BROUGHTON
HIGH SCHOOL
Achieving Together

COMPUTING CURRICULUM STATEMENT

Intent

At Broughton High School, we are dedicated to providing exceptional computing education that empowers our students with the knowledge, skills, and practical application of computing principles. We firmly believe in the importance of blending theoretical understanding with real-world application, ensuring that all students benefit from a comprehensive educational experience. Our intent statement outlines our commitment to excellence in computing education, aligning with the National Curriculum for Computing, and reflects our school motto of 'achieving together.'

Empowering Students for the Digital Age:

In an ever-evolving digital world, it is imperative to equip our students with the necessary tools to navigate and contribute meaningfully to the technological landscape. Our computing education aims to foster critical thinking, logical reasoning, and creativity, enabling students to understand and embrace emerging technologies. By blending theoretical knowledge and practical application, we strive to develop well-rounded individuals who are confident in their abilities to thrive in the digital age.

Aligning with the National Curriculum for Computing:

Our computing curriculum adheres closely to the guidelines outlined in the National Curriculum for Computing. We emphasise the three core aspects: computer science, information technology, and digital literacy.

a. Computer Science:

We instill a solid understanding of computer science principles, including algorithms, programming, and computational thinking. Students develop proficiency in coding languages, including Python and Javascript, enabling them to create programs, solve problems, and design innovative solutions. We foster a growth mindset, encouraging students to embrace challenges and persevere in their quest for knowledge and skill development.

b. Information Technology:

In line with the National Curriculum, we equip students with the essential skills to work confidently with information technology. From understanding hardware and software components to network systems and data management, students gain the practical knowledge necessary to use technology effectively. We emphasise ethical considerations, privacy, and digital security, ensuring our students are responsible digital citizens.

c. Digital Literacy:

We believe that digital literacy is an essential component of modern education. Our students develop the ability to express themselves creatively through digital media, harnessing a range of tools and platforms. They learn to critically evaluate information sources, engage in online communication responsibly, and navigate the digital world with confidence.

Blending Knowledge and Application:

We recognise that blending declarative and procedural knowledge is crucial for effective learning. We provide students with ample opportunities to apply their theoretical knowledge to real-world scenarios. Through hands-on projects, collaborative problem-solving activities, and industry partnerships, students gain practical experience and develop the skills required to tackle complex computing challenges.

Individualised Learning and Inclusivity:
We believe in the importance of catering to the unique learning needs of each student. Our curriculum ensures that all students, regardless of their background or abilities, have equal opportunities to excel. We offer differentiated and scaffolded instruction, personalised support, and enrichment programs to foster an inclusive learning environment. We aim to nurture students' passion for computing, helping them discover their strengths and pursue further studies or careers in this field. Having acknowledged the gender imbalance in computing, we are following recommendations and guidance[1], to address barriers to girls enjoying computing as a subject, and choosing Computer Science as a GCSE. In addition, we provide our **pupil premium** pupils with revisions guides and work books free of charge where needed. Pupils who wish to extend and continue classwork are aided in their pursuits by allowing them to borrow equipment, such as Micro:Bits.

Collaborative Learning and Professional Development:
We foster a collaborative learning environment where students work together, leveraging their diverse skills and perspectives. Through group projects, coding clubs, and competitions, students learn the value of teamwork, communication, and problem-solving. Our dedicated computing department engages in continuous professional development to stay abreast of the latest advancements in the field. We actively seek partnerships with industry professionals and local organisations to provide students with real-world insights and mentorship opportunities.

We have established **links with FE and HE institutes** and have previously sent some of our pupils to a Computing masterclass at Runshaw college. Key Stage 4 (KS4) Computer Science pupils are encouraged to take part in various local and national competitions, such as the CyberFirst by GCHQ.

Sequencing the Curriculum for Progressive Learning:
We understand the importance of sequencing the curriculum to ensure progressive learning and skill development. Our computing education is designed to provide a scaffolded approach, building upon students' prior knowledge and experiences. We begin with foundational concepts, gradually introducing more advanced topics and technologies as students progress through their academic journey. Each new unit of work builds upon what has been taught previously and units are strategically interspersed to aid long-term recall based upon research theories such as spaced learning. All this is geared towards providing students with solid computing skills needed across their various curriculum subjects by the end of KS3. Those who wish to continue Computing at KS4 have a head start since relevant sections of the KS4 curriculum are woven into our KS3 curriculum where appropriate. This thoughtful sequencing enables students to develop a solid understanding of computing principles while also fostering their confidence and independence in tackling complex challenges.

