

The Computer Science Curriculum at Our Lady's Catholic High School

Our computer science curriculum aims to equip pupils to use computational thinking and creativity to understand and change the world. Computer science has deep links with mathematics, science, and design and technology, and provides insights into both natural and artificial systems. Computer science and computer technology are part of just about everything we do from the cars we drive, to how we entertain ourselves, to business and government. Computer science is at the centre of innovation in sciences, medicine, politics, education, entertainment and many more.

Computer scientists are needed in the digital age that we live in, computers and an understanding of programming are required everywhere. Computer scientists design, develop and apply the software and hardware for the programmes that we encounter in everyday life. Therefore, there are good job opportunities. Every industry uses computers, so as a computer scientist you will have to the potential to work in any.

The most important aspect of computer science is problem solving, which is an essential skill for life. Pupils have an opportunity to study the design, development and analysis of software and hardware used to solve problems in a variety of business, scientific and social contexts. There is a significant human aspect to computer science as computers are designed to solve problems for humans, which impacts upon our everyday lives.

Pupils are taught the principles of information and computation, how digital systems work, and how to put this knowledge to use through programming. Building on this knowledge and understanding, pupils are equipped to use information technology to create programs, systems and a range of content. Computer science also ensures that pupils become digitally literate – able to use, and express themselves and develop their ideas through, information and communication technology – at a level suitable for the future workplace and as active participants in a digital world.

The curriculum for computer science aims to ensure that all pupils:

- understand what algorithms are; how they are implemented as programs on digital devices; and that programs execute by following precise and unambiguous instructions;
- understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation;
- analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems;
- design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts;
- use sequence, selection, and repetition in programs; work with variables and various forms of input and output;
- use logical reasoning to explain how some algorithms work and to detect and correct errors in algorithms and programs;
- understand computer networks including the internet; how they can provide multiple services, such as the world wide web; and the opportunities they offer for communication and collaboration;
- use technology purposefully to create, organise, store, manipulate and retrieve digital content;
- recognise common uses of information technology beyond school;
- use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact;
- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems;

- are responsible, competent, confident and creative users of information and communication technology;
- use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content;
- select, use and combine a variety of software (including internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information.

At Key stage 2 pupils should be taught how to write programs that incorporate sequence, selection and iteration which use variables as well as inputs and outputs. At KS3 these skills are built on in various units. Pupils should also know how to design and debug their own programs by decomposing problems which they should be able to explain using logical reasoning which again is fundamental to the algorithm section of the KS3 curriculum.

At KS2 pupils should have some understanding of networks including the internet and understand services that they offer. Again, this is built upon at KS3 and KS4. It is also key that pupils understand how to use technology safely and is continued to be built into the KS3 curriculum through Esafety and Ethics units of work.

The KS3 curriculum has been designed to ensure learners have sufficient knowledge to stay safe online and use computers safely in life. The KS3 curriculum also provides a focus on developing resilient learners who are able to recover from mistakes and effectively solve problems. The topics at KS3 give a basis of knowledge, skills and understanding to allow students to progress onto either Information Technologies or computer science at KS4 and will provide exposure to those subjects so that students can make an informed decision on their GCSE choices. Within computer science, the KS3 curriculum hits the key areas discussed at KS2, but more in-depth. Pupils continue to design, use and evaluate programs and models that are related to the real world, e.g. traffic light systems, in a variety of different programming contexts and algorithms. This includes written programs as well visual representations such as flowcharts. Pupils are taught to understand why there are alternatives and different ways to solve the same problem. At KS3, all of the National Curriculum statements are elements of the KS4 GCSE curriculum which we cover with each year going into more detail. Boolean and binary are introduced as well as different hardware components and how they are used within different systems. Pupils have the opportunity to undertake creative projects that involve selecting, using, and combining multiple applications, across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users. This is used to consolidate knowledge that pupils have covered and apply it to different scenarios. This allows pupils to create, reuse, revise and repurpose digital artefacts for a given audience, with attention to trustworthiness, design and usability. By pupils creating and reusing resources they will be able to identify the strengths and weaknesses to each.

The rationale of the KS4 curriculum is for students to develop the mind-set of a computer scientist built upon the foundations at KS3. Learners have the opportunity to develop their capability, creativity and knowledge in computer science, digital media and information technology. A lot of thought has been put in from the department to ensure that there is clear sequencing within the curriculum. This is reviewed yearly and adapted when and where needed. Opportunities to discuss careers within the curriculum is discussed where relevant. Most units of work have the opportunity to discuss careers and this is shared with pupils. This allows pupils to see how the subject they are covering relates to the real world and how these skills can be applied. It gives the topic a purpose rather than just a task to complete.

The curriculum for computer science is designed so that all pupils are taught as individuals, including SEND and disadvantaged pupils as they are all taught the same topics. No topic is left out because it will be deemed "too difficult" for some pupils. There are different programs available to teach the same topic, for example

if pupils are struggling to grasp Python programming through the IDLE program, the teacher instructs pupils to use a different system called Mu for instance which is more user friendly and more of a “help” for pupils. The expectation of the work that is produced is the same but the way of teaching it may differ or scenarios may differ to show the skills and understanding. Building up tasks allows pupils to build up confidence within the subject. Within computer science there is more than one way to complete a task. The concepts are key the same but the way for pupils to achieve those concepts may differ. Resources are purchased for all pupils but it has been found that these have been a great support for those with SEND (revision guides for example) as they can look back to the work covered to recap or to use within lesson to support their learning. Online resources have also been purchased to aid with learning as some pupils are put off by long exam questions. With resources such as Socrative, Quizzes and Edcuake support their learning in a different way. At KS4 pupils’ strengths and areas of improvement are looked at to help support pupils through their exams and gain marks where their strengths lie.

Tasks for outside of the classroom have been designed so that they can be completed online and on a mobile device but if this isn’t possible, different provisions are put in place by the department e.g. printing off the work. This is addressed at the start of the year so no learning is missed outside of the classroom time. Pupils are also encouraged to take part in any extra activities when they are run, for example the UK Bebras Challenge.

There are many different CPD courses that are run by STEM learning and Teach Computing which are shared within the department to build on our own knowledge of the curriculum which in turn is then shared within the department and the curriculum adapted based on skills/ new pedagogy that have been learnt which in turn impacts on learning. By attending CPD courses it means that the curriculum is relevant and allows for any opportunity for further knowledge to be gained and shared with the department. It also allows us to be up to date with future career opportunities that would be shared with pupils.

Assessment is important within computer science to judge pupils understanding of a particular subject. Assessment takes place during every lesson either formally or informally. Formal assessment is tracked through the use of the worksheets that are produced and used within lesson and stored centrally for tracking. End of topic tests are also used. All units of work are marked and feedback is given to pupils for them to action. Pupils are encouraged to learn from their mistakes to allow them to develop their knowledge and application of that knowledge to different questions.

Within each topic there is key vocabulary which is discussed each year and used within every topic covered. These are shared with pupils and built on each year (year 7 into year 8 and so forth). Key words are introduced into each topic via worksheet and discussed regularly. The teacher consistently uses subject specific language verbally as well as written instructions and pupils are encouraged to do the same. The use of questioning for homework tasks allows pupils to continue to see the keywords being used and applied.