Swindon Academy Computer Science Curriculum Map

Intent

The Computer Science Curriculum provides an understanding of computers and how they work in the modern world. The curriculum is sequenced to work through the logic of computing from how it was built to the impact it has on our world. Computer Science will be a subject new to students in KS4, therefore students will sit a baseline test which will establish learning/current knowledge, identify gaps and learning needs. This will enable plans to be made to target student's needs more effectively.

In KS4, the opportunity to study GCSE Computer Science and Cambridge National Creative iMedia courses are offered. All students, no matter what course they take, have an expectation of achieving the highest possible outcome. In Computer Science students will leave KS4 having knowledge, understanding and be able to apply this to computer systems. This includes PC's, tablets and all computing devices, how they are built, the processes used by computing, how the components work together/communicate, algorithms and programming, networks, cyber security, impacts of ethics, legal and environmental aspects of computing on society. In creative i-media students will leave KS4 with pre-production skills, how to create a digital graphic (from planning to evaluation stage), creating a digital animation (from planning to evaluation stage) and Designing a game concept. Students on the creative i-media course will leave KS4 with the knowledge and skills of the creative iMedia industry and transferable skills and tools which crossover into other aspects/subjects, such as research, planning and review, communicating and working with others.

In KS5, students have the opportunity to study an A-Level Computer Science. This is a follow through for the GCSE and is designed to allow students who have not complete the GCSE to start their computer science journey. Those students who have not sat the GCSE will very quickly learn the basic of programming and then all will extend their programming skills and understanding to enable them to code at a higher level. This in turn will support the completion of the programming project where the topic is of their own choosing. Students will also have a deeper understanding and master other topics such as how data is represented in computers, computer systems, consequences of using computer systems, communication and networks, computer organisation and architecture, databases, big data and functional programming.

Currently at KS5 the A-Level in Computer Science is the only option however; the intent is to add a level 4 course which will be a follow through for students who take the Creative iMedia course.

Implementation – Rosenshine principles of instruction – *please write one or two sentences to describe the implementation for each of the Rosenshine principles below these must be subject specific and observable in lessons.*

Daily Review	New Material in Small Steps	Ask Questions	Provide Models	Guide Student Practice	Check Student Understanding	Obtain High Success Rate	Scaffolds for Difficult Tasks	Independent Practice	Weekly and Monthly Review
Mon Tue Wed Thu Fri Daily review is an important component of instruction. It helps strengthen the connections of the material learned. Automatic recall frees working memory for problem solving and creativity.	Our working memory is small, only handling a few bits of information at once. Avoid its overload—present new material in small steps and proceed only when first steps are mastered.	The most successful teachers spend more than half the class time lecturing, demonstrating and asking questions. Questions allow the teacher to determine how well the material is learned.	Students need cognitive support to help them learn how to solve problems. Modelling, worked examples and teacher thinking out loud, help to clarify the specific steps involved.	Students need additional time to rephrase, elaborate and summarise new material in order to store it in their long-term memory. More successful teachers build in more time for this.	Less successful teachers merely ask "Are there any questions?" no questions are taken to mean no problems. False. By contrast, more successful teachers check on all students.	A success rate of around 80% has been found to be optimal, showing students are learning and also being challenged. Better teachers taught in small steps followed by practice.	Scaffolds are temporary supports to assist learning. They can include modelling, teacher thinking aloud, cue cards and checklists. Scaffolds are part of cognitive apprenticeship.	Independent practice produces 'overlearning" - a necessary process for new material to be recalled automatically. This ensures no overloading of students' working memory.	7 31 The effort involved in recalling recently –learned material embeds it in long-term memory. And the more this happens, the easier it is to connect new material to such prior knowledge.
TLAC: Do Now, Exit ticket, Quizzing. This will be in 3 stages (across 3 lessons) Lesson 1: Quizzing keywords Lesson 2: Quizzing questions (Low marks) Lesson 3: Quizzing questions (High marks)	TLAC: What to do, Name the steps, I do we do you do. Teachers will provide steps/instructions to ensure logic and understanding of students.	TLAC: No opt out, cold call, right is right, stretch it. Teachers will use the phrases and plan questions being asked. Thinking about what the outcome of the questions should be in all abilities.	TLAC: Name the steps, I do we do you do, using the visualiser, show call. Demo's will be given and clarification on steps to complete tasks. Teacher will observe and use student answers for discussion.	TLAC: At bats, pepper, break it down. Writing notes in own words, checking for understanding after. Using at bats and pepper to question understanding.	TLAC: Circulate-check-respond, show me, tracking not watching, reject self-report. Teachers will circulate and observe students working. Whiteboards should be in use and shown to the teacher on request. Be focused on what you are looking for in your observations/give feedback to support mastering of the topic.	TLAC: I do we do you do, 100%, no opt out, SLANT, Circulate-check-respond. Teachers should observe, check and stop learning if misconceptions are identified. All should participate in checking of understanding which is construed by questioning.	TLAC: Break it down, name the steps, turn and talk, build stamina. This should be visible throughout the entire lesson. There will be elements of demo from teachers and students. There should be pair work and opportunity for discussion whilst written and computer work is being undertaken.	TLAC: Build stamina, show call, SLOP – Share lots of practice. Students will be given silent time to formulate ideas and produce work independently. The teacher will observe and share good practice when they see fit during the lesson.	TLAC: Do now, Exit ticket, Quizzing, At bats. This will be visible in the questioning and structure of do nows. Some exit tickets will be visible at the end of lesson. Students will be recalling concepts as they progress through the syllabus therefore recalling will be visible as students will be referring to work that they have previously created.