Preparing Students for the Future Workforce:
As educators, we have a responsibility to prepare our students for the demands of the future workforce, which is characterised by rapid technological advancements and evolving job market dynamics. Our computing education equips students with the skills, competencies, and adaptability necessary to thrive in this landscape. We go beyond simply teaching specific software packages, emphasising the importance of fundamental principles that underpin computing.

We encourage students to develop problem-solving skills, critical thinking abilities, and resilience, enabling them to tackle novel challenges and adapt to emerging technologies. By nurturing their creativity and fostering an entrepreneurial mindset, we empower students to become innovators, capable of identifying opportunities and creating solutions that address real-world problems. We also provide opportunities for work-based learning, internships, and industry collaborations, exposing students to the realities of the professional world and fostering connections with potential employers.

Additionally, we recognise the importance of nurturing transferrable skills, such as communication, collaboration, and project management. These skills are essential in an increasingly interconnected and globalised workforce, where effective teamwork and effective communication are highly valued. Through group projects, presentations, and collaborative activities, we cultivate these skills in our students,

[1] https://static.teachcomputing.org/GBIC-Research-Report-Options-evenings-and-booklets.pdf?ref=blog.teachcomputing.org&_ga=2.55075619.986875332.1685014670-1337537095.1685014670

preparing them for the collaborative nature of future workplaces.

Embracing Technological Advancements and Emerging Fields:
The field of computing is ever-evolving, with new technologies and disciplines constantly emerging. At Broughton High School, we remain committed to staying at the forefront of these advancements, ensuring our students are equipped with the latest knowledge and skills. In 2023, we have reviewed and updated our curriculum significantly to reflect the current trends in computing, including artificial intelligence, data science, cybersecurity, and Internet of Things (IoT). This ensures that our students are prepared to seize the opportunities presented by these emerging fields and contribute to technological advancements in the future workforce.

Cultivating Cultural Capital
We recognise the importance of cultivating cultural capital in our students, providing them with a deep understanding of the broader societal and cultural implications of computing. We encourage students to explore the historical and cultural context of computing, examining how technology has shaped and continues to shape our world. Through discussions, research, and exposure to diverse perspectives, students develop an awareness of the ethical, legal, and social implications of computing. They gain a broader understanding of the impact of technology on individuals, communities, and global issues.

Furthermore, we promote inclusivity and diversity within our computing curriculum. We strive to ensure that students from all backgrounds feel represented and included. By incorporating diverse perspectives and examples into our teaching materials, we expose students to a range of voices and experiences, fostering empathy and cultural sensitivity. We encourage students to critically evaluate the representation and biases embedded in technology, equipping them with the skills to challenge inequalities and promote inclusivity within the digital realm.

Implementation

The Computing curriculum is delivered through an average of 1.5 hours of lessons per week in Year 7 and Year 9, and one hour a week in Year 8. Lessons are predominately taught by two specialist Computing teachers with some lessons (at KS3) taught by the Head of Business who has experience of delivering Computing at KS3. There are six Year 7 classes with approximately 30 pupils each. In Year 8 and 9, the pupils are divided across eight classes, allowing much more flexibility in meeting the needs of individual students with the smaller class sizes. Since pupils are taught in mixed ability groups, this model of reduced class sizes is especially appreciated by **pupils requiring extra support,** as well as our **more able pupils** who are provided further opportunities of stretch and challenge.

At Key Stage 3, most topics are between six and eight lessons long. Pupils are assessed both on their substantive knowledge and their ability to apply this knowledge in identified tasks and coding projects. Our new curriculum incorporates the pedagogical principles and teaching resources, originally created by the National Centre for Computing Education (NCCE) and the Raspberry Pi Foundation. This material is nationally recognised and has been widely adopted by schools across the UK. It offers teaching and learning resources created by subject experts and blends the latest pedagogical research with teacher feedback. These resources have been carefully adapted to meet the needs of our students at Broughton High School. A notable advantage of using this material, is that many primary schools have taken to using the NCCE material for Key Stages 1 and 2, which provide a strong foundation to build upon and a natural sequence for subsequent teaching at Broughton.

