

COMPUTER SCIENCE

Year 7 – 9 Curriculum rationale

At Key Stage 3, the Computer Science curriculum focuses on three main strands identified by the Royal Society as integral to developing computing, with each component is essential in preparing pupils to thrive in an increasingly digital world. The curriculum weaves together digital literacy, information technology and computer science across the Key Stage, and ensures continual progression from year to year.

Students will learn computational thinking techniques for tackling real-world problems while developing an understanding of algorithms and logical reasoning for effective problem-solving.

Proficiency in programming starts in Year 7 with block based coding using Edublocks and moves quickly through to textual programming with Python.

The curriculum covers foundational concepts such as Boolean logic, binary representation, and basic binary operations. Students will gain comprehensive knowledge of computer systems, including hardware, software components, data manipulation, and execution of instructions.

Engaging in creative projects using multiple applications and platforms, students will learn to collect, analyse and model data, as well as create digital artefacts with attention to trustworthiness, design, and usability. Promoting responsible technology use, students will develop literacy in recognising and reporting inappropriate content and recognise the importance of critically assessing the information they see online.

With an eye to the future, units covering programming using drones; cyber-security; artificial intelligence; and app/game development are reviewed and updated regularly. The curriculum will ensure a well-rounded and forward-looking student experience in preparation for Key Stage 4 and beyond.

	Autumn	Spring	Summer
Year 7	Term 1: Computational Thinking Term 2: Online Awesomeness	Term 3: The Evolution of Computers Term 4: Programming - Edublocks	Term 5: Using Media - gaining support for a cause Term 6: Game Development TBC
	<p>Computational Thinking: This unit introduces students to computational thinking, covering four main components:</p> <ol style="list-style-type: none"> 1. Algorithms 2. Decomposition 3. Pattern Recognition 4. Abstraction <p>The lessons cover:</p> <ul style="list-style-type: none"> ● Defining and creating algorithms ● Breaking down complex problems (decomposition) ● Identifying patterns in problems and solutions ● Abstracting essential information and filtering out unnecessary details ● Comparing algorithm efficiency <p>Learning Objectives: By the end of the unit, students will be able to:</p> <ul style="list-style-type: none"> ● Explain the terms algorithm, decomposition, abstraction, and pattern recognition ● Produce simple algorithms to solve problems ● Apply computational thinking concepts to various scenarios ● Compare algorithms and understand efficiency <p>Online Awesomeness focuses on various aspects of digital citizenship and online safety for Year 7 students. The main topics include:</p> <ol style="list-style-type: none"> 1. Screen time and its effects 	<p>The Evolution of Computers reflects a remarkable journey through technological innovation and societal change. From early mechanical devices to today's smartphones and quantum computers, this curriculum explores key milestones and figures like Charles Babbage and Ada Lovelace. It examines how computers have revolutionised communication, commerce, and education, while addressing important ethical issues like privacy, data security, and the digital divide. Looking ahead, the course explores emerging technologies such as artificial intelligence and quantum computing, preparing students to navigate the future of technology with awareness and responsibility.</p> <p>The Evolution of Computing Devices</p> <ul style="list-style-type: none"> ● Understanding the progression from early mechanical computers to modern digital devices ● Exploring key milestones in computer history <p>Social Impacts of Computing</p> <ul style="list-style-type: none"> ● Analysing how computers have changed society ● Discussing ethical considerations in computing <p>Future Trends in Computing</p> <ul style="list-style-type: none"> ● Exploring emerging technologies like AI, IoT, and quantum computing ● Considering potential future impacts on society <p>Computing Pioneers</p>	<p>The Year 7 "Using Media" unit focuses on developing students' digital literacy and information technology skills, helping them create and promote a web page for a cause they feel passionate about. The unit covers key topics such as word processing, copyright and licensing, credibility of sources, webpage creation, and promoting a cause through digital media.</p> <p>Lessons:</p> <ol style="list-style-type: none"> 1. Word Processing and Formatting: <ul style="list-style-type: none"> ○ Learn about the features of word processing software. ○ Practice formatting techniques (bold, alignment, font styles) to enhance document readability and presentation. 2. Copyright and Licensing of Images: <ul style="list-style-type: none"> ○ Understand the importance of selecting appropriate images for online content. ○ Explore copyright laws and Creative Commons licences, learning how to credit image authors appropriately. 3. Evaluating Credibility of Sources: <ul style="list-style-type: none"> ○ Learn techniques to verify the trustworthiness of online content. ○ Develop critical thinking skills to assess information's credibility (source, authorship, and factual accuracy). 4. Planning and Creating a Web Page: <ul style="list-style-type: none"> ○ Plan, research, and construct a webpage based on a chosen cause. ○ Incorporate proper citations, maintain image integrity, and ensure the layout

	<ol style="list-style-type: none"> 2. Selfie safety and online image sharing 3. Trolling and cyberbullying 4. Cybercrime and online fraud protection <p>Students will be able to:</p> <ol style="list-style-type: none"> 1. Identify ways they engage with the online world and explain concepts using correct technical terms 2. Understand the consequences of excessive screen time on mental and physical health 3. Recognize potential problems of sharing images online and understand long-term consequences 4. Describe different types of internet trolls and understand how to be an "upstander" against cyberbullying 5. Identify various cybercrime techniques and examine examples of scam emails 	<ul style="list-style-type: none"> ● Learning about significant figures in computer science history ● Understanding their contributions to the field <p>Environmental Impact of Computing</p> <ul style="list-style-type: none"> ● Examining the ecological footprint of technology ● Exploring sustainable computing practices <p>Programming: EduBlocks</p> <p>This unit is designed to help students transition from block-based coding (like Scratch) to text-based programming in Python. The unit covers six structured lessons and an end-of-unit assessment, making it ideal for introducing students to the world of coding through a familiar interface</p> <p>Lesson 1: Introduction to Python and Coding Concepts</p> <ul style="list-style-type: none"> ● Topics Covered: <ul style="list-style-type: none"> ○ This lesson bridges the gap between Scratch and Python, introducing students to text-based coding through a familiar block interface. ○ Concepts such as algorithms, sequencing, and basic coding structures are taught. ○ Students are introduced to EduBlocks, a visual tool that translates code blocks into Python text, making it easy to visualise the connection between block-based and text-based programming. ○ Learning Activity: Students compare simple Scratch code (block-based) with its Python equivalent to 	<p>is appealing for the intended audience.</p> <ol style="list-style-type: none"> 5. Promoting a Cause: <ul style="list-style-type: none"> ○ Apply skills in digital media and design to effectively promote a cause through the web page. ○ Organise content logically and reference all materials. 6. Project Assessment: <ul style="list-style-type: none"> ○ Evaluate and complete the project based on peer feedback, with a focus on proper content organisation, referencing, and digital presentation.
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understand how code translates between the two.

Lesson 2: Turtle Graphics and Iteration

- **Topics Covered:**
 - Introduces **Turtle**, a Python library for drawing shapes and patterns using code.
 - The lesson focuses on **iteration**, teaching students how to use **loops** (for, while) to repeat tasks efficiently.
 - Students learn how to draw shapes and complex patterns by controlling **Turtle** with iterative code.
 - **Learning Activity:** Students use loops to draw repeating patterns and explore the use of different shapes in Turtle.

Lesson 3: User Input and Data Types

- **Topics Covered:**
 - Teaches how to receive and process **user input** in Python, a key skill for interactive programs.
 - Students are introduced to different **data types** (e.g., integers, floats, strings) and learn about **logic** and handling **errors** in Python code.
 - **Learning Activity:** Students create simple interactive programs where users input data (e.g., their name or age), and the program processes and responds to the input.

Lesson 4: Variables and Their Use

- **Topics Covered:**
 - This lesson explains **variables**—how to declare them, store values, and use them in a Python program.
 - Students learn how to manipulate data stored in variables and apply

variables to **Turtle** to create dynamic shapes.

- **Learning Activity:** Students write programs using variables to control the size or number of shapes drawn by Turtle.

Lesson 5: Functions and Subroutines

- **Topics Covered:**
 - This lesson introduces **functions**, one of the core principles of efficient programming. Students learn to break down their code into smaller, reusable sections.
 - They also learn about **arguments** and **return values**, enabling them to pass data into and out of functions.
 - **Learning Activity:** Students create simple functions to draw specific shapes using **Turtle** and experiment with passing parameters to control how the shapes are drawn.

