

Computer Science Learning Journey

Intent

At S.Peter' Collegiate school, we aim to prepare our learners for their future by giving them the opportunities to gain knowledge and develop skills that will equip them for an ever changing digital world. Knowledge and understanding of Computing is of increasing importance for children's future both at home and for employment. Our Computing curriculum focuses on a progression of skills in digital literacy, computer science, information technology and online safety to ensure that children become competent in safely using, as well as understanding, technology. These strands are revisited repeatedly through a range of topics during a student's time in school to ensure the learning is embedded and skills are successfully developed. Learners will have the opportunity to gain an understanding of computational systems of all kinds, whether or not they include computers. Our intention is that Computing also supports children's creativity and cross curricular learning to engage children and enrich their experiences in school.

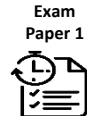
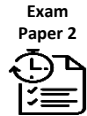
Implementation

Students are taught Computing under three strands, *Theoretical* - Students will understand a range of number systems such as binary, denary and hexadecimal. They will understand how to convert between binary and denary, as well as hexadecimal and binary. Students will understand how to perform simple operations such as binary addition. Students will understand that data such as numbers, characters, images and sound can be represented in binary on a computer. Students will understand simple logic gates (AND, OR, NOT) in circuits, use truth tables and be able to write a logic statement for a given problem. *Problem Solving* - Students must understand standard algorithms for sorting (bubble sort, merge sort) and searching (linear search, binary search). Students will use logical reasoning to compare the efficiency of different algorithms for the same problem. *Programming* - Students are expected to be familiar with, and understand how to use a range of data types (string, integer, float, Boolean) and data structures (string, array). Students will understand the purpose of programming constructs such as sequence, selection (decisions) and iteration (repeat). Students will understand how to use Boolean operators (AND, OR, NOT) in programming. Opportunities will be given where students can use more than one, text-based, programming language to explore simple computational abstractions that model real-world problems and physical systems. This will include solving a range of computational challenges that is fully working and meet user requirements. Students will understand the purpose of procedures and/or functions and use it in programming. Students will understand the environmental, ethical and legal impact of technology. At S.Peters' Collegiate School, we give children access to a wide range of good quality resources and provide cross curricular opportunities for children to apply their Computing knowledge and skills.

Impact

Our curriculum hopes that all pupils will be provided with the best quality delivery and assessment available at all times. Pupils will be fully engaged in challenging activities that require problem solving, use of initiative, creativity and a good understanding of the skills and knowledge relating to the context of the subject. Any pupil that is driven to succeed will progress and gain the highest grades available.

Post-16



Revision

Ethical, Legal and Cultural Concerns

What are the issues created and addressed by technology and the impact on society including ethical, legal, cultural, environmental and privacy (I'm back to being Police again)? Legislation (now I'm a politician), Data Protection, computer misuse, copyright and licences

Producing Robust Programs

Use string manipulation & file handling, open, read, write, close. Storing data in records. Using SQL to search for data. Using arrays to solve problems, 2D as well as sub programs & random number generation. Understanding why defensive programming is necessary. Using defensive designs (is that dangerous?) Then I have to test it all to make sure it works and debug if it doesn't, is that normal, boundary, invalid or erroneous? I will have to refine! Create code which is easy to maintain. Know the purpose of testing and types used for validation.

Programming Fundamentals

Using variables, constants, operators, inputs/outputs (*and shake it all about*). Sequences, selection & iteration (*oh... Hokey Cokey Cokey*). Arithmetic, integers, Boolean (*oh no not Math ☹*). Characters & string manipulation (in an orchestra?), using appropriate data types and casting (*acting?*)

Algorithms

Using abstraction, decomposition and algorithmic thinking to define a problem. Create structure diagrams & flowcharts. How to efficiently search and sort data. Writing algorithms using Python. What are binary, bubble, merge, insertion sorts. How do I identify bugs and fixes? What are trace tables?

YEAR 11



Introduction

Specification requirements. Mark Scheme. Course calendar. Where to find resources. Folder Setup. Workbooks. Homework calendar. Student/Teacher expectations. Understanding of flipped and unflipped learning. What is a computer?



Programming Languages & IDEs

What are the characteristics of languages; high and low-level. What is the purpose of translators, compilers, interpreters? What is Little Man Computer? Tools in an IDE; editors, error diagnostics, run-time environments & translators.