Teachers use a **variety of adaptive teaching strategies**, including but not limited to:

- The PRIMM model – Students are provided with a problem, usually in a programming language. They then follow the five steps of: Predict, Run, Investigate, Modify and Make to gain a greater understanding of the solutions available to the problem.
- Paired Programming – Students code in pairs, with one person at the keyboard as the 'Driver' and the second student as a 'Navigator' providing suggestions, researching possible solutions. At timed intervals, the students swap roles to ensure a balanced approach to team programming.
- Project-based learning – Throughout KS3, students are provided with various digital project challenges, which allows them to implement the knowledge and skills into a working example, such as a website, a mobile app or a game.
- Physical computing – This encourages a hands-on approach, using small devices, such as Microbits and Raspberry Pi computers, and understanding the connection between the theory and working practice.

Teachers foster an enjoyment and curiosity for computing, and **routinely check pupils' understanding**, through marking, assessments and class discussions to identify and correct misunderstandings and ensure that all pupils embed key concepts in their long-term memory. Pupils are provided with numerous opportunities to connect new knowledge and skills and build on prior learning.

The structure of our KS3 curriculum is well balanced, incorporating the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation, as well as the essential skills of digital media production. These are not merely taught as discrete disciplines but rather they form the basis of various modules strategically interspersed across the curriculum. This allows us to **support retrieval** and **spaced practice**, and also creates a journey that sequences naturally into KS4 Computer Science or iMedia.

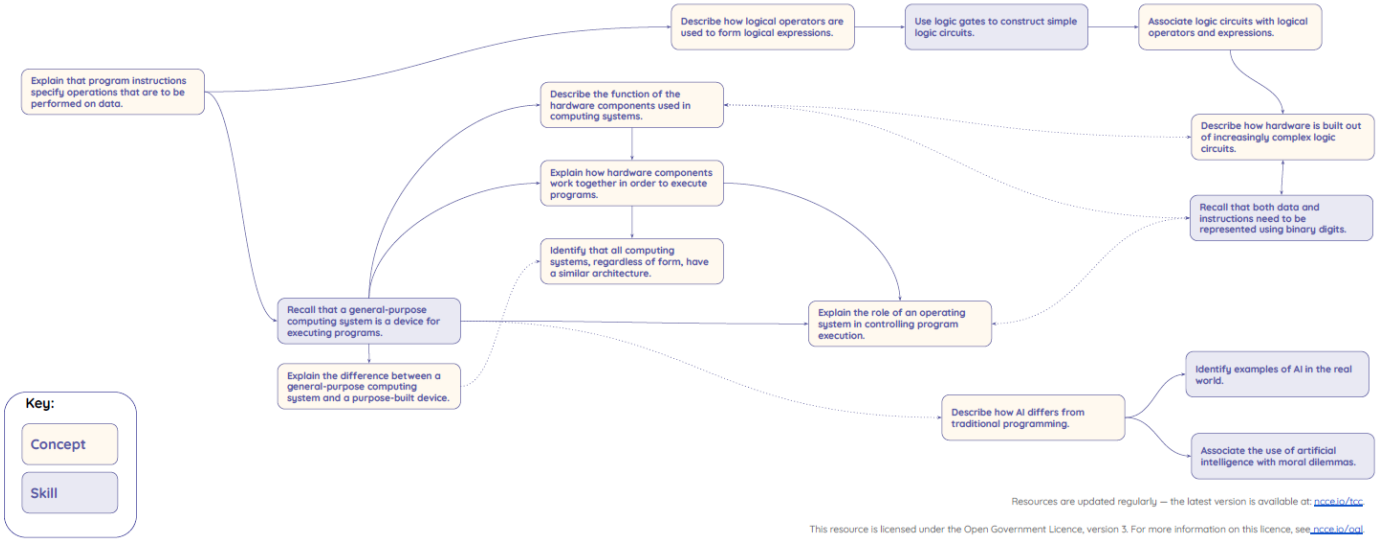
For example: In Year 7, pupils explore coding, algorithms and problem solving, designing flow charts, and utilising block-based programming languages using Scratch and Micro:Bits. As part of this they study control, logic and abstraction. These concepts are again revisited in Year 8 where they extend this knowledge by using a block-based programming interface to create a JavaScript mobile phone app. This unit also encourages students to transition from block-based programming and text-based programming, by allowing students to switch between block-based and text-based programming with the press of a a button. In a subsequent unit, students take the next step into a fully text-based programming language, Python. In Year 9 pupils continue to use Python, and incorporate elements of this skill in a further Physical

