Newport Girls' High School Curriculum Summary

Faculty:	Mathematics and Technology		**Subject:**	Computer Science

Our Vision

Faculty Vision

The Mathematics and Technology Faculty comprises of the subjects: mathematics, further mathematics, computing and design technology. Our aim is to work together to create and develop learners who are equipped to succeed in this modern technological world. Throughout their time here they will evolve their mathematical and logical understanding and appreciate the importance of accuracy and rigour. They will enhance their creativity to solve problems be it in a practical environment or in theory. We will help foster their love of STEM subjects by creating a learning environment where students feel appreciated and valued and are given opportunities to thrive.

Subject Vision

Programming will be at the heart of the curriculum, and developed for as many different contexts as can be facilitated by the technical infrastructure and the time constraints of the school year. It will start off visually in year 7 to develop logic skills but avoid syntax errors, and then build in sophistication, adding in Python towards the end of KS3, introducing Visual Basic in KS4 and C# in KS5. Pupils will then have received a proper grounding in programming principles which will be able to be used regardless of the platform, much as a driver is able to drive any make of car even though they have controls in different places and perform slightly differently.

Vestiges of the old ICT curriculum will remain in KS3, so that the students can gain skills in selected applications namely; web authoring, spreadsheets and databases, with very commonly used applications such as Word Processing and Presentation software being used all the time, and advanced tips and tricks introduced as appropriate.

Curriculum Intent

At KS3, students will be introduced to safe and suitable practice regarding networked computers and Internet use with a view to augmenting, not replacing PSHE material covering similar ground. After that, the emphasis is on programming, starting visually to promote logic skills with Scratch, then moving to Small Basic with its "Intellisense" that helps students write code, to eventually writing scripts in Python where they will then have to pay attention to syntax as well as logic.

Office applications will also feature in KS3, but the emphasis will be more on the advanced technical aspects that allow the students to be more creative in manipulating digital data than if they had been introduced cross curricula. The specific applications will be Web Authoring software, Spreadsheets and Databases, with the phone app module split into two, one using online app development software to create the look and feel of the app, which is more like ICT, and the other to program the app.

KS4 will follow the AQA syllabus with the Visual Basic option for console applications. The Visual Basic option is chosen because the Visual Studio development environment gives very good help and support for the students programming, and it allows their programs to be compiled which is much more satisfying as they can create applications which will run on their own, without the need for the development environment. Thirdly, Visual Basic is very similar to the pseudo code use in the written exam papers.

At KS5, students develop their programming skills using C#. More abstract and mathematical theoretical concepts are introduced which will complement A Level Mathematics if they are taking it. Students will have to complete a project to code an application for a real-life problem as well as sitting an electronic exam which will fully test their programming skills. Additional languages are also used as the requirements dictate.

Curriculum Sequencing Rationale & Implementation

The sequence of modules for Computer Science are designed to develop the students' skills so that they can create programs of increasing sophistication, that allows their programming to embody the theory they learn .

KS3:

Starts with building a web site promoting their local area. This is an ICT module that enables the pupils to use their digital equipment to create original material. The students are encouraged to use multi-media elements to enhance their web site where relevant, stretching the use of the web authoring software beyond static presentation of information. Other ICT modules are included; in year 7 spreadsheets are used, where students see that variables and if statements enable them to program their spreadsheet. They are also introduced to advanced short cutting tools, and begin to appreciate the versatility of digital data. Further ICT modules include the designing and creating of a phone app using Appshed in year 8, which requires the application of aesthetic and presentation skills, and Databases in Year 9, which feeds into the KS4 curriculum.

Programming is started visually using Scratch and the basic principles of algorithm development are introduced, namely: assignment, selection, iteration and sequence . These will reoccur throughout the whole of the curriculum right up to KS5. Different programming environments are then introduced with the visual element continued in year 7 with Flowol. In year 8, the programming aspect of the Phone app is done with Blockly code which is quite visual then more text-based coding is introduced with Small Basic and finally Python.

While theory is interwoven within all the modules, more abstract theory is introduced in year 8 with the exploration of number systems, binary numbers and binary arithmetic. Computer architecture and hardware is also introduced in year 8.

The whole program of studies at KS3 gives a good grounding for what is to come in KS4.

KS4:

The year 9 curriculum is designed as a transition from KS3 to the AQA GCSE Computer Science syllabus. Tasks are more project based and complex than previously encountered. Though the same principles of algorithm development used in KS3 are reinforced, more complex data structures and a modular approach to coding are introduced. The pupils have more choice in the challenges they tackle, to allow those who are keen to take the subject further to push on as far as they can, while allowing students who do not want to take it further to code at a level they can manage. Initially coding is done in Python, then Small Basic and then Visual basic is introduced and becomes the developmental platform of choice for the GCSE syllabus.

More emphasis is given to abstraction and decomposition in analysing problems. This would have been very teacher led in KS3 but in KS4 pupils are encouraged to do more of the analysis individually. This is reinforced with lessons in computational thinking, where problems are analysed and solved just with pen and paper.

At the time of choosing the GCSE options the teaching focuses completely on the AQA syllabus, interleaving theory and coding. Programming is done solely through Visual basic and as far as possible the theory is reinforced with a programming task. This gives maximum coding practise while at the same time forcing the student to go over the theory again in detail. So, for example, calculating the size of an image file based on resolution and number of colours, will be followed by a task to program an image size calculator.

Some theory does not lend itself to a programming task so is tackled in groupwork with shared information via presentation software. This gives the students a break from programming and a chance for discussion.

KS5:

This follows the AQA Computer Science A Level syllabus. Modules are designed around the AQA specification, and coding is done primarily in C#. The syllabus follows two paths; Computer Science theory and programming techniques. Unlike in KS4, there is little overlap with programming and theory, mainly due to time constraints and the abstract nature of some Computer Science theory but where possible it is facilitated, for example, with the module on encryption.

All aspects of programming theory will have a corresponding task. No programming is solely paper based, so that all programming techniques are tried out by the pupils. Where possible, this will be using C#, as in the Object-Oriented Programming module, but other languages will be used as needed, for example SQL for database queries and Haskell for Functional programming.

The curriculum aims to equip the students for the project they will have to code and submit, enable them to perform well in the programming exam, and to have learnt all they have needed for their theory exam.

For specific information relating to the content of the curriculum in each year group, opportunities for wider personal development and enrichment and ways for parents to support their daughter in her learning within this subject, please see the Learning Overviews on our website.