Lesson 6: Building a Final Project

- **Topics Covered:**
 - This project-based lesson allows students to apply the knowledge from the previous lessons to build their own creative projects using **Turtle**.
 - Students are encouraged to experiment with all they have learned, from loops and functions to variables and user input.
 - **Learning Activity:** Students work on a **mini-project** of their choice (e.g., creating a simple drawing program, building an interactive game using Turtle) and present their work to the class.

<p>Why?</p>	<p>Computational thinking is a fundamental skill set in the modern digital age. It's important for students to learn this topic because:</p> <ol style="list-style-type: none"> 1. Problem-solving skills: It teaches students how to approach complex problems systematically. 2. Digital literacy: It prepares students for a world increasingly driven by technology and algorithms. 3. Logical thinking: It enhances students' ability to think logically and critically. 4. Career readiness: Many future jobs will require computational thinking skills, even outside of traditional computer science roles. 5. Interdisciplinary applications: These skills can be applied across various subjects and real-life situations. <p>Online Awesomeness: The importance of learning about online safety, digital citizenship, and responsible technology use is paramount in today's increasingly digital world.</p> <p>Digital Integration in Daily Life: As technology continues to permeate every aspect of our lives, understanding how to navigate the digital world safely becomes essential. From online banking to social interactions, students need to be equipped with the knowledge to protect themselves and make informed decisions online.</p> <p>Future Career Readiness: Most future careers will involve some level of digital interaction. By learning about online safety and responsible technology use early, students are developing crucial skills that will be valuable in virtually any profession they choose.</p> <p>Cybersecurity Awareness: With the rise of cybercrime, understanding how to protect personal information and recognise potential threats is becoming as important as</p>	<ul style="list-style-type: none"> - Contextual Understanding: Knowledge of computer history helps students appreciate the rapid pace of technological advancement and prepares them for future changes. - Ethical Awareness: Understanding the social impacts of computing helps students become responsible digital citizens and tech professionals. - Career Preparation: Insight into future trends can guide students in choosing relevant skills to develop for their future careers. - Innovation Inspiration: Learning about computing pioneers can inspire students to pursue their own innovations in technology. - Environmental Responsibility: Awareness of computing's environmental impact encourages students to consider sustainability in their future tech-related decisions. - Critical Thinking: Analysing the evolution and impact of technology develops critical thinking skills applicable in many fields. - Interdisciplinary Connections: This topic connects computer science with history, sociology, and environmental studies, broadening students' perspectives. <p>Programming: EduBlocks</p> <p>Smooth Transition: The EduBlocks unit is designed to ease students into text-based programming, making the transition from Scratch much more manageable and engaging.</p> <p>Hands-on Learning: By using fun and visual projects like Turtle graphics, students get instant feedback on their code, which reinforces understanding.</p>	<p>Using Media:</p> <p>This unit is critical in preparing students for the digital age, where media literacy and the ability to navigate online content are essential. Key benefits include:</p> <ol style="list-style-type: none"> 1. Digital Literacy: Mastery of word processing, web design, and media tools helps students adapt to modern educational and professional environments, where digital communication is standard. 2. Critical Thinking: Students learn to evaluate the credibility of sources, ensuring that they do not fall prey to misinformation—an increasingly important skill in a world of "fake news." 3. Understanding Copyright and Ethics: Knowing how to legally use and credit others' work fosters ethical behaviour and respect for intellectual property, crucial in creative and academic industries. 4. Web Design Skills: Building a webpage equips students with practical skills that are highly valued in many careers, such as marketing, media, and IT. 5. Communication and Persuasion: Promoting a cause develops students' ability to communicate persuasively and clearly, skills important for activism, public speaking, and leadership roles in their futures.
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<p>physical safety skills. This knowledge will help students safeguard themselves and potentially their future employers from digital threats.</p> <p>Mental Health and Well-being: As social media and constant connectivity become more prevalent, understanding the impact of screen time and online interactions on mental health is crucial. This knowledge can help students maintain a healthy relationship with technology throughout their lives.</p> <p>Digital Footprint Management: Everything posted online contributes to a person's digital footprint. Teaching students about this concept early helps them make more conscious decisions about what they share online, which can impact their future educational and career opportunities.</p> <p>Critical Thinking in the Information Age: With the abundance of information (and misinformation) available online, developing critical thinking skills to evaluate online content is essential. This skill will be crucial for students as they navigate an increasingly complex information landscape.</p> <p>Ethical Online Behaviour: Understanding the impact of online actions on others helps foster a more respectful and empathetic digital community. This is important for creating a positive online environment and can translate to better interpersonal skills in the real world.</p> <p>Data Privacy Awareness: As data becomes an increasingly valuable commodity, understanding how personal data is collected, used, and protected online is crucial. This knowledge will help students make informed decisions about their privacy in an increasingly data-driven world.</p> <p>Digital Citizenship: Learning to be a responsible digital citizen prepares students to actively participate in</p>	<p>Real-World Relevance: Understanding core programming concepts like variables, loops, and functions lays the groundwork for more advanced programming in Python and other languages.</p> <p>Creative Expression: Students get the chance to apply their skills creatively in project-based learning, building confidence and problem-solving abilities.</p> <p>Cross-Platform: EduBlocks allows advanced students to explore different programming environments, including Python, microBit, and HTML, broadening their digital skills.</p>	
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	<p>online communities and digital democracy. This is increasingly important as more civic and political engagement moves online.</p> <p>Adaptability to Technological Change: By understanding the fundamental principles of online safety and digital literacy, students will be better prepared to adapt to new technologies as they emerge. This adaptability will be crucial in a rapidly evolving technological landscape.</p> <p>Global Connectivity: As the world becomes more connected, understanding how to interact safely and respectfully with people from diverse backgrounds online becomes increasingly important. This knowledge promotes global understanding and cooperation.</p> <p>Innovation and Creativity: A solid understanding of digital tools and online safety allows students to explore and innovate with technology more confidently. This can lead to new ideas and solutions in various fields.</p> <p>By learning these topics, students are not just preparing for the digital aspects of their future careers, but are also developing essential life skills that will help them navigate the complexities of the modern world. This knowledge empowers them to harness the benefits of technology while minimising its risks, setting them up for success in both their personal and professional lives.</p>		
<p>How parents / carers can support</p>	<p>Computational thinking External Resources for Enhanced Study:</p> <ol style="list-style-type: none"> 1. BBC Bitesize KS3 Computer Science - Computational Thinking: https://www.bbc.co.uk/bitesize/guides/zp92mp3/revision/1 2. Code.org's Computational Thinking course: https://studio.code.org/s/course4/stage/1/puzzle/1 	<p>Virtual Computer History Tours</p> <p>Computer History Museum Virtual Tours (https://computerhistory.org/exhibitions/virtual-tours/)</p> <p>Tech Pioneer Biographies: Ada Lovelace Day (https://findingada.com/)</p> <p>Future Tech Exploration</p>	<p>Ideas, Web Links, and Learning Opportunities for Home:</p> <p>To deepen understanding and practice at home, students can explore the following resources and activities:</p>

