graphics

Learners will familiarise themselves with the coding environment and have an opportunity to build on the programming concepts they used in previous units before undertaking their project. Learners will work to consider the needs of the user; decompose the project into smaller, more manageable parts; develop their app; and finish off by evaluating the success of the project against the needs of the user.

Big Idea Links

- Knowledge of hardware, software and networks
- Developing a high level of proficiency across a wide range of software types Develop coding/programming skills to produce solutions to a range of problems
- Analysing existing artefacts and products
- Understanding and demonstrating principles of good design
- Evaluating own products and artefacts for success, improvements and developments

Unit 12 - Media – Advanced Spreadsheets

Spreadsheets are incredibly useful and powerful tools. They are used every day by people in all sorts of ways, from storing information about products and stock levels to managing multi-million-pound budgets. This module focuses on more advanced features of spreadsheets, including new functions, form controls and macros to develop more bespoke and user-friendly spreadsheets.

Big Idea Links

- Knowledge of hardware, software and networks
- Developing a high level of proficiency across a wide range of software types
- Develop coding/programming skills to produce solutions to a range of problems (macro)
- Analysing existing artefacts and products
- Understanding and demonstrating principles of good design
- Evaluating own products and artefacts for success, improvements and developments

Unit 13 - Media – Digital 3D Animations

Films, television, computer games, advertising, and architecture have been revolutionised by computer-based 3D modelling and animation. In this unit learners will discover how professionals create 3D animations using the industry-standard software package, Blender. By completing this unit learners will gain a greater understanding of how this important creative field is used to make the media products that we consume. Sessions will take learners through the basics of modelling, texturing, and animating; outputs will include 3D models, short videos, and VR. Links are made throughout to computer science, computational thinking, and the world of work. Tools and techniques learnt in this unit can also be used for 3D printing.

Big Idea Links

- Developing a high level of proficiency across a wide range of software types
- Analysing existing artefacts and products
- Understanding and demonstrating principles of good design
- Evaluating own products and artefacts for success, improvements and developments

Unit 14 - Media – Cyber Security

This unit takes the learners on an eye-opening journey of discovery about techniques used by cybercriminals to steal data, disrupt systems, and infiltrate networks. The learners will start by considering the value of their data to organisations and what they might use it for. They will then look at social engineering techniques used by cybercriminals to try to trick users into giving away their personal data. The unit will look at the more common cybercrimes such as hacking, DDoS attacks, and malware, as well as looking at methods to protect ourselves and our networks against these attacks.

Big Idea Links

- Developing a high level of proficiency across a wide range of software types
- Analysing existing artefacts and products
- Understanding and demonstrating principles of good design
- Evaluating own products and artefacts for success, improvements and developments

Unit 15 - Data Science

This unit takes the learners on an eye-opening journey of discovery about techniques used by cybercriminals to steal data, disrupt systems, and infiltrate networks. The learners will start by considering the value of their data to organisations and what they might use it for. They will then look at social engineering techniques used by cybercriminals to try to trick users into giving away their personal data. The unit will look at the more common cybercrimes such as hacking, DDoS attacks, and malware, as well as looking at methods to protect ourselves and our networks against these attacks.

Big Idea Links

- Developing a high level of proficiency across a wide range of software types
- Analysing existing artefacts and products
- Understanding and demonstrating principles of good design
- Evaluating own products and artefacts for success, improvements and developments

Unit 16 - Digital Media - Audiovisual

In this unit, learners will focus on digital media such as images and sounds, and discover the binary digits that lie beneath these types of media.

Just like in the previous unit, where learners examined characters and numbers, the ideas that learners need to understand are not really new to them. You will draw on familiar examples of composing images out of individual elements, mixing elementary colours to produce new ones, and taking samples of analogue signals, to illustrate these ideas and bring them together in a coherent narrative.

This unit also has a significant practical aspect. Learners will use relevant software (GIMP and Audacity, in this case) to manipulate images and sounds and get an idea of how the underlying principles of digital representations are applied in real settings.

Big Idea Links

- Developing a high level of proficiency across a wide range of software types
- Analysing existing artefacts and products
- Understanding and demonstrating principles of good design
- Evaluating own products and artefacts for success, improvements and developments

Unit 17 - Python programming with sequences of data

This unit introduces learners to how data can be represented and processed in sequences, such as lists and strings. The lessons cover a spectrum of operations on sequences of data, that range from accessing an individual element to manipulating the entire sequence. Great care has been taken so that the selection of problems used in the programming tasks are realistic and engaging: learners will process solar system planets, book texts, capital cities, leaked passwords, word dictionaries, ECG data, and more.

A range of pedagogical tools are employed throughout the unit, with the most prominent being pair programming, live coding, and worked examples.

Big Idea Links

- Developing a high level of proficiency across a wide range of software types
- Analysing existing artefacts and products
- Develop coding/programming skills to produce solutions to a range of problems
- Evaluating own products and artefacts for success, improvements and developments

Key Stage 4 - How do following these 'Big Ideas' cover the National Curriculum requirements

The course delivered is the Level 2 OCR Cambridge National Creative i-Media

Unit	Content
R081	Written Exam – Pre-production Documents
R082	Creating Digital Graphics
R085	Creating a Multi-page website
R087	Creating an Interactive Multimedia Product

How are the Big Ideas developed through Key Stage 4

Year / Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
10	Unit R085 LO1 **Analyse**	Unit R085 LO2 **Design**	Unit R085 LO3/4 **Create/Review**	Unit R081 Revision **Analyse/Review**	Unit R081 Revision/Exam **Analyse/Review**	Unit R082 LO1 **Analyse**
Coverage	1,2,3	1,2	1,2,3	1,2,3	1,2,3	1,2,3
11	Unit R082 LO2 **Design**	Unit R082 LO3 **Create**	Unit R082 LO4 **Review**	Unit R081 Revision **Analyse/Review**	Unit R081 Exam **Analyse/Review**	
Coverage	1,2,3	1,2,3	1,2	1,2,3	1,2,3	

Key Stage 4 National Curriculum

All pupils must have the opportunity to study aspects of information technology and computer science at sufficient depth to allow them to progress to higher levels of study or to a professional career.

All pupils should be taught to:

1. Develop their capability, creativity and knowledge in computer science, digital media and information technology **Covered 18 times**
2. Develop and apply their analytic, problem-solving, design, and computational thinking skills **Covered 18 times**
3. Understand how changes in technology affect safety, including new ways to protect their online privacy and identity, and how to report a range of concerns **Covered 15 times**

Rationale

1. To provide a broad and balanced coverage of all NC requirements.
2. To meet all school requirements in terms of knowledge based curriculum, literacy focus, internal and external assessment
3. To prepare students for KS4/5 option choices—upon entry to GCSE/A Level course all students will be experienced and have grounding, knowledge and skills in the 4 key areas:

   1–Analyse 2–Design 3–Create 4-Review

To develop and reinforce the skills and knowledge required to ensure all students are equipped to deal with the world of social media and electronic commerce in a safe and responsible manner.