Curriculum Principles: Computing

INTENT: A powerful, knowledge-rich curriculum

By the end of their education, a student of Computing at Dixons Fazakerley Academy:

- Will be equipped to use computational thinking to become creators of digital technologies, digital artefacts and computing knowledge. Our curriculum progression can be categorised across Computer Science, Information Technology and Digital Literacy.
- Will have gained knowledge and skills in areas such as programming languages, spreadsheet modelling, animation, cyber security and data representation. They will also have developed critical thinking, problem solving, communication and project management skills, which are essential in the field of computing
- We enable students to understand concepts such as sequencing, selection and iteration. We provide students the opportunity to put theory into practice using textual and visual languages.

Our uniting 'sentence' is:

"*The Computing department empowered students to become; enthusiastic, skilled, innovative and considerate users of technology and embedded skills to contribute effectively towards the development of a technological society."*

In order to deliver a powerful, knowledge-rich curriculum we have selected knowledge by:

- Starting from Year 7, we aim to introduce essential abstract skills such as algorithmic thinking, problem-solving, and decomposition. Our curriculum is built upon three critical components - Computer Science, Information Technology, and Digital Literacy - ensuring that we offer a well-rounded education. By thoughtful consideration and debate, we have carefully selected the knowledge from these pillars that will create a balanced and comprehensive learning experience for students

- We convene with subject specialists at cross cutting teams from various schools within our trust to deliberate and exchange ideas on the content that must be incorporated into our curriculum. This rich debate from subject specialists enables us to consistently challenge and refine the powerful knowledge in our curriculum.

- We utilised the resources provided by the National Centre for Computing Education to ensure that our instructional units and delivery strategies met our contextual needs. Additionally, we participated in multiple training sessions and meetings with leaders from the NCCE to collaborate on shaping our curriculum.

The threshold concepts in our subject are:

- Computational thinking: this is a way of thinking about problem-solving that involves breaking down complex problems into smaller, more manageable parts, identifying patterns and relationships, and developing algorithms (a step-by-step process for solving a problem). Understanding computational thinking is essential to being able to effectively program a computer, making it a critical threshold concept in computing education
- Digital footprints: this refers to the idea that everything we do online leaves a trace or record that can be permanent and potentially accessible to others, including personal information and behaviour patterns. Understanding and managing one's digital footprint is essential for minimising the risk of cyber-attacks, protecting personal privacy, and ensuring online safety. It is vital students have an understanding of networks which form the basis of cyber-attacks.
- System Architecture: this refers to the overall design and organisation of a system, including the relationships between system components, their functions, and how they work together. Understanding the relationship between hardware and software is an essential component of system architecture, as it helps students to understand how the overall computer system is designed and functions. When teaching pupils to use different software it is vital to discuss design and user interface.
- Algorithms: these are a step-by-step procedure for solving a problem. It involves breaking a task down into smaller steps that can be followed in a specific order to reach a desired outcome. This understanding is important not only for programming, but for any programming language. Once students understand this concept, they will be able to apply it to other programming languages and see the importance of planning and organisation in programming.
- Programming: this is an important threshold concept in the computer science curriculum because it is a fundamental skill that many other computer science concepts and disciplines rely on. Once students have mastered programming, they may find it easier to understand algorithms, data structures, and software development methodologies. Therefore, programming can be seen as a gateway to other important conceptual frameworks in computer science, making it an essential threshold concept.
- Function and formula: understanding the basic functions and formulas is a threshold concept because it is a foundational concept that forms the basis of more advanced learning in spreadsheets. Without understanding these concepts, students will not be able

to perform more complex tasks in spreadsheets. It involves learning the basic concepts such as data entry, calculations, using basic functions (e.g. SUM, AVERAGE, MAX, MIN), and creating formulas. Understanding these concepts will allow students to create and manipulate spreadsheets more efficiently and effectively.

- Students must understand the potential risks and negative consequences associated with being online, including but not limited to cyberbullying, identity theft, and online exploitation. They need to recognize that the internet is not a safe place and that their online behaviour and decisions can have far-reaching consequences. They must be able to assess the potential risks of their online activities and take appropriate actions to protect themselves and others.
- The principles of animation, students need to understand the key principles of animation such as timing and spacing. Additionally, they must learn how to work with layers, utilise tweens to create smooth movement, create storyboards to plan their animations, and manipulate objects to achieve their desired effects. Mastering these concepts will enable students to produce high-quality animations that capture their intended message and captivate their intended audience.
- Design principles refer to a set of fundamental concepts and practices that guide the creation of software systems, user interfaces, and other digital products. Design principles are essential in computing/IT because they help developers to create solutions that are efficient, effective, and user-friendly. Once students understand and apply design principles, they can create more effective and desirable solutions.
- It is important to understand how data is represented in digital form, and this includes the concept of binary. However, to truly understand binary in different contexts, it is critical for students to grasp the various ways in which data is represented in different areas such as digital audio and images. By developing a comprehensive understanding of data representation, students will be better equipped to work with digital media and effectively engage with technology in different settings.
- Understanding the legal and ethical considerations of using digital systems and data, including data protection, computer crimes, intellectual property, responsible data sharing, environmental impact, and ethical behaviour.