<p>3. CS Unplugged - Computational Thinking activities: https://csunplugged.org/en/computational-thinking/</p> <p>4. Google for Education - Computational Thinking Course: https://edu.google.com/resources/programs/exploring-computational-thinking/</p> <p>5. Scratch - A free programming language for creating interactive stories, games, and animations: https://scratch.mit.edu/</p> <p>6. Khan Academy - Computing courses: https://www.khanacademy.org/computing</p> <p>These resources offer a mix of explanations, interactive exercises, and practical applications that can help reinforce the concepts learned in class and provide additional challenges for students who want to explore further</p> <p>Internet Awesomeness External Resources for Enhanced Study:</p> <ol style="list-style-type: none"> 1. Common Sense Media - Digital Citizenship Curriculum: https://www.commonsense.org/education/digital-citizenship 2. Internet Matters - Online Safety Advice: https://www.internetmatters.org/ 3. Childnet International - Young People's Resources: https://www.childnet.com/young-people/ 4. UK Safer Internet Centre: https://www.saferinternet.org.uk/advice-centre/young-people 5. National Crime Agency - ThinkUKnow: https://www.thinkuknow.co.uk/ 	<p>MIT Technology Review (https://www.technologyreview.com/)</p> <p>Ethical Computing Debates</p> <p>Ethics in Technology (https://ethics.acm.org/)</p> <p>Retro Computing Experience</p> <p>Try using an emulator to experience early computing systems</p> <ul style="list-style-type: none"> • Resource: Internet Archive's Software Library (https://archive.org/details/softwarelibrary) <p>Environmental Impact Calculator</p> <p>Calculate your personal technology carbon footprint</p> <p>Greenpeace's Guide to Greener Electronics (https://www.greenpeace.org/usa/reports/greener-electronics/)</p> <p>AI and Machine Learning Experiments</p> <p>Experiment with beginner-friendly AI tools</p> <p>Google AI Experiments (https://experiments.withgoogle.com/collection/ai)</p> <p>Programming: EduBlocks</p> <p>Online Coding Platforms</p> <ul style="list-style-type: none"> • Repl.it: An interactive platform where students can write Python code and see results instantly. It's perfect for experimenting with code learned in EduBlocks and trying out new Python projects. 	<ol style="list-style-type: none"> 1. Online Tools for Word Processing and Web Design: <ul style="list-style-type: none"> ○ Google Docs (https://docs.google.com/): Practice document formatting techniques. ○ Google Sites (https://sites.google.com/): Build a simple webpage and experiment with layouts and images. 2. Creative Commons and Copyright Resources: <ul style="list-style-type: none"> ○ Creative Commons Search (https://search.creativecommons.org/): Find copyright-free images to use in projects and learn about different licenses. ○ YouTube - Copyright and Creative Commons (https://www.youtube.com/watch?v=q0VzUigrb_g): Short videos explaining copyright laws and how Creative Commons licenses work. 3. Fact-Checking and Evaluating Sources: <ul style="list-style-type: none"> ○ Fact-Checking Websites: ○ Snopes (https://www.snopes.com/): Check the credibility of viral stories and news. ○ FactCheck.org (https://www.factcheck.org/): Evaluate the trustworthiness of political claims and public statements. ○ Quizizz (https://quizizz.com/admin/quiz/6557b20184c6de9aaed4e872?source=quiz_share): Take quizzes on identifying fake news and credible sources. 4. Web Design Tutorials: <ul style="list-style-type: none"> ○ Codecademy (https://www.codecademy.com/): Free web design tutorials to understand HTML and CSS basics. ○ W3Schools (https://www.w3schools.com/):
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6. MediaSmarts - Digital and Media Literacy:
<https://mediasmarts.ca/digital-media-literacy>

- **Codecademy:** Offers interactive Python tutorials starting from basic concepts to advanced topics. Codecademy provides exercises and projects to practice coding in real-world contexts.
- **Edublocks:** The platform where students can continue working on block-based Python projects. It is a fantastic tool for bridging the gap between visual coding (like Scratch) and text-based programming.

2. Python Learning Resources

- **Automate the Boring Stuff with Python:** A free, beginner-friendly book that teaches Python by working through practical coding tasks like automating repetitive tasks on the computer. It's especially great for students wanting to apply Python to real-life problems.
- **Real Python:** A website packed with tutorials, articles, and challenges. It's perfect for deepening Python skills through more advanced topics like working with APIs, web scraping, and object-oriented programming.
- **W3Schools Python Tutorial:** A simple and easy-to-follow guide for learning Python basics. The website provides interactive examples and allows students to test their Python code directly in the browser.

3. Python Projects and Challenges

- **Project Euler:** A website that offers a series of challenging mathematical and computational problems to be solved with programming. It's a great way for students to stretch their problem-solving skills using Python.
- **LeetCode:** Provides coding challenges that range from easy to difficult. It's perfect for students who want to practice Python by solving real-world problems.

Learn about webpage elements like tables, images, and text formatting.

5. Interactive Learning Platforms:

- **Kahoot! (<https://kahoot.com/>):** Engage in interactive quizzes related to media, technology, and digital literacy.
- **BBC Bitesize (<https://www.bbc.co.uk/bitesize/>):** Explore lessons on ICT, media, and more.

		<ul style="list-style-type: none"> ● Kaggle: This platform allows students to work on data science projects using Python. Students can access datasets and notebooks to learn how Python is used in data analysis. 	
	Autumn	Spring	Summer
	Term 1: Introduction to Programming Term 2: My Digital World	Term 3: Layers of Computing Systems Term 4: TBC - Drone Programming	Term 5: Data Modelling using Spreadsheets Term 6: Vector Graphics
Year 8	<p>Introduction to Programming:</p> <p>This unit introduces Year 8 students to text-based programming with Python. The curriculum covers:</p> <ol style="list-style-type: none"> 1. Basic programming concepts: input/output, variables, and arithmetic operations 2. Program flow control: selection (if/else statements) and iteration (while loops) 3. Randomness and logical expressions 4. Combining concepts to create simple games and practical applications <p>Key learning objectives include:</p> <ul style="list-style-type: none"> ● Writing and executing Python programs ● Understanding algorithms and program execution ● Using variables, arithmetic expressions, and user input ● Implementing selection and iteration ● Debugging and error correction 	<p>Layers of Computing Systems</p> <p>This unit introduces Year 8 students to the layers of computing systems, from programs and operating systems to physical components and binary building blocks. It provides a concise overview of how computing systems operate, focusing on essentials while abstracting complex technical details.</p> <p>Key Topics:</p> <ul style="list-style-type: none"> - General-purpose computing systems - Programs and their execution - Hardware components - Operating systems - Logic gates and circuits - Artificial intelligence and machine learning - Open source software <p>Learning Objectives by Lesson</p> <p>Lesson 1: Get in Gear</p> <ul style="list-style-type: none"> - Understand general-purpose computing systems - Define programs as sequences of instructions - Differentiate between general-purpose systems and purpose-built devices <p>Lesson 2: Under the Hood</p> <ul style="list-style-type: none"> - Describe functions of hardware components - Explain how components work together to execute programs 	<p>The Data Modelling using Spreadsheets Unit introduces students to the world of data modelling using spreadsheet software. Beginning with basic navigation, students learn to identify key components such as rows, columns, cells, and cell references. Through hands-on tasks, they apply formatting techniques to enhance data presentation. As the unit progresses, students develop proficiency in basic calculations using formulas (+, -, *, /) and explore the autofill feature to replicate data efficiently.</p> <p>The unit then transitions into data collection, teaching students the difference between raw data and processed information. They learn to design surveys and gather primary data for analysis. Following this, they explore more advanced spreadsheet functions like SUM, MAX, MIN, and COUNTA, and how to visualise data through charts. By the end of the unit, students master additional functions like AVERAGE, IF, and COUNTIF, and are able to sort and filter large datasets. In the final lessons, conditional formatting is introduced, allowing students to visually represent data trends automatically. The unit culminates in an assessment where students apply all the skills they've learned.</p>

