Ravens Wood School

KS3 Curriculum Plan

Subject: Computer Science

Overarching Topic 1: Networking			
Why is this topic being studied at this time? How does it fit into the wider subject curriculum?	How do computers communicate? The first network was created by the United States Advanced Research Project Agency Network (ARPANET) in 1969. It was the first public packet-switched computer network, and its main use was for academic and research purposes. Many of the protocols used by computer networks today were developed for ARPANET and it is considered the forerunner of the modern Internet. Our current state of dependence on technology means that students must know how computers communicate. Furthermore, they learn about when does a standalone computer become a network and which hardware, software and communications media work together to form a network?		
	Critical	**Core**	**Pinnacle**
The Big Questions (What questions will students be able to answer upon mastery of the topic?)	What is the difference between the Internet and the World Wide Web? What is a domain name? What are the three most commonly used network topologies?	What is the meaning and significance of bandwidth? What are the advantages and disadvantages of the three main network topologies? Can you identify some of the hardware components used in a LAN?	Can you design a network layout for a given purpose using the hardware components you have previously learnt? Can you describe the concept of cloud computing and some of the benefits it brings to individuals and organisations?
The Key Skills/ Techniques	**The sophistication and application of skills will become more advanced as students' progress through the critical, core and pinnacle knowledge.**		
	Skill/Technique	**How will this skill be developed?**	
	Understand how web addresses are constructed	This skill will be developed through deconstruction of an IP address and by explaining the significance of each address segment.	
	Understand how packet switching works.	This concept will be developed using online video resources and by using the Packet Switching Resource Sheet. Students can role play the job of routers and the packet switching process from sender to receiver. The resource also explains that images are sent in the same way as text; the image is split into chunks and sent as packets too.	

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Overarching Topic 2: AI & Machine Learning			
Why is this topic being studied at this time? How does it fit into the wider subject curriculum?	Can Robots replace humans? This is a question that has been asked since the 1950s when Von Neumann and Turing revolutionised the computers of the 20th century. It was during this decade that the term "artificial intelligence" was coined. The sci-fi world along with futurists like to suggest that artificial intelligence amounts to sinister robots who become obsessed with eradicating humanity. It's fun to contemplate such fantasies, but they nonetheless give us the false impression about what artificial intelligence actually is. Technological advancement is inevitable. It is more than likely that artificial intelligence will be applied in many fields and that this exponentially developing technology will diversify itself. However, students must be aware of how AI evolves to make sure it works flawlessly and without threatening their fundamental rights. For instance, algorithms must be audited by independent bodies to ensure that they function fairly. Our lives are becoming increasingly interwoven with AI-based systems. Since artificial intelligence is applied in various areas to make important decisions about us and our lives, it is essential we know how this technology works for the benefit of all of us.		
	Critical	**Core**	**Pinnacle**
The Big Questions (What questions will students be able to answer upon mastery of the topic?)	Where did AI originate and how far have we come? How do computers make rules used in AI decision making? What is the difference between facts and rules?	What training data can be provided to a machine and what can it do with this information? Where is machine learning used in our world today and how can this be developed further? What are the impacts of AI and machine learning on our futures?	What are the strengths and weaknesses of machine learning? How can bias be introduced into AI algorithms and machine learning and what is the impact? Why is the process of interpreting patterns is not as useful a skill as 'thinking'?
The Key Skills/ Techniques	**The sophistication and application of skills will become more advanced as students' progress through the critical, core and pinnacle knowledge.**		
	Skill/Technique	**How will this skill be developed?**	
	Understand the difference between facts and rules	This skill will be developed by use of worksheet based scenarios where students need to identify food using AI, moving on to decisions made by self-driving cars	
	Image recognition	Students use practical exercises guided by worksheets to describe techniques for detecting patterns in a grid of pixels. Discussion based activities identify a number of problems with facial recognition that may result in breaking AI rules to detect a specific fact.	

