COMPUTING

Curriculum Intent, Implementation and Impact

Intent

We aim to create the very best Computer Scientists. We challenge students to think, act and speak like those working in the field would. We do this by ensuring our students use terminology relevant for the workplace and gain practical knowledge of software used in industry. During their time at NHGS they will observe through research and investigations how systems have been developed in the real world. The students will evaluate good and bad examples of the methods used by organisations to change or implement new systems. The teaching staff in ICT/Computing will communicate with students using modern office tools such as email and cloud computing. The students will learn to respond in a timely professional manner.

Our curriculum at NHGS goes far beyond what is taught in lessons, for whilst we want students to achieve the very best examination results possible, we believe our curriculum goes beyond what is examinable. As a department we encourage trial and error and allow the students to learn from their mistakes by evaluating and improving work. By making mistakes, evaluating and then creating improved versions of algorithms or programs students will build confidence and resilience in their attitudes towards their work at NHGS.

Our curriculum in ICT/Computing forms a backbone to our ethos statement. Examples of how our curriculum supports the ethos statement are many and varied in Computing. Students will be creative when solving problems by designing efficient algorithms. They must demonstrate a structured logical method of working. Students must enquire and evaluate their algorithms to justify their effectiveness and efficiency. Students will learn to be mindful about the information they share personally and also investigate and discuss the use of information within an organisation or country. Teachers in the Computing Department will be professional and courteous to demonstrate and expect mannerly behaviour and communication.

As a knowledge engaged curriculum we believe that knowledge underpins and enables the application of skills; both are entwined. As a department we define the powerful knowledge our students need and help them recall it by using a variety of teaching styles and methods. Students have access to the Google Classroom where all their lesson content and tasks are stored. This keeps all the lessons and topics in the order they were taught and students can easily look back and find previous resources. Students have the opportunity to see all the presentations that were demonstrated during class time. Lessons will also make use of videos, worksheets and eBooks. Students have the opportunity to present work in a variety of ways from written documents to multimedia videos.

We build the Cultural Capital of our students by discussing the moral and ethical impact of technology for example the storing and distribution of personal data and the widespread use of tailored marketing. They will also investigate the environmental issues surrounding energy

use within data centres and the waste products from hardware when it is disposed of in landfill. With the worldwide focus of artificial intelligence this area of study is going to play an important role in our modern world and software engineers need to be prepared for the responsibility placed upon their shoulders. With the introduction of self-driving cars and many other automated systems new opportunities in Computer Science are opening. Positions in business are being created to evaluate the moral, financial and cultural implications technology that thinks and decides for us will place on the worldwide community. There are hundreds of very different careers relating to ICT, Computer Science and Technology. Students with a Computing degree have the choice to follow different paths and our curriculum is designed to provide experience, knowledge and skills to enable students to evaluate the breadth of opportunities available to them when they leave full time education. Students also need to be aware of the dangers of a connected world and how to manage their online profile in order to present themselves to the world in a professional and safe manner.

Implementation

In Key Stage 3 lessons start with a 'Fruitful Three' these are warm up questions based on the previous lesson and Computer Science general knowledge. Lesson objectives and keywords are shared with the students. They have constant access to these through the posted online resources. All students have access to the Google Classroom. All lessons are posted in the classroom so they can always find their work even if they cannot attend that lesson due to absence or internal and external commitments. The students are issued with the teacher's presentation that contains all the knowledge for the lesson. In class this will be presented by the teacher and form the basis for class discussion. The students will also receive in the classroom post a student presentation. This presentation has tasks and activities for them to complete, the aim, to practice and solidify the content of the lesson. Every lesson ends with a multiple choice quiz which? is the starter in the following lesson. The students receive instant feedback once they submit the quiz. Where appropriate if they got a question wrong the feedback will explain the correct answer. If the student is still confused by the question or has misconceptions the teacher is available to explain and clarify the answer. The results from the quiz are also made available to the teacher so they can monitor the success of the lesson and evaluate if the objectives of the lesson have been met. This can assist in the planning for the following lessons.

In Key Stage 4 the lessons are split between theory and coding. A theory lesson in Key Stage 4 will commence with a starter activity. Moving on, the students will be made aware of the objectives and keywords for the lesson. They will also have a 'Key Question'. This Key Question is designed to be open and allow longer discussion and develop the use of terminology. Skills that are required to engage with the topic and complete essay style questions. The teacher will present the knowledge of the lesson. This knowledge is posted on the Google Classroom so the students always have access to this information. The students will make notes on the lesson in a GCSE Notes Document. This document is split into three parts. The first section the students write the main points of the topic. The second section is very important and it asks the students to think of questions they could be asked from the notes they have written, testing themselves on the topic of the lesson. The third section is designed to build their terminology by listing and defining the keywords of the lesson. The students have a digital workbook for each topic. The workbook contains activities to reinforce the knowledge of the session. The lesson concludes with a multiple choice quiz conducted online, self marking with instant feedback for the student and teacher. The students are also provided with a video for that particular lesson so they always have the opportunity to rewatch the content that was delivered in that particular lesson. In the dedicated coding session the students have the additional element of working through problems they are required to provide a software solution. Although there is a dedicated coding session the importance of making a link between the two sessions is emphasised and explained by the

teacher. There is important theory knowledge that is highlighted when the students are creating software programs.

Lessons in Key Stage 5 follow a similar format to Key Stage 4. The main difference being students receive digital activity sheets each lesson instead of a workbook for the topic. Again the A-Level Notes Document plays an important role in getting the students to think about the type of questions they will be asked. Towards the end of Year 12 students will have some independent time in lessons to develop a software solution for a real world application. They will consolidate all their practical skills and knowledge as they produce a Systems Life Cycle Report which documents the creation of their system. They will need to consider the analysis, design, implementation, testing and finally evaluate their success.

Impact

At the end of Key Stage 3 students should leave the subject with a good understanding of the role technology plays in our society. They will be aware of how to conduct themselves online and the digital footprint they create. They will appreciate that computers are not magical boxes but only process 1's and 0's and these binary digits are used in different ways to produce numbers, characters, images and sound. They will be able to convert values between denary, binary and hexadecimal and know the reasons different number systems are used in Computer Science. Through trial and error they will have skills in producing logical and structured solutions in code and will be able to explain the algorithms they have created.

Students opting to complete the GCSE course will have extended their Key Stage 3 knowledge to include an understanding of the threats to computer systems and how to protect against them. The subject of networks, standards and protocols is complex but they will know the differences between local and wide area networks and the way data travels around the world. They will be able to recognise the advantages and disadvantages of standard sorting and searching algorithms and decide which algorithm suits a certain scenario. In their practical programming they will be able to recognise and implement the three constructs of programming and use a variety of data structures from simple variables to lists and databases. They will understand the basic components of a CPU and some binary logic gates. The number of students taking the GCSE subject has increased over the last few years demonstrating the interest that has been generated through Key Stage 3.

A student with a Computer Science A-Level completed at North Halifax Grammar School will understand the importance of sequencing steps to solve complex problems. Their knowledge of sorting and searching algorithms will be extended to also include binary trees and pathfinding algorithms. They will be able to describe how an algorithm will scale with increasing amounts of data using Big O notation. Their knowledge of binary logic will be extended from GCSE to include Adder and Flip Flop circuits. They will be able to simplify binary expressions using Karnaugh Maps. Students that successfully complete the Computer Science A-Level have moved on to Computer Science degrees at university. Another popular entrance into the profession is through degree apprenticeships and a number of Computer Science students have taken this opportunity with large successful companies in a variety of industries.