	<ul style="list-style-type: none"> Applying programming concepts to solve problems <p>My Digital World</p> <p>This unit focuses on important digital literacy topics including online safety, online reputation, big data, malware, and data protection. The lessons are designed to teach students how to navigate the internet safely, protect their digital footprint, and understand how personal data is collected and used online.</p> <p>Learning Objectives:</p> <ol style="list-style-type: none"> Online Safety: Students learn to identify potential risks in their daily online activities, such as social media use, phishing, and malware, and explore practical actions to protect themselves. Online Reputation: Students assess their own digital footprint, understand how their online behaviour impacts personal and professional opportunities, and learn strategies to manage and improve their online reputation. Big Data and Data Protection: Lessons introduce students to big data, its use by companies and governments, and the privacy implications involved. They also explore data protection techniques like encryption and two-factor authentication. Digital Privacy and Rights: Students learn about their rights to privacy, such as the right to access and delete personal data, 	<ul style="list-style-type: none"> Recognize the similar structure of all computing systems <p>Lesson 3: Orchestra Conductor</p> <ul style="list-style-type: none"> Analyze hardware component interactions Define operating systems and their role <p>Lesson 4: It's Only Logical</p> <ul style="list-style-type: none"> Describe logical operators (NOT, AND, OR) Construct logic circuits using gates Understand binary representation of data and instructions <p>Lesson 5: Thinking Machines</p> <ul style="list-style-type: none"> Define artificial intelligence and machine learning Identify real-world AI applications Describe machine learning processes Compare machine learning to traditional programming Consider ethical implications of AI <p>Lesson 6: Sharing</p> <ul style="list-style-type: none"> Explain implications of sharing program code Understand key concepts of open source software <p>Programming Drones using Python</p> <p>This innovative unit combines Python programming with drone technology, offering students a unique, hands-on learning experience. Using the CoDrone EDU, an educational drone designed for learning, students will progress from basic flight controls to more advanced concepts like autonomous navigation and simple computer vision.</p> <p>The unit goes beyond mere drone operation, focusing on developing crucial skills such as problem-solving, critical thinking, and data analysis. Students will learn to make logical</p>	<p>Learning Objectives Summary:</p> <ol style="list-style-type: none"> Basic Spreadsheet Use: <ul style="list-style-type: none"> Identify spreadsheet components (rows, columns, cells). Use basic formatting techniques to organise data visually. Formulas and Functions: <ul style="list-style-type: none"> Perform calculations using basic formulas (add, subtract, multiply, divide). Use advanced functions such as SUM, COUNTIF, AVERAGE, and IF. Data Collection and Analysis: <ul style="list-style-type: none"> Differentiate between primary and secondary data. Collect, analyse, and present data through visual representations like charts. Advanced Data Manipulation: <ul style="list-style-type: none"> Sort and filter large datasets using advanced functions. Apply conditional formatting to automate data display based on set criteria. <p>The Vector Graphics unit offers students the opportunity to create graphics using vector graphic editing software like Inkscape. By the end of the unit, students will have created illustrations, logos, or icons. This unit enables them to understand and utilise the tools necessary for creating digital graphics.</p> <p>Lesson Overviews and Learning Objectives:</p> <p>Lesson 1: Get into Shapes</p>
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	<p>and discuss the ethical implications of data collection.</p> <p>5. Online Filter Bubbles: The concept of filter bubbles and their impact on limiting diverse information online is introduced, along with strategies for students to diversify their sources and break out of these bubbles.</p>	<p>decisions based on sensor inputs and work collaboratively on projects. These skills are invaluable across various subjects and prepare students for future opportunities in fields like robotics, artificial intelligence, and data science.</p> <p>Safety and responsible technology use are emphasised throughout the curriculum. By the end of the unit, students will have gained not only programming skills but also a deeper understanding of how technology can be applied to solve real-world problems. This unit provides an engaging platform for students to explore the exciting intersection of computer science and cutting-edge technology.</p> <p>Week 1: Introduction to CoDrone EDU and Python Basics Learning Objectives:</p> <ul style="list-style-type: none"> ● Set up the development environment for CoDrone EDU ● Understand basic Python syntax and data types ● Familiarisation with the CoDrone EDU library and its basic functions <p>Week 2: Drone Movement and Control Learning Objectives:</p> <ul style="list-style-type: none"> ● Program basic flight controls (takeoff, landing, directional movement) ● Implement hover and yaw rotations ● Create simple flight patterns using sequential commands <p>Week 3: Sensors and Data Collection Learning Objectives:</p>	<p>Content: Introduction to vector graphics and Inkscape, focusing on using basic shape tools.</p> <p>Objectives:</p> <p>Use tools to draw and modify shapes.</p> <p>Change shape position and rotation.</p> <p>Explain how z-order (layering) affects visibility.</p> <p>Lesson 2: Working with Multiple Objects</p> <p>Content: Working with multiple objects, including alignment, distribution, grouping, and combining shapes.</p> <p>Objectives:</p> <p>Use tools to align and distribute objects.</p> <p>Utilise grouping to manage multiple objects simultaneously.</p> <p>Combine shapes using union, intersection, and difference operations.</p> <p>Lesson 3: Paths</p> <p>Content: Understanding that vector graphics are made up of paths and nodes, and how to modify them.</p> <p>Objectives:</p> <p>Explain that vector graphics consist of paths.</p> <p>Create and modify straight and curved paths.</p> <p>Convert shapes to paths and edit them.</p> <p>Lesson 4: What Will You Make?</p>
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		<ul style="list-style-type: none"> ● Read and interpret sensor data (altitude, battery, attitude) ● Use the rangefinder for basic obstacle detection ● Collect and display flight data in the Python console <p>Week 4: Autonomous Flight Programming Learning Objectives:</p> <ul style="list-style-type: none"> ● Implement conditional statements for decision-making in flight ● Create autonomous navigation algorithms using sensor data ● Develop error handling for safe autonomous operation <p>Week 5: Computer Vision Basics Learning Objectives:</p> <ul style="list-style-type: none"> ● Capture and process images using the drone's camera ● Implement basic colour detection algorithms ● Create a simple object tracking program <p>Week 6: Final Project and Review Learning Objectives:</p> <ul style="list-style-type: none"> ● Design and implement a multi-stage flight mission ● Present and demonstrate projects to peers ● Reflect on learning and identify areas for further exploration 	<p>Content: Start an open-ended project using the learned techniques.</p> <p>Objectives:</p> <p>Choose and plan a project.</p> <p>Combine tools and techniques to create a vector image.</p> <p>Evaluate the project against its intended purpose.</p> <p>Lesson 5: Behind the Scenes</p> <p>Content: Explore how vector images are stored as SVG markup and modify markup values.</p> <p>Objectives:</p> <p>Explain how markup defines vector graphics.</p> <p>Change objects by modifying their markup.</p> <p>Plan and implement project improvements.</p> <p>Lesson 6: Showcase</p> <p>Content: Compare vector and bitmap images, and final project review and presentation.</p> <p>Objectives:</p> <p>Explain the differences between vector and bitmap images.</p> <p>Determine which image type suits specific uses.</p> <p>Evaluate the final image against a rubric.</p>
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Why?	<p>introduction to Programming</p> <ol style="list-style-type: none"> 1. Foundational skills: Learning programming provides a strong foundation in computational thinking, problem-solving, and logical reasoning. These skills are valuable across many disciplines and careers. 2. Digital literacy: In an increasingly digital world, understanding how software works is becoming as important as traditional literacy. Programming knowledge helps students become creators, not just consumers, of technology. 3. Career opportunities: The tech industry continues to grow, offering numerous job opportunities. Even in non-tech fields, programming skills are increasingly valued. 4. Analytical thinking: Programming teaches students to break down complex problems into smaller, manageable parts - a skill applicable in many areas of life and work. 5. Creativity and innovation: Coding allows students to bring their ideas to life, fostering creativity and innovation. 	<p>Layers of Computer Systems</p> <ul style="list-style-type: none"> - Digital Literacy: Understanding computing systems is crucial in our technology-driven world. - Career Preparation: Knowledge of computer systems is valuable in many fields, not just IT. - Problem-Solving Skills: Learning about computer architecture enhances logical thinking and problem-solving abilities. - Innovation Understanding: Knowing how computers work helps students appreciate and potentially contribute to technological advancements. - Ethical Considerations: Exploring AI and open source concepts introduces students to important ethical discussions in technology. - Interdisciplinary Connections: This knowledge connects to other subjects like mathematics, physics, and even philosophy. 	<p>The Data Modelling using Spreadsheets Unit is essential for students as it equips them with critical data literacy skills that are increasingly vital in today's data-driven world. Proficiency in spreadsheets allows students to efficiently handle, organise, and analyse information—skills that are foundational across all sectors, from business to healthcare to STEM fields.</p> <p>Learning how to model and interpret data through visual charts and applying conditional formatting fosters analytical thinking, problem-solving, and decision-making abilities. Additionally, mastering functions like COUNTIF and IF helps students prepare for more complex data analysis tasks they will encounter in higher education and professional environments.</p> <p>Furthermore, the ability to organise and present data effectively is crucial for future careers, whether in financial analysis, research, project management, or any field requiring data interpretation. Ultimately, this unit prepares students for a future where digital skills and data competency are non-negotiable in the workplace.</p>

6. Persistence and resilience: Debugging and problem-solving in programming teach students to persevere through challenges, a valuable life skill.
7. Maths and logic application: Programming provides practical applications for mathematical and logical concepts, reinforcing learning in these areas.
8. Preparation for future learning: This introduction to Python prepares students for more advanced computing courses and sets a foundation for lifelong learning in technology.
9. Understanding technology: Programming knowledge helps students better understand the technology they use daily, making them more informed digital citizens.
10. Adaptability: Learning to code helps students adapt to new technologies and tools, a crucial skill in our rapidly evolving technological landscape.

By providing this foundation in programming, the curriculum equips students with valuable skills and knowledge that will benefit them in their academic journey and future careers, regardless of the specific path they choose.