Computer Network Connections & Protocols

What are LANS & WANS? What's an IP and MAC (I've got a Mac!) address? How do I learn these TCP/IP, HTTP, HTTPS, FTP, POP, IMAP, SMTP, and what are layers?

Systems Architecture

What is the CPU? How does it function? What are the components it is made of? What are the common characteristics which affect performance? What are embedded systems? Who is Von Neumann?

Boolean Logic

Creating simple logic diagrams and truth tables. Combine Boolean and logical operators to solve problems

YEAR 10

Representations

Going audiovisual 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..

System Software

What are operating systems & interfaces? What is memory, peripheral, user and file management? What is utility software and why do they need encryption, defragmentation and file management & data compression?

Memory & Storage

What is primary & secondary storage and what is the purpose of RAM and ROM, the differences between them, the advantages and disadvantages? Why do we need virtual memory? What is flash memory? What are the common types of storage?

Network Security

What forms of attack happen to computers and networks? What's malware, phishing (I fish), brute force attacks (dangerous) DoS (about?) Interception & theft (sounds dodgy). How to prevent attacks (who from?) What is an SQL injection, does it hurt? Firewalls, so I'm training to be a Firefighter too, who needs password encryption and security, sounds more like the Police!

Animation

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

Cybersecurity

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.

YEAR 9



Introduction 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.

Physical Computing

This unit applies and enhances the learners' programming skills in a new engaging context: physical computing, using the BBC micro:bit.

Data Science

In this unit, learners will be introduced to data science, and by the end of the unit they will be empowered by knowing how to use data to investigate problems and make changes to the world around them.

Programming

This unit builds learners' confidence and knowledge of the key programming constructs. Importantly, this unit does not assume any previous programming experience, but it does offer learners the opportunity to expand on their knowledge throughout the unit.

YEAR 8



Programming

This unit builds learners' confidence and knowledge of the key programming constructs. Importantly, the main programming concepts covered in this unit are sequencing, variables, selection, and count-controlled iteration.

Computer Systems

This unit takes learners on a tour through the different layers of computing systems: from programs and the operating system, to the physical components that store and execute these programs, to the fundamental binary building blocks that these components consist of.

Representation

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..

Web Design and Production

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.

Modelling Data

The spreadsheet unit for Year 7 takes learners from having very little knowledge of spreadsheets to being able to confidently model data with a spreadsheet. The unit uses engaging 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.



Mobile App Development

In a world where there's an app for every possible need, this unit aims to take the learners from designer to project manager to developer in order to create their own mobile app. 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.

YEAR 7

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.

Networks

This unit begins by defining a network and addressing the benefits of networking, before covering how data is transmitted across networks using protocols. The types of hardware required are explained, as is wired and wireless data transmission. Learners will develop an understanding of the terms 'internet' and 'World Wide Web', and of the key services and protocols used. Practical exercises are included throughout to help strengthen understanding.

Using ICT

A primer for learners on how to use the school network appropriately. This unit builds in time for teacher-led discussions on why appropriate usage is important, as well as allowing for opportunities to highlight online safety issues.

Computer Science Learning Journey

Key Stage 2 Expected Prior Learning

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

Cultural Capital:

Within the department we recognise that along with teaching the content of the curriculum, we are tasked with enabling our students to function as well-informed individuals after they leave our school.

We understand that exposure to culture and situations which students might not have previous experience of, is key to improving individual student's cultural capital. Therefore, we do encourage students to communicate effectively using Computing and technology in a range of ways.

Computing perhaps more so than any other subjects, demonstrate the value of creating cultural capital. The rising number of technology companies and their growing influence on the world both socially and economically has led to the creation of many technology billionaires.

A large part of the Computer Science curriculum is based on the ability to abstract and decompose a problem to product a solution through investigation. Students have opportunities throughout the curriculum to produce robust, considered solution to problems posed in class and develop problem solving and analysis skills.



Recommended Computer Science Text Books:

- OCR GCSE Computer Science
- GCSE Computer Science for OCR student book
- Compute-IT: Students Book 1 – Computing for KS3

Recommended Computer Science Reading Books:

- The Magic School Bus Gets Programmed
- Why Doesn't My Floppy Disk Flop?
- Personal Computers
- Edward Roberts and the story of the Personal Computer