Term	1	2	3		3	4	5	6		6
Year 10	**GCSE Computer Science:** Unit 3 & 4: Data Representation & Computer Systems Unit 4 will be taught first. This unit focuses on how the computer is built and what components make up the computer system. Pupils will study the Von Neumann architecture and link this to how the memory is used. They will investigate how data is sent through this system and look inside the intricate workings of the CPU and other components. Students will focus on hardware and software that are essential to the computer systems functions. They will study the role is of system software and how it works within the whole system. Unit 4 builds on unit 3 and has a focus on how data is stored and used with the computer. It starts with binary and how the computer converts decimal and hexadecimal into its own language to conserve memory. It moves forward into memory and how much you can store in each memory allocation. Binary arithmetic is covered. And finally, how images and text is stored and compressed to save memory and enable the computer to be the most efficient it can be.			Assessment 1 – Made paper focusing on U3/4	Review and reteach	**GCSE Computer Science:** Unit 1 & 2: Fundamentals of algorithms & Programming Unit 1 introduces algorithms and breaking down a problem. This includes computational thinking which benefits other subjects as it teaches how to approach problems and find solutions. Students will learn flowcharts and Pseudocode which are forms of strategy in how to break down a problem. Unit 2 is the main learning in these terms. This introduces and teaches students how to code and complete problems in a programming language (Python). Students will learn the theory behind the language and the technical programming skills of Python. They will learn how to build programs for different purposes, e.g. to complete arithmetic, file manipulation etc. At the end of the learning students will be given programming problems which accumulate the learning from these units and will be a walkthrough of what is to come next term in their actual NEA.		**GCSE Computer Science:** Non-examined assessment (NEA): Students will be prepared in terms 4/5 and taught how to program. As part of the GCSE, students will need to complete an NEA which is provided by the exam board and students must have 20 hours to complete it. This consists of a programming problem which they will need to create in the time allocated. Students will receive booster sessions of knowledge to ensure they are enabled to complete the NEA.	Assessment 2 – Past Paper 1	Review and reteach
Year 10	**Cambridge National in Creative iMedia:** Unit R081: Pre-Production skills This unit is the basis of all other units in this qualification and teaches skills that are required in all other units. Students will learn what documents and planning requirements there are when creating iMedia. This includes the uses and purpose of mood boards, mind maps, visualisation diagrams, story boards and scripts. Students will then learn how to read and interpret client requirements for pre-production including the importance of identifying the audience needs. Students will learn how to prepare a work plan and schedule which includes health and safety considerations and legislation.		Unit R081: Pre-Production skills Students will produce all the pre-production documents for a client brief. Students will review the pre-production document and identify areas for improvement. Students will sit a written mock exam paper for this unit.	Assessment 1 – Mock paper for Unit R081		**Cambridge National in Creative iMedia:** Unit R082: Creating Digital Graphics This unit teaches students the basics of digital graphics editing. Students will first learn about why and how digital graphics are used. They will learn about the types of graphics and the properties of digital graphics, i.e. properties such as pixel dimension etc. Secondly students will learn how to interpret clients' requirements for a digital graphic, produce a work plan and identify the assets and resources needed for it. In addition, the legislation that goes with using digital graphics will also be taught. Thirdly, students will create a digital graphic. Finally, students will review and identify improvements for the digital graphic. Students will practice the creating the documents necessary to fulfil the assignment briefs using similar scenarios. Students will then be fully prepared to complete the documents necessary for the actual assignment brief which is provided by the exam board. Students will sit the real exam for unit R081. Students will complete revision and preparation work which will enable them to sit this paper.			Assessment 1 – Mock paper for Unit R081	