My Digital World

1. **Empowerment in a Digital Age:** Understanding how to protect oneself online, manage a digital reputation, and navigate privacy risks is crucial for students growing up in a highly connected world. This knowledge empowers them to be responsible digital citizens.
2. **Career and Personal Impact:** As students move forward, their online behaviour can

- **Consumer Awareness:** Understanding computer systems helps students make informed decisions about technology purchases and usage.

Programming Drones using Python

1. **Practical Application of Programming Skills:** Programming drones provides a tangible, real-world application of coding skills. Students can immediately see the results of their code in action, which enhances engagement and understanding.
2. **Interdisciplinary Learning:** Drone programming combines elements of computer science, physics, and engineering. This interdisciplinary approach helps students develop a broader understanding of how these fields interact in real-world applications.
3. **Problem-Solving and Critical Thinking:** Creating flight algorithms and handling various scenarios (like obstacle avoidance) encourages students to think critically and develop problem-solving skills that are transferable to many areas of study and future careers.
4. **Introduction to Emerging Technologies:** Drones are increasingly used in various industries, from agriculture to filmmaking. Exposure to drone technology and programming prepares students for future opportunities in these growing fields.
5. **Spatial Reasoning and 3D Thinking:** Programming a drone to navigate in three-dimensional space helps develop spatial reasoning skills, which are valuable in

Vector Graphics:

Learning vector graphics equips students with valuable skills for careers in graphic design, web development, animation, and digital marketing, allowing them to create scalable, professional-quality visuals. It also provides opportunities for further education in multimedia design and opens doors for freelancing, entrepreneurship, and personal branding on social media platforms and website.. This versatile skill is crucial in the digital age, where high-quality visual content is essential across industries.

Further Education Pathways

- **Graphic Design Degree:** Vector graphics are a core component of any graphic design curriculum, and mastering them at an earlier stage gives students a strong head start.
- **Multimedia Design Programs:** Programs focusing on multimedia and digital design often require proficiency in vector graphics to create interactive and visual digital content.
- **Animation and Game Design:** Specialised courses in 2D and 3D animation, as well as game design programs, place strong emphasis on using vector-based software to create scalable artwork.
- **Web Development and Digital Media:** Courses in web design and development frequently incorporate vector graphics for creating icons, logos, and web elements.
- **Engineering and Architecture:** For students who are more technically inclined, vector graphics form the foundation for CAD (computer-aided design), which is essential in fields like engineering, architecture, and product design.

	<p>significantly impact job opportunities and personal relationships. Learning how to build and protect a positive online reputation ensures they are prepared for the future.</p> <p>3. Awareness of Data Use and Ethics: With the increasing use of big data by companies, it is important for students to understand how their data is collected, used, and sometimes misused. Learning about data privacy and protection equips students with the tools to make informed decisions about sharing their personal information online.</p> <p>This foundational knowledge will help students navigate the digital world safely, responsibly, and with an understanding of the broader implications of their online actions</p>	<p>fields like architecture, engineering, and game development.</p> <p>6. Data Analysis and Interpretation: Working with sensor data from the drone introduces students to data collection, analysis, and interpretation – crucial skills in our data-driven world.</p> <p>7. Creativity and Innovation: The open-ended nature of drone programming allows students to express creativity in designing flight patterns, missions, and applications, fostering innovation and out-of-the-box thinking.</p> <p>8. Teamwork and Communication: Group projects involving drone programming can enhance collaboration skills, as students work together to solve complex problems and present their solutions.</p> <p>9. Safety and Responsibility: Learning to program drones responsibly instils an understanding of safety protocols and ethical considerations in technology use.</p> <p>10. Preparation for Future Careers: The skills learned in drone programming are applicable to various high-demand fields, including robotics, autonomous vehicles, and IoT (Internet of Things), giving students a head start in these career paths.</p> <p>This unit not only teaches valuable programming skills but also provides a unique and engaging platform for students to apply these skills in a cutting-edge technological context, preparing them for future academic and career opportunities.</p>	
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<p>How parents / carers can support</p>	<p>Programming External Resources for Enhanced Study:</p> <ol style="list-style-type: none"> Codecademy - Learn Python https://www.codecademy.com/learn/learn-python Python for Beginners - Microsoft's Video Series https://www.youtube.com/playlist?list=PLlrD0HtieHhS8VzuMCfQD4uJ9yne1mE6 Trinket - Python in the browser https://trinket.io/python Python Game Development for Beginners https://www.youtube.com/watch?v=XGf2GcyHPhc CS Circles - Interactive Python Tutorials https://cscircles.cemc.uwaterloo.ca/ Python for Kids: A Playful Introduction to Programming (Book by Jason R. Briggs) Invent Your Own Computer Games with Python https://inventwithpython.com/invent4thed/ <p>These resources offer a mix of tutorials, interactive coding environments, and project-based learning that can help reinforce the concepts learned in class and provide additional challenges for students who want to explore further. Parents can use these resources to understand what their children are learning and even learn alongside them.</p> <p>My Digital Worlds External Resources for Enhanced Study:</p> <p>Resources:</p> <ul style="list-style-type: none"> ThinkUKnow: This site provides age-appropriate advice on staying safe online, including information on cyberbullying, privacy, and internet safety. 	<p>Layers of Computer Systems Resources for Enhanced Study:</p> <p>Online Courses:</p> <p>"How Computers Work: Demystifying Computation" (FutureLearn) "Understanding Computer Systems" (FutureLearn) "Understanding Maths and Logic in Computer Science" (FutureLearn)</p> <p>Video Series:</p> <p>"How Computers Work" on Khan Academy "Crash Course Computer Science" on YouTube</p> <p>Interactive Learning:</p> <p>Use Scratch to explore programming concepts Experiment with Google Teachable Machine for hands-on AI experience</p> <p>Reading Materials:</p> <p>"The Computing Universe" by Tony Hey and Gyuri Pápay "D is for Digital" by Brian W. Kernighan "The Pattern on the Stone" by Daniel Hillis</p> <p>Virtual Exhibitions:</p> <p>Explore the online "Revolution" exhibition by the Computing History Museum</p>	<p>Data Modelling using Spreadsheets: Resources for enhanced study at home</p> <p>Video Tutorials:</p> <ul style="list-style-type: none"> Spreadsheet Basics for Beginners Google Sheets Formulas Tutorial This video walks students through the fundamentals of using spreadsheets, including data entry and basic formatting. Advanced Functions in Spreadsheets Google Sheets IF & IFS Functions - Formulas with If, Then, Else, Else If Statements Covers using formulas like SUM, AVERAGE, and COUNTIF, essential for more complex data analysis. <p>Vector Graphics: Home Learning Ideas and Resources</p> <p>Online Tutorials and Courses:</p> <p>Inkscape Official Tutorials: A comprehensive set of tutorials to help students learn everything from basic tools to advanced techniques in vector design. Inkscape Tutorials Envato Tuts+: Offers free and paid tutorials on vector graphics, covering a wide range of tools like Illustrator and Inkscape. Envato Tuts+ Vector Graphics</p> <p>Free Vector Graphics Software:</p> <p>Inkscape: Free, open-source vector graphic software for students to download and practise creating logos, illustrations, and more.</p> <p>Vectr: A browser-based vector graphics tool that requires no download, making it easy to use anywhere.</p> <p>YouTube Channels:</p>
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- **National Online Safety:** Offers free resources and guides on how to protect yourself from online risks like phishing, malware, and more.
- **BBC WebWise:** : A beginner's guide to using the internet safely, with information on online safety and privacy.
- **DeleteMe:** A tool that helps users remove personal information from public databases.
- **The Children's Commissioner: Digital Footprint:** A resource to help students understand how their online actions contribute to their digital footprint.
- **FutureLearn: Big Data Analytics:** A free online course that introduces students to the world of big data.
- **Khan Academy: Internet Data and Privacy:** Lessons on how the internet works, including how data is shared and protected.
- **ICO for Young People:** The Information Commissioner's Office (ICO) has guides and videos on personal data rights and responsibilities.
- **TED Talk: Beware Online Filter Bubbles:** A TED talk by Eli Pariser explaining how filter bubbles affect what we see online.
- **The Filter Bubble Experiment:** A project where students can explore how different search results are influenced by their browsing habits.

Wider Learning Ideas:

- **Create a Family Digital Safety Plan:** Encourage students to work with family members to create rules around online behaviour, privacy settings, and social media usage.
- **Watch Documentaries on Digital Privacy:** Suggest watching documentaries like *The*

Logos By Nick: In-depth tutorials on vector design, focusing primarily on Inkscape and covering various aspects like logo design and complex illustrations.