Computing unit of work, where they use Python code to control components, such as LEDs and motors. These skills, and in particular the Python programming language, are essential in the GCSE Computer Science course, and so the journey through KS3 provides a very strong foundation for any students wishing to take that route at KS4. Regardless of their KS4 pathway, text-based programming requires pupils to demonstrate not only computational thinking but also tenacity and resilience; essential ingredients for lifelong independent learning. We go beyond the requirements of the Computing National Curriculum and teach several programming languages, in order to stretch our learners.

Similarly, aspects of our KS3 curriculum provide a well sequenced journey through digital media production. In Year 7, students engage with the creation of media, from poster and presentations to making a blog to promote an environmental cause. In Year 8, students deepen their understanding of graphics, exploring bitmaps and vectors, as well as putting this knowledge into specific projects through a web design unit and a mobile app development unit. In Year 9, students explore the more challenging aspect of 3D animation, as well as exploring media production in a project-based unit that covers many of the topics that could be explored further in KS4 iMedia.

Online etiquette and safety is taught as a discrete module in Year 7 and further age appropriate 'top-ups' are provided in subsequent years.

Each unit of work has a detailed Scheme of Work, and a Learning Graph, which organises concepts, knowledge and skills into a visual graph and provides a progression framework as the backbone of our curriculum. An example is given below for the Computer Systems unit:



Learning resources are presented to students via Microsoft Teams, using digital notebooks and assignments for learner work. Additional enriched content is provided (video, audio, external hyperlinks, quizzes, worksheets etc.) to provide all of our pupils with equal access to the curriculum, both within and outside of planned computing curriculum time. Each module is planned such that the intended knowledge and skills steadily build up and are imparted to the pupils.

In addition to Microsoft Teams, we deploy other software and technologies to aid teaching and learning. Each one has been carefully selected based upon the underlying research-based benefit. We use a combination of online resources, such as Idea.org.uk, Seneca, TuringLab, and Kahoot for KS3 and additional resources, such as IsaacComputerScience and AdaComputerScience for KS4.

We are fortunate to be supported by a Senior Leadership Team who understand and share our vision for Computing at Broughton. Investment in computers and associated infrastructure has ensured we have had access to quality equipment and crucially the necessary software needed for us to implement the curriculum at both KS3 and KS4.

We encourage our pupils to be aware beyond their own experiences/world and actively promote a broad world view beyond the walls of our classrooms.

- Pupils are encouraged to take part in the online Alan Turing competition - which previously extended to attending the grand final live cryptography competition at the Alan Turning building at the University of Manchester. This promotes aspiration towards university/further education.
- Candidates have visited the Runshaw Comp Science Master class day
- Entry to the Cyber security competition at Newman College
- We encourage pupils to take part in the GCHQ (The UK's cyber security arm) Cyber Assess competition.
- Our curriculum resources frequently signpost to, and highlight the vast array of Computing careers.
- Throughout KS3, we have a range of modules which use realistic scenarios, allowing pupils to apply knowledge and skills in context.
- We incorporate links with other subjects such as MFL (including a translated page on their travel websites), Mathematics, Technology (3D printing) and Music (correcting syntax errors).
- Involvement in the Digital Leaders programme.

At the start of Year 7, all pupils complete a **baseline assessment**. This gives us a good understanding of pupils' prior ability. They repeat the test at the end of year 7 allowing us to measure progress to some extent. At the end of Year 8 and 9, all pupils complete an end of year computing exam.