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Overarching Topic 3: Python programming project.			
Why is this topic being studied at this time? How does it fit into the wider subject curriculum?	How can we solve a problem using the four pillars of computational thinking? Further to your son's experience of Python in year 7 and year 8, he will now have the opportunity to develop these problem solving and logical thinking knowledge and skills by working with a given scenario. Students will recap the fundamentals of Python and then be gradually introduced to the stages of the systems life cycle. Students should know that all problems, new or existing, require the use of a systems life cycle in order to create or improve a specific product or system. They will learn the fundamentals of project management by working through the systems life cycle in order to create a solution to a given scenario.		
	Critical	**Core**	**Pinnacle**
The Big Questions (What questions will students be able to answer upon mastery of the topic?)	What are the 3 basic programming structures of sequence, selection and iteration? What basic programming techniques can I use to create a solution to a problem?	How can I use data types correctly and convert between them when necessary? How do we create lists in python? What are procedures and functions?	How can I use the four pillars of computational thinking (abstraction, decomposition, pattern recognition and algorithmic thinking) to solve a given problem?
The Key Skills/ Techniques	**The sophistication and application of skills will become more advanced as students' progress through the critical, core and pinnacle knowledge.**		
	Skill/Technique	**How will this skill be developed?**	
	Programming	Students will undertake practical activities based on re-producing code supplied by their teacher then writing their own code based on this.	
	Problem solving and team work	During the practical activities, errors will be encountered that students will need to rectify themselves. Students will work together to review each other's code to try to assist in fixing any issues that arise. They will also be given access to 'cheat' sheets that will provide details of programming syntax for them to refer to as a reference guide.	

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Overarching Topic 4: Logic and Boolean Algebra			
Why is this topic being studied at this time? How does it fit into the wider subject curriculum?	Boolean algebra is fundamental in the development of digital electronics, and is provided for in all modern programming languages. If students use different voltage levels to symbolise binary bits, they can turn extremely basic Boolean gates into the components needed to make simple mechanical calculators, including counters, adders, and other mathematical tools. From there, it's only a small step to design circuits that use Boolean logic to subtract, multiply, divide, and more. During their programming project, students will have used Boolean logic during their use of selection statements. They can apply the same logical process to understanding how logic gates work within a computer to perform these functions. This also refers back to their work in Year 7 on Logic Gates and is a good opportunity for students to recall this knowledge before progressing on their GCSE journey.		
	Critical	**Core**	**Pinnacle**
The Big Questions (What questions will students be able to answer upon mastery of the topic?)	What symbols are used to represent NOT, AND, and OR logic gates? How do I know the various outputs from a logic gate?	How can recognise a logic gate from its truth table? How do I draw a logic circuit to solve a given problem? How do I construct basic logic statements?	How can I draw a logic circuit to implement a given written logic statement?
The Key Skills/ Techniques	**The sophistication and application of skills will become more advanced as students' progress through the critical, core and pinnacle knowledge.**		
	Skill/Technique	**How will this skill be developed?**	
	Recognise a given logic gate and/or be able to recall the shape of an AND, OR,NOT gate	Students will be given lots of practice in drawing and recalling each gate.	
	Calculate the output of logic gates based on the input	Students will use truth tables to identify outputs from possible combinations of inputs.	

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<table>
<tr><td colspan="4">Overarching Topic 5: Flash Animation Project</td></tr>
<tr><td>Why is this topic being studied at this time?

How does it fit into the wider subject curriculum?</td><td colspan="3">In this unit, we let out the creative side of our students. They will be taught how to create their own Flash Animation project. Pupils will learn how animations are created and use a variety of drawing and animation techniques including tweening and motion paths in order to plan, create and export a multi-layered animation into a format that can be played as a standalone file or as a moving image within a web page. The unit includes theory on frame rates and the effect on file size. Pupils are encouraged to analyse existing animated advertisements before planning and creating their own to deliver effective messages to a specific audience.

This topic provides students with links to media based subjects as well as technology based subjects. Animations are used in marketing as well as for general entertainment purposes and students can link their animation to both of these simultaneously.</td></tr>
<tr><td></td><td>Critical</td><td>Core</td><td>Pinnacle</td></tr>
<tr><td>The Big Questions
(What questions will students be able to answer upon mastery of the topic?)</td><td>How do I create a simple animation using drawing and frame-by-frame techniques?

How can I improve my animation to create a more smooth animation?

How do I create an animation that carries a simple message?</td><td>How does tweening and frame-by-frame techniques improve my animation?

How can I improve my animation to carry an effective message?</td><td>How can I ensure that my animation is suitable for a specific audience and purpose?

What combination of techniques can I use to produce a more professional animation?</td></tr>
<tr><td rowspan="4">The Key Skills/ Techniques</td><td colspan="3">The sophistication and application of skills will become more advanced as students' progress through the critical, core and pinnacle knowledge.</td></tr>
<tr><td>Skill/Technique</td><td colspan="2">How will this skill be developed?</td></tr>
<tr><td>Understand the part that frame rate plays in a working animation</td><td colspan="2">By use of online learning videos and examples of animation. Additionally, students will use step by step worksheets to develop these skills.</td></tr>
<tr><td>Use standard tools such as Motion tweening, text buttons and sound effects</td><td colspan="2">This is a practical unit whereby students will learn at their own pace with the assistance of many examples, from peers, from online and from using the detailed worksheets available.</td></tr>
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