The Future: Offers valuable insights into design principles and vector graphics applications in professional contexts.

Online Communities and Challenges:

Reddit – Inkscape: Students can join this community to ask questions, share their work, and learn from others.

Dribbble: A platform for designers to showcase their work, join design challenges, and get inspired by others' vector designs.

Creative Competitions and Freelancing:

99designs: A platform where students can participate in design contests to practise their skills and receive feedback.

DesignCrowd: Another freelancing platform where students can take on real-world vector graphic design projects.

	<p><i>Great Hack</i> (on Netflix) to understand how personal data is collected and used.</p> <ul style="list-style-type: none"> ● Create a Data Privacy Checklist: Students can create a list of steps they will take to protect their privacy online (e.g., using a VPN, strong passwords, limiting app permissions). ● Diversify Information Sources: Encourage students to actively seek news from diverse and neutral sources to escape filter bubbles. ● Install and Use Antivirus Software: Encourage students to explore how antivirus software works by installing free trials and running system scans on their computers. 		
	Autumn	Spring	Summer
Year 9	Term 1: Further Programming with Python Term 2: Living Online	Term 3: Introduction to Cyber Security Term 4: Going Audio Visual	Term 5: Computer Networks Term 6: TBC Drone Programming
	<p>The Further Programming with Python unit focuses on teaching students how to represent and process data using sequences, such as lists and strings, within Python. The unit covers various programming techniques that enable learners to access, manipulate, and iterate over data structures in real-world contexts. Key lessons include working with lists, loops (both for and while loops), string manipulation, and applying programming concepts to solve practical problems.</p> <p>Learning Objectives:</p> <ol style="list-style-type: none"> 1. Basic Python Programming Skills: 	<p>Introduction to Cyber Security:</p> <p>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.</p> <p>Learning Objectives by Lesson</p>	<p>Computer Networks:</p> <p>This unit provides an overview of computer networks, focusing on the history, components, and technologies that enable data transmission between devices. It covers the concept of "protocols" and their role in ensuring successful communication. The unit delves into the various hardware components required for networking, such as cables, hubs, servers, and routers, and explores the differences between wired and wireless network connections. Additionally, it examines the internet, its services, and the World Wide Web, explaining key concepts like packet switching, IP addresses, and web protocols. The unit also discusses the growth of the "Internet of Things" and the implications for privacy and security.</p>

<p>Reconnect with basic Python programming by writing programs that use arithmetic expressions, receive input, and handle selection (e.g., <code>if-elif-else</code> statements).</p> <p>Learn to identify and correct common syntax errors.</p> <p>2. Working with Lists:</p> <p>Perform operations such as adding, removing, and modifying list items.</p> <p>Iterate over lists using loops (<code>for</code> and <code>while</code>) and perform common operations on list elements.</p> <p>3. String Manipulation:</p> <p>Recognize similarities between lists and strings.</p> <p>Apply list operations to strings and manipulate individual characters in a string.</p> <p>4. Problem Solving with Programming: Develop solutions to meaningful problems by applying programming language features such as loops, variables, and operations on lists and strings.</p> <p>5. Mini-Projects: Apply all learned concepts to complete a mini-project involving real-world data (e.g., analysing solar system data, creating playlists).</p> <p>Living Online</p>	<p>Lesson 1: You and Your Data</p> <p>Differentiate between data and information Critique online services regarding data privacy Understand what happens to data entered online Explain the need for the Data Protection Act</p> <p>Lesson 2: Social Engineering</p> <p>Recognize how human errors pose security risks Implement strategies to minimise data compromise through human error</p> <p>Lesson 3: Script Kiddies</p> <p>Define hacking in the context of cybersecurity Explain DDoS attack impacts Identify strategies against brute force attacks Understand the need for the Computer Misuse Act</p> <p>Lesson 4: Rise of the Bots</p> <p>List common malware threats Examine how different malware types affect computer systems Question the impact of malicious bots on societal issues</p> <p>Lesson 5: There's No Place Like 127.0.0.1</p> <p>Compare security threats based on probability and potential impact</p>	<p>Learning Objectives and Importance:</p> <p>Define computer networks and explain data transmission protocols:</p> <p>Understanding the fundamental principles of how devices communicate and share information is crucial for students to navigate the digital world effectively.</p> <p>Identify networking hardware and compare wired and wireless technologies:</p> <p>Knowing the different networking components and their capabilities allows students to make informed decisions about technology choices and troubleshoot issues.</p> <p>Explain the internet, its services, and the World Wide Web:</p> <p>Developing a deep understanding of the internet, its architecture, and the various services it provides prepares students for the increasingly interconnected nature of modern life and future career opportunities.</p> <p>Describe the "Internet of Things" and discuss related privacy and security concerns:</p> <p>Awareness of the growing trend of connected devices and the associated risks empowers students to make informed decisions about</p>
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<p>The "Living Online" unit equips students with essential digital citizenship skills to navigate today's complex online world. It covers key topics like managing digital footprints, recognising compulsive design, combating cyberbullying, and identifying fake news. By addressing online self-esteem, free speech, and responsible content moderation, the lessons help students become ethical and informed digital participants.</p> <p>Summary of Content and Learning Objectives:</p> <ol style="list-style-type: none"> Digital Footprints <ul style="list-style-type: none"> Understanding consequences of oversharing online Thinking critically about data collection by companies Learning to control shared information Digital Addiction and Compulsive Design <ul style="list-style-type: none"> Identifying features of compulsive design Understanding how these features keep users online Exploring ways to tackle compulsive design Cyberbullying and Online Interactions <ul style="list-style-type: none"> Understanding the definition and impact of cyberbullying Examining potential cyberbullying situations 	<p>Explain network protection methods against common threats</p> <p>Lesson 6: Under Attack</p> <p>Identify the most effective methods to prevent cyberattacks</p> <p>Going Audio Visual</p> <p>The Representations: Going Audiovisual unit focuses on digital media, including images and sounds, and explores the binary data that underlies these forms of media. Students will learn how images are formed from pixels and how colours are represented through binary digits. The unit also introduces sound representation, showing how analog signals are sampled and converted into digital formats. Throughout the lessons, students use software like GIMP and Audacity to manipulate images and sounds, reinforcing the theoretical concepts with hands-on practice.</p> <p>The unit builds on previous learning about data representations and encourages students to explore the connections between digital images and sound, illustrating how both are stored and manipulated using binary data. The unit culminates with lessons on alternative representations, such as vector graphics and MIDI, as well as the concept of data compression. By the end of the unit, students will understand how media is digitally</p>	<p>technology use and protect their personal information.</p> <p>Programming Drones using Python</p> <p>This innovative unit combines Python programming with drone technology, offering students a unique, hands-on learning experience. Using the CoDrone EDU, an educational drone designed for learning, students will progress from basic flight controls to more advanced concepts like autonomous navigation and simple computer vision.</p> <p>The course goes beyond mere drone operation, focusing on developing crucial skills such as problem-solving, critical thinking, and data analysis. Students will learn to make logical decisions based on sensor inputs and work collaboratively on projects. These skills are invaluable across various subjects and prepare students for future opportunities in fields like robotics, artificial intelligence, and data science.</p> <p>Safety and responsible technology use are emphasised throughout the curriculum. By the end of the unit, students will have gained not only programming skills but also a deeper understanding of how technology can be applied to solve real-world problems. This unit provides an engaging platform for students to explore the exciting intersection of computer science and cutting-edge technology.</p> <p>Week 1: Introduction to CoDrone EDU and Python Basics Learning Objectives:</p>
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<p>Analysing personal online behaviour and its consequences</p> <p>4. Social Media and Self-Esteem</p> <p>Understanding how social media affects self-esteem</p> <p>Exploring connections between digital living and mental health</p> <p>Learning to use social media mindfully to boost self-esteem</p> <p>5. Fake News and Information Literacy</p> <p>Understanding what fake news is</p> <p>Learning how to spot fake news</p> <p>Creating guides to inform others about fake news</p> <p>6. Online Moderation and Free Speech</p> <p>Understanding restrictions around free speech online</p> <p>Exploring the balance between free speech and internet safety</p> <p>Interpreting Community Guidelines for social media</p>	<p>represented and edited and will develop practical skills using industry-standard tools.</p> <p>Learning Objectives Summary</p> <p>Digital Image Representation:</p> <p>Understand how images are composed of pixels. Learn key terms like "pixels," "resolution," and "colour depth."</p> <p>Calculate image representation size by considering resolution and colour depth.</p> <p>Image Manipulation:</p> <p>Perform basic editing tasks using GIMP or similar software.</p> <p>Understand the ethical implications of digital image manipulation.</p> <p>Sound Representation:</p> <p>Recognize sound as a wave and understand key terms like "sampling rate" and "sample size."</p> <p>Use Audacity or similar software to manipulate and edit sound files.</p> <p>Data Representation and Compression:</p> <p>Explore alternative representations like vector graphics and MIDI.</p> <p>Understand the importance of compression in reducing file sizes without sacrificing quality.</p>	<ul style="list-style-type: none"> ● Set up the development environment for CoDrone EDU ● Understand basic Python syntax and data types ● Familiarisation with the CoDrone EDU library and its basic functions <p>Week 2: Drone Movement and Control Learning Objectives:</p> <ul style="list-style-type: none"> ● Program basic flight controls (takeoff, landing, directional movement) ● Implement hover and yaw rotations ● Create simple flight patterns using sequential commands <p>Week 3: Sensors and Data Collection Learning Objectives:</p> <ul style="list-style-type: none"> ● Read and interpret sensor data (altitude, battery, attitude) ● Use the rangefinder for basic obstacle detection ● Collect and display flight data in the Python console <p>Week 4: Autonomous Flight Programming Learning Objectives:</p> <ul style="list-style-type: none"> ● Implement conditional statements for decision-making in flight ● Create autonomous navigation algorithms using sensor data ● Develop error handling for safe autonomous operation <p>Week 5: Computer Vision Basics Learning Objectives:</p>	
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			<ul style="list-style-type: none"> ● Capture and process images using the drone's camera ● Implement basic colour detection algorithms ● Create a simple object tracking program <p>Week 6: Final Project and Review Learning Objectives:</p> <ul style="list-style-type: none"> ● Design and implement a multi-stage flight mission ● Present and demonstrate projects to peers ● Reflect on learning and identify areas for further exploration
Why?	<p>Further Programming with Python</p> <p>Problem-Solving Skills: Programming enhances logical thinking and problem-solving abilities, which are valuable skills across many fields. Students learn how to break down real-world problems and develop structured solutions.</p> <p>Real-World Application: Learning to manipulate sequences of data is fundamental in many industries such as data analysis, web development, and artificial intelligence. This knowledge prepares students for future careers in technology and science.</p> <p>Preparation for Advanced Learning: The Python programming concepts taught in this unit serve as a foundation for more advanced computing and data science topics. Mastering these skills early gives students an advantage in further education and career paths.</p> <p>Digital Literacy: Understanding how data is processed and manipulated in code equips students with essential digital literacy skills. These skills are important in an increasingly technology-driven world, where coding is becoming a basic literacy.</p>	<p>Introduction to Cyber Security:</p> <p>Digital Safety: Equips students with knowledge to protect themselves online.</p> <p>Career Opportunities: Introduces a growing field with numerous job prospects.</p> <p>Critical Thinking: Develops analytical skills for assessing online risks and threats.</p> <p>Ethical Awareness: Encourages consideration of ethical implications in technology use.</p> <p>Technological Literacy: Enhances understanding of how modern systems operate and are vulnerable.</p> <p>Personal Responsibility: Emphasises the role individuals play in overall cybersecurity.</p> <p>Legal Awareness: Introduces relevant laws and regulations in the digital space.</p> <p>Global Perspective: Highlights the interconnected nature of cybersecurity issues worldwide.</p>	<p>Computer Networks:</p> <p>Preparing for the Digital Future:</p> <p>Today's students are growing up in an increasingly digital and interconnected world. Understanding the fundamental principles of computer networks, the internet, and associated technologies is crucial for navigating this landscape effectively. The skills and knowledge gained in this unit will help students leverage technology to their advantage, whether in their academic pursuits, future careers, or personal lives.</p> <p>Developing Technological Literacy:</p> <p>Computer networks and the internet are ubiquitous in modern society, permeating various aspects of our lives. By understanding how these systems work, students develop a technological literacy that empowers them to make informed decisions about technology use and adoption.</p>