Term	1		2		3	4		5
Year 11	**GCSE Computer Science:** Unit 5 Computer Networks Students will learn the different types of networks used across the globe. Students will focus then on the structures they can use in each of the networks and learn about the pros and cons of each. Students should be able to recognise which network is suited to a specific scenario. Alongside this, students will learn about the protocols of data transmission across the networks and how to keep the network safe from hackers etc.	*Mock 1*	**GCSE Computer Science:** Unit 6: Cyber Security Students will learn what cyber security is and its purpose. They will focus on the threats that can pose a risk to computers/networks. This includes social engineering and malicious code. Students will learn how to detect and protect their computer/data from cyber security threats, including biometrics, CAPTCHA, etc.	*Mock 2*	**GCSE Computer Science:** Unit 7 Ethics, Legal & Environmental impact on society, recap of all units, recap previous learning. Students will investigate the impact of any ethical, legal and environmental aspects of digital technology on wider society. Students will focus this learning on the following subjects: cyber security, mobile technologies, wireless networking, cloud storage, theft of computer code, issue's around copyright of algorithms, cracking, hacking, wearable technologies and computer-based implants. Students will be expected to understand and explain the general principles. Data privacy issues should be considered in all aspects. Recap learning from all units – focus on main areas of syllabus by completing self-assessment checks and quizzing.		*Mock 3*	Revision and past paper practice to embed knowledge and apply skills