Formative assessment is part of every lesson. Teachers routinely assess that pupils are learning, understanding and remembering the components of the curriculum through recall quizzes, whiteboard activities, and targeted questioning. For units of work with a practical component, work is assessed against agreed criteria contained in a rubric document. This rubric is shared with the students prior to starting the practical work, so that expectations are clear and the rubric can indicate and guide progress from one lesson to the next. This documentation usually includes a space for written teacher and student feedback to indicate what has been done well and what improvements are needed. Pupils are expected to improve work as a result of feedback.

For more theoretical units of work, an end of unit quiz is used for summative assessment, composed of multiple-choice questions, along with short-form and longer-form questions. For some units, both a quiz and rubric assessment methods are used. The same rubrics and end of unit quizzes are used across the department, and practical work is moderated to ensure consistency and standardisation. Trends, such as well answered questions and poorly answered questions are immediately apparent to the teacher who can intervene to correct misunderstandings across each class as a whole.

Data points from homework and end of unit assessment are tracked by grade in Teams, as well as using a RAG marking system which will inform teachers in deciding if pupils are meeting curriculum expectations when completing termly reviews.

At KS4, GCSE students complete regular end of unit tests throughout the two years, along with some mid-unit testing during longer units of work. Scores are analysed against curriculum expectations, and underperforming students are provided with targeted support at lunch/after school in small groups. When possible, end of unit tests are spaced, i.e. completed several weeks after the completion of the unit to aid long term knowledge retention.

There is a culture of **regular peer and self-assessment**. Pupils use purple pens (or more often purple digital text) to highlight and make subsequent improvements to their work. After creating a substantial computing product such as a mobile app, pupils may send their work home electronically. As part of their homework, pupils showcase their work to their parents/guardians. Most work is submitted through Microsoft Teams or handed in physically for the teacher to mark. This reduction in printed work helps the environment as we seek to reduce our carbon footprint.

For iMedia, continuous assessment takes place as pupils progress through the coursework units. Exam style questions are regularly utilised throughout KS4 to prepare students for the final exams.

All this is done to ensure all pupils '**achieve together'** to produce their '**best at Broughton'**.

Impact

The quality of pupils' work in Computing is consistently and routinely of high quality. Pupils largely store their work electronically in organised and properly labelled hierarchical folder structures. They are increasingly using cloud computing (Office 365) to store and transfer their work securely. Students are increasing in their confident use of Microsoft Teams, which is the routine practice in Computing. Pupils use their **Computing skills across the curriculum** in numerous subjects to effectively research, present and organise their work. They are also able to use their Computing skills to work collaboratively where necessary. Their problem-solving skills, developed whilst programming, often build upon their mathematical knowledge and allow them to practice crucial problem-solving skills in a different context.

All pupils have the opportunity to choose GCSE Computer Science or the vocational Certificate in Creative iMedia. Typically, a smaller number of pupils (including SEND/Disadvantaged) opt for GCSE Computer Science in line with the national trend. The vocational option, Creative iMedia is a relatively popular choice. Results from **pupil voice questionnaires** carried out at the end of each year by all pupils are generally very positive. Many of our Computer science students **opt** to study the subject at **A-level** beyond Broughton. The number of girls opting for GCSE Computer Science remains a concern at Broughton, although this is an issue affecting schools nationally.

Tests scores, especially at KS4 level, show the impact of effective feedback on pupils' outcomes. Historically, the computing department has **performed amongst the top departments** in Broughton in terms of GCSE results. Average Point Score (**APS**) compared to pupils nationally at a similar starting point for GCSE Computer Science was **+1.17**, **+0.86, +1.46, +1.01 and +0.84 for the last few years**. This demonstrates the impressive progress and outcomes for our Computing students. Results for the iMedia course have also been generally good. The previous year's national APS score for the subject was +0.04, although this last year there was an under-performance in the subject due to Covid and other disruptions to the course.

Pupils enjoy Computing. Our after-school **extra-curricular computing club** has been open to all pupils and has been well attended by both boys and girls (though boys remain in the majority). Pupils take pride in their classwork and often take completed work home for parents to see.

Following a presentation by the head of department to the governors' curriculum and standards committee, the **governors last reviewed** (and approved) the computing curriculum in **January 2019**.