	<p>Living Online Digital Citizenship: These topics are crucial for developing responsible digital citizens who can navigate the online world safely and ethically.</p> <p>Future Employment: Understanding digital footprints is vital for future job prospects, as employers often check candidates' online presence.</p> <p>Mental Health: Knowledge about the impact of social media on self-esteem and the risks of digital addiction is crucial for maintaining good mental health in the digital age.</p> <p>Critical Thinking: Learning to identify fake news and understand compulsive design enhances critical thinking skills, essential for academic and professional success.</p> <p>Online Safety: Understanding cyberbullying and online moderation helps students stay safe online and contribute to a positive digital environment.</p> <p>Information Literacy: The ability to discern reliable information from fake news is crucial in an era of information overload.</p> <p>Ethical Decision Making: Exploring the balance between free speech and online safety helps develop ethical decision-making skills.</p> <p>Tech Awareness: Understanding how technology is designed to keep users engaged fosters a more mindful approach to tech use.</p>	<p>Going Audio Visual:</p> <p>Learning about digital representations of images and sounds is essential for students in today's digital world. It provides foundational knowledge for careers in media, software development, digital marketing, game design, and audio production. This unit enhances students' understanding of how everyday digital content, such as photos and music, is created and manipulated.</p> <p>Mastering these skills equips students with critical digital literacy, allowing them to be both consumers and creators in a technology-driven society. Understanding how binary data translates into media content also opens pathways for further education in fields like computer science, multimedia design, and digital engineering.</p>	<p>This knowledge allows students to troubleshoot issues, evaluate the appropriateness of technology solutions, and engage more meaningfully with the digital world.</p> <p>Fostering Critical Thinking and Problem-Solving:</p> <p>The study of computer networks and the internet requires students to think critically about concepts like data transmission, hardware components, and network protocols. Grappling with these technical concepts cultivates essential problem-solving skills that are valuable across various disciplines and future career paths.</p> <p>Exploring Future Career Opportunities:</p> <p>Proficiency in networking and internet-related technologies opens up a wide range of potential career paths for students, from network administration and cybersecurity to web development and software engineering. Exposing students to these topics early on can help them identify their interests and aptitudes, allowing them to make informed decisions about their educational and professional trajectories.</p> <p>Understanding the Societal Impact:</p> <p>The growth of the "Internet of Things" and the increasing interconnectedness of devices have significant implications for privacy, security, and ethical considerations. By exploring these issues, students develop a nuanced understanding of the societal impact of emerging technologies and the importance of responsible technology use.</p>
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Overall, this unit on computer networks and the internet equips students with the knowledge, critical thinking skills, and technological literacy necessary to thrive in the digital age. It paves the way for future success in both academic and professional pursuits, while also fostering a deeper appreciation for the societal implications of technological advancements.

Programming Drones using Python

11. **Practical Application of Programming Skills:** Programming drones provides a tangible, real-world application of coding skills. Students can immediately see the results of their code in action, which enhances engagement and understanding.
12. **Interdisciplinary Learning:** Drone programming combines elements of computer science, physics, and engineering. This interdisciplinary approach helps students develop a broader understanding of how these fields interact in real-world applications.
13. **Problem-Solving and Critical Thinking:** Creating flight algorithms and handling various scenarios (like obstacle avoidance) encourages students to think critically and develop problem-solving skills that are transferable to many areas of study and future careers.
14. **Introduction to Emerging Technologies:** Drones are increasingly used in various industries, from agriculture to filmmaking. Exposure to drone technology and programming prepares students for future opportunities in these growing fields.
15. **Spatial Reasoning and 3D Thinking:** Programming a drone to navigate in three-