Term	1			2		2	3		3	4		4	5	6		6
Year 12	Topics to be covered: 4.1 Fundamentals of programming • Programming basics • Selection • Iteration • Arrays • Subroutines • Files and exception handling • Problem solving computational thinking • Structured programming	Assessment 1	Review and reteach	Topics to be covered: 4.1 Fundamentals of programming • Structured programming • Writing and interpreting algorithms • Testing • Abstraction and automation • Finite state machines 4.5 Fundamentals of data representation • Number systems • Bits, bytes and binary	Assessment 2	Review and reteach	Topics to be covered: 4.5 Fundamentals of programming • Binary arithmetic • Representing images • Representing sound • Data compression and encryption algorithms 4.6 Fundamentals of computer systems • Hardware and software • Role of an operating system • Programming language classification • Programming language translators • Logic gates • Boolean algebra	Assessment 3	Review and reteach	Topics to be covered 4.7 Fundamentals of computer organisation and architecture • Internal computer architecture • The processor • The processor instruction set • Assembly language • Input-output devices • Secondary storage devices 4.12 Fundamentals of functional programming • OOP and functional programming • OOP design principles • Functional programming • Function application • Lists in functional programming 4.11 Big Data • Big data	Assessment 4	Review and reteach	Topics to be covered: 4.2 Fundamentals of data structure • Vectors • Queues • Lists • Stacks • Hash tables • Graphs • trees 4.3 Fundamentals of algorithms • Algorithms recursive algorithms • Big-O notation • Searching and sorting • Graph traversal algorithms • Optimisation algorithms • Limits of computation		Assessment 5	Review and reteach
	Students will be preparing for their exams throughout the term by learning exam techniques and practicing exam questions.			Students will be preparing for their exams throughout the term by learning exam techniques and practicing exam questions.			Students will be preparing for their exams throughout the term by learning exam techniques and practicing exam questions.			Students will be preparing for their exams throughout the term by learning exam techniques and practicing exam questions.			Students will be preparing for their exams throughout the term by learning exam techniques and practicing exam questions.			
	Students will complete weekly practical programming practice.			Students will complete weekly practical programming practice.			Students will complete weekly practical programming practice.			Students will complete weekly practical programming practice.			Students will complete weekly practical programming practice. Students will be introduced to the programming project. This is worth 20% of the overall grade.			

Term	1		2		3		4		5
Year 13	Topics to be covered: 4.10 Fundamentals of databases - Entity relationship modelling - Relational databases and normalisation - Introduction to SQL - Defining and updating tables using SQL - Systematic approach to problem solving	***_Mock 1***	Topics to be covered: 4.9 Fundamentals of communicating and networking - Communication methods - Network topology - Client-server and peer-to-peer - Wireless networking - Communication and privacy 4.8 Consequences of using computers - Social, legal and cultural issues	***Mock 2***	Topics to be covered: 4.4 Theory of computation - Regular languages: Mealy machines - Sets - Regular expression 4.5 Fundamentals of data representation - Turing machines - Bachus-Naur - Reverse polish notation 4.9 Fundamentals of communicating and networking - The internet: structure of the internet - Packet switching and routers - Internet security - TCP/IP standard application layer protocols	***Mock 3***	Topics to be covered: 4.9 Fundamentals of communicating and networking - IP addresses - Client-server model	***Mock 4***	**Revision and past paper practice to embed knowledge and apply skills**
	Students will also be working on the programming project which is a requirement of the exam board and is worth 20% of the overall grade.		Students will also be working on the programming project which is a requirement of the exam board and is worth 20% of the overall grade.		Students will also be working on the programming project which is a requirement of the exam board and is worth 20% of the overall grade.		Students will also be completing their work on the programming project which is a requirement of the exam board and is worth 20% of the overall grade.		
	Students will be preparing for their exams throughout the term by learning exam techniques and practicing exam questions.		Students will be preparing for their exams throughout the term by learning exam techniques and practicing exam questions.		Students will be preparing for their exams throughout the term by learning exam techniques and practicing exam questions.		Students will be preparing for their exams throughout the term by learning exam techniques and practicing exam questions.		

Impact

In KS4 in computer science we have a progress 8 score of +0.2 in both 2018 and 2019.
2017-18: Progress score of +0.2 (Grade 4 58.1%) (Grade 5 45.2%)
2018-19: Progress score of +0.2 (Grade 4 28%) Grade 5 20%)

We have currently changed the curriculum which in 2020 should increase the numbers in KS5. We have provided two pathways with the GCSE in computer science and Cambridge National in Creative iMedia to ensure inclusivity. We do not teach in KS3 therefore KS4 numbers are built from extra-curricular clubs, options assembly and promotion of the subject around the school.

2018-19 results
Boys progress -0.2
Girls progress +1.3
SEN -0.3
Non-SEN +0.3
PP Progress -0.5
Higher ability progress +1.2
EAL +4.8
There are some areas for improvement, which we have addressed in the curriculum.