In order to achieve a true understanding of Computing, topics have been intelligently sequenced based on the following rationale:

- The curriculum is designed to allow for opportunities to revisit and embed key topics. Topics are covered, then revisited through low stakes quizzing, do know activities and end of cycle intervention. Topics are covered in future years to build on prior knowledge such as programming to help support their computational thinking.
- Schema development is a key aspect of our computer science curriculum. By creating a strong network of mental structures, students can better understand and solve complex computer science problems. Our curriculum offers multiple opportunities for schema development, including assessments and feedback mechanisms that help students reflect on their progress and build on their existing knowledge and skills. This approach ensures that students are well-prepared for continued learning and growth in the field of computer science.
- Our computer science curriculum is designed around a thematic approach, with an emphasis on identifying and exploring connections between units. This allows students to develop a deeper understanding of foundational concepts. By building connections between units, students are able to build schema and construct a more cohesive and comprehensive understanding of computer science.
- To ensure a seamless transition from Key Stage 2 to Key Stage 3, our curriculum is designed to build upon the foundational knowledge and skills acquired by students in their primary school education. We have therefore undertaken to gather information from our local primary schools about their curriculum to ensure we are familiar with the concepts, methods, and topics covered in Key Stage 2. This will enable us to build a program that is aligned with the prior learning and development of our students, and will support their ongoing progress towards achieving the goals set out in the national framework for computing education.

The science curriculum will address social disadvantage and actively seeks to tell the stories of the marginalised by:

- Students have access to knowledge navigators and revision materials to complete at home. Students in KS4 are provided with resources to reduce the 'digital divide' including revision guides, topic-based exam workbooks, flash cards and vocabulary booklets. Homework is set using carousel for knowledge retrieval students have access to computers after school to complete their homework.
- There is no assumption from the department that students will have access to specialist hardware and software outside of school. Pupils needing to use Computers for any part of their course will have access to the school ICT suite. Pupils that have access to a device at home can benefit from the use of free programming software such as Python and Kodu as well as Oak academy videos to support their learning.
- In modern times, knowledge and skills related to technology are crucial to success and safety. As technology and the internet become more embedded in our daily lives, it is important for children to learn about online safety. This includes understanding how to protect

their personal information, how to identify and avoid online risks, and how to use technology responsibly. By teaching children about e-safety, we are equipping them with the skills and knowledge necessary to navigate the online world safely and effectively, which is increasingly important in modern society. We encourage children to treat all groups online with respect and dignity.

- Modern technologies have led to the formation of diverse and inclusive world teams that offer flexibility to their members. Organisations are leveraging tools such as collaboration and communication, scheduling, and planning tools to communicate with stakeholders. However, modern technologies have both positive and negative impacts on organisations and individuals, such as infrastructure requirements, accessibility and impacts on mental wellbeing. Organisations should consider the impact of modern technologies on social disadvantage and marginalised communities.

We fully believe Computing can contribute to the personal development of students at Dixons Fazakerley Academy by:

- Computing can contribute to the personal development of students at Dixons Fazakerley Academy by providing them with essential skills and knowledge that will be useful for their future careers. The subject allows students to develop critical thinking and problem-solving skills necessary for the ever-changing digital world.
- Computing also helps students to become more confident and familiar with technology, which enhances their abilities to work independently and collaboratively on projects.
- Through computing, students can develop creativity, communication skills, and learn how to use technology ethically and safely. These skills can greatly improve their personal and professional lives and contribute to their overall growth as individuals.

At KS3 and KS4, our belief is that homework should be interleaved revision of powerful knowledge that has been modelled and taught in lessons. This knowledge is recalled and applied through a range of low stakes quizzing and practice.

Opportunities are built in to make links to the world of work to enhance the careers, advice and guidance that students are exposed to:

- Career Spotlight: Our curriculum includes a dedicated Careers Spotlight, where students are exposed to various computer science careers at different stages of the program, providing practical information on skills, qualifications, and job prospects.
- Real-World Projects: Our students engage in hands-on projects and assignments that simulate real-world scenarios, strengthening their problem-solving, teamwork, and communication skills. These activities include programming with Kodu and Python, industry-standard tools used by professionals in the field, enabling students to develop skills directly applicable to their future careers.
- We offer extracurricular activities that further enhance students' coding skills and provide additional opportunities for practical application. Students can explore their interests and develop their skills outside of the classroom. Our goal is to prepare our students for their future careers in computer science by exposing them to real-world environments and work expectations.

We teach beyond the requirements of the National Curriculum by:

- Promoting digital literacy, is indeed included in the National Curriculum. However, we go beyond the National Curriculum requirements by incorporating more advanced digital concepts such as coding, cyber-security, and artificial intelligence.
- We also place a greater emphasis on the ethical and responsible use of technology, which is not explicitly covered in the National Curriculum.
- Overall, our goal is to provide a broad and balanced education that prepares our students not just for traditional academic success, but for a fulfilling and meaningful life beyond the classroom.