			<p>dimensional space helps develop spatial reasoning skills, which are valuable in fields like architecture, engineering, and game development.</p> <ol style="list-style-type: none">16. Data Analysis and Interpretation: Working with sensor data from the drone introduces students to data collection, analysis, and interpretation – crucial skills in our data-driven world.17. Creativity and Innovation: The open-ended nature of drone programming allows students to express creativity in designing flight patterns, missions, and applications, fostering innovation and out-of-the-box thinking.18. Teamwork and Communication: Group projects involving drone programming can enhance collaboration skills, as students work together to solve complex problems and present their solutions.19. Safety and Responsibility: Learning to program drones responsibly instills an understanding of safety protocols and ethical considerations in technology use.20. Preparation for Future Careers: The skills learned in drone programming are applicable to various high-demand fields, including robotics, autonomous vehicles, and IoT (Internet of Things), giving students a head start in these career paths. <p>This unit not only teaches valuable programming skills but also provides a unique and engaging platform for students to apply these skills in a cutting-edge technological context, preparing them for future academic and career opportunities.</p>
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<p>How parents / carers can support</p>	<p>Programming External Resources for Enhanced Study:</p> <ol style="list-style-type: none"> 8. Codecademy - Learn Python https://www.codecademy.com/learn/learn-python 9. Python for Beginners - Microsoft's Video Series https://www.youtube.com/playlist?list=PLlrxDOHtieHhS8VzuMcfQD4uJ9yne1mE6 10. Trinket - Python in the browser https://trinket.io/python 11. Python Game Development for Beginners https://www.youtube.com/watch?v=XGf2GcyHPhc 12. CS Circles - Interactive Python Tutorials https://cscircles.cemc.uwaterloo.ca/ 13. Python for Kids: A Playful Introduction to Programming (Book by Jason R. Briggs) 14. Invent Your Own Computer Games with Python https://inventwithpython.com/invent4thed/ <p>These resources offer a mix of tutorials, interactive coding environments, and project-based learning that can help reinforce the concepts learned in class and provide additional challenges for students who want to explore further. Parents can use these resources to understand what their children are learning and even learn alongside them.</p> <p>Living Online</p> <p>Digital Footprint Audit: Students can Google themselves and analyse their online presence.</p> <p>Screen Time Challenge</p> <p>App: Use apps like 'RescueTime' or 'Forest' to track and manage screen time.</p>	<p>Cybersecurity Resources for Enhanced Study:</p> <p>1. Online Courses and Learning Platforms</p> <ul style="list-style-type: none"> ● FutureLearn – Introduction to Cyber Security A free course that introduces students to essential cybersecurity concepts, threats, and how to protect themselves online. Topics include data protection, malware, and how to secure online accounts. ● Cybrary Offers free courses on cybersecurity topics, including hacking, malware, social engineering, and digital forensics. Students can explore areas such as ethical hacking, network security, and more. ● Google Cybersecurity Basics A beginner-friendly course that covers the basics of cybersecurity, such as understanding online threats, and how to defend against them. <p>2. Interactive Learning Resources</p> <ul style="list-style-type: none"> ● CyberStart Go A fun, free interactive platform where students can learn ethical hacking, solve puzzles, and play games related to cybersecurity. It offers a series of challenges to test problem-solving and coding skills. ● Cisco Packet Tracer A powerful simulation tool that helps students learn about network security, firewalls, and how to protect data in real-world scenarios. Great for hands-on learning in a virtual environment. <p>3. Videos and Documentaries</p>	<p>Computer Networks: Home learning opportunities</p> <ol style="list-style-type: none"> 1. Interactive Online Courses: <ul style="list-style-type: none"> ○ Cisco Networking Academy's "Introduction to Networks" course: https://www.netacad.com/courses/networking/introduction-networks ○ Khan Academy's "Internet 101": https://www.khanacademy.org/computing/code-org/computers-and-the-internet 2. Network Simulation Tools: <ul style="list-style-type: none"> ○ Cisco Packet Tracer (free for students): https://www.netacad.com/courses/packet-tracer ○ GNS3 Network Simulator: https://gns3.com/software/download 3. Interactive Visualisations: <ul style="list-style-type: none"> ○ "How DNS Works" interactive comic: https://howdns.works/ ○ "How HTTPS Works" interactive guide: https://howhttps.works/ 4. Video Resources: <ul style="list-style-type: none"> ○ Crash Course Computer Science playlist (especially networking-related videos): https://www.youtube.com/playlist?list=PL8dPuaaLjXtNIUrzyH5r6jN9ullgZBpdo ○ TED-Ed's "There and Back Again: A Packet's Tale": https://www.youtube.com/watch?v=ewrBaIT_eBM 5. IoT and Cybersecurity: <ul style="list-style-type: none"> ○ Mozilla's "IoT For Beginners" course: https://github.com/microsoft/loT-For-Beginners ○ Cybersecurity Lab by NOVA Labs: https://www.pbs.org/wgbh/nova/labs/lab/cyber/ 6. Podcasts:

	<p>Set a personal goal to reduce screen time and replace it with offline activities.</p> <p>Cyberbullying Awareness</p> <p>Website: StopBullying.gov (https://www.stopbullying.gov/)</p> <p>Social Media and Self-Esteem</p> <p>MindsetKit's Growth Mindset for Teens (https://www.mindsetkit.org/growth-mindset-teens)</p> <p>Fake News Detective</p> <p>Game: 'Bad News' (https://www.getbadnews.com/)</p> <p>Digital Wellbeing Project</p> <p>Google's Digital Wellbeing Experiments (https://experiments.withgoogle.com/collection/digital-wellbeing)</p> <p>Design a personal plan for healthy digital habits.</p>	<ul style="list-style-type: none"> ● NOVA: Cyberwar Threat (YouTube) This documentary dives deep into the world of cyberwarfare, exploring the threat that hacking and cyber-attacks pose to countries and organisations. ● Crash Course Computer Science – Cybersecurity This video from Crash Course covers cybersecurity in a simple, engaging way. It explains how hackers exploit vulnerabilities, and ways to protect systems from these threats. ● The Great Hack (Netflix) A documentary focusing on data privacy and the power of big data in cyber surveillance, giving students a broader understanding of how personal data is used and potentially abused. <p>4. Cybersecurity Games and Simulators</p> <ul style="list-style-type: none"> ● Cyber Security Lab (PBS Kids) An interactive game where students take on the role of a cybersecurity expert defending a company from cyber-attacks. It teaches about firewalls, encryption, and social engineering in a fun way. ● Hack The Box (HackTheBox.eu) An online platform where students can solve hacking challenges, learn penetration testing, and develop cybersecurity skills in a hands-on manner. ● Cyber Defense Challenge (NetWars) by SANS A game-based cybersecurity challenge that helps students learn defense strategies against cyber-attacks. It is suitable for both beginners and advanced learners. 	<ul style="list-style-type: none"> ○ "Packet Pushers" for networking professionals: https://packetpushers.net/ ○ "Internet History Podcast": http://www.internethistorypodcast.com/ <p>7. Additional Reading:</p> <ul style="list-style-type: none"> ○ "But How Does It Really Work?" blog series on networking: https://wizardzines.com/zines/networking/ <p>Programming Drones using Python</p> <p>Robolink's Codrone resources are packed full of information, further learning, tutorials and guidance for students wishing to learn more https://learn.robotlink.com/product/codrone-edu/</p> <p>Drone Technology News and Articles:</p> <p>DroneLife: https://dronelife.com/ UAV Coach: https://uavcoach.com/</p> <p>Educational YouTube Channels:</p> <p>Drone Programming tutorials by Robolink: https://www.youtube.com/c/Robolink</p>
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5. Cybersecurity Websites and Blogs

- [Krebs on Security](#)
A leading blog by cybersecurity expert Brian Krebs. Students can read about the latest cybersecurity threats, hacker tactics, and how to stay protected.
- [Have I Been Pwned?](#)
A useful tool that allows students to check if their email addresses or personal information have been compromised in a data breach. This helps students understand the importance of personal data protection.
- **National Cyber Security Centre – Young People Resources**
The UK government’s hub for cybersecurity education, offering videos, articles, and learning resources to help young people understand the dangers of cybercrime and how to protect themselves.

Going Audio Visual: Resources for Enhanced Study:

Ideas, Weblinks, and Home Learning Opportunities

1. **GIMP (Image Editing) Tutorials:**
 - **Official GIMP Tutorials:** Students can access a wide range of tutorials to practise their image editing skills.
 - **Audacity Official Website:** Students can learn basic sound editing through tutorials and guides. Audacity Tutorials
2. **Free Online Courses:**
 - **Data Representation in Computing:** A course that delves deeper into how data like images and sounds are

represented. [Teach Computing Courses](#)

3. **Creative Projects:**

- **Create a Photo Collage:** Using GIMP, students can create digital collages by combining various images, improving their hands-on experience with digital media.
- **Sound Remixing with Audacity:** Students can use Audacity to remix audio tracks, explore sound effects, and experiment with audio compression.