Computing key stage 3 Curriculum Sequencing Rational

Our key stage 3 curriculum is in line with the national curriculum and has been designed to give students the knowledge to use a range of different applications, develop their computational thinking/programming skills, improve digital literacy and to understand how digital computers operate.

In choosing what is part of our curriculum we have considered the national curriculum, the content of GCSE Computer Science and what we think is useful for the students to know.

Strands of Computing

https://www.gov.uk/government/publications/research-review-series-computing/research-review-series-computing

The above Ofsted report highlights three main areas of content in Computing.

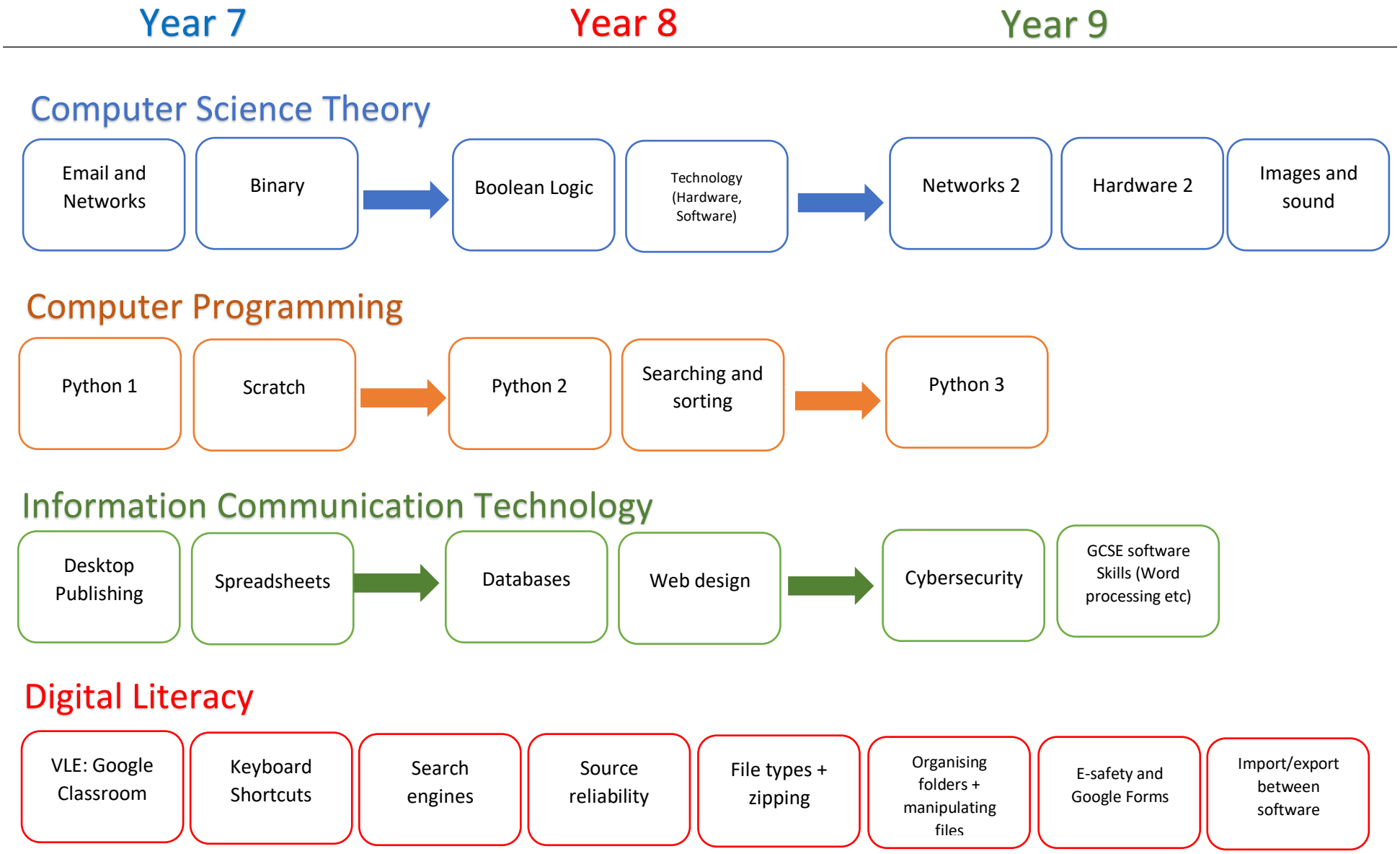
- computer science
- information technology
- digital literacy

However, we would consider it more accurate to say we teach aspects of digital literacy across other units where appropriate. For instance, showing students how to do an advanced web search while they collect images for a DVD cover or teaching the importance of using reliable sources in their web development unit. Therefore, we split the content in to the following pillars:

- Computer Science theory
- Programming
- information technology

This is emphasised on the following page which maps out the main units of teaching across key stage 3 alongside the pillar that is covered. The digital literacy pillar includes some of the things we endeavour for students to learn during their key stage 3 journey.

Computing Curriculum Sequence Map



Sequencing and rational

The rest of this document outlines each unit we do and why we teach it, while trying to explain the sequencing and how different units tie together. Major assessment pieces are listed here but for more details, please see the assessment map.

Year 7

1. Emails and networks

Important to start by getting students familiar with school systems (Google Classroom, webmail etc) that they will use across all subjects. We also take this opportunity to discuss the benefits/drawbacks of computer networks as they will be frequently using them and it is part of GCSE theory.

No Assessment

2. Binary: Representing numbers

All data and instructions in a digital computer are represented using 0s and 1s. We begin by introducing this idea in this unit by showing how all denary numbers can be encoded in binary as this is arguably the easiest for students to understand. From there we can build on this in later units with topics such as Boolean logic and representation of audio and images. This is also a topic that is in the GCSE and A level.

Online Binary Test

3. Introduction to Python programming

Programming is essentially telling a digital computer what to do. This is an important part of the computing curriculum, so much so that Python programming accounts for 50% of the GCSE content and the national curriculum states that two different programming languages should be taught to the students (One of which should be text based such as Python). This is why we teach a unit of Python across year 7, 8 and 9. Here we aim to expose students to text-based programming, using an IDE and some basic programming concepts (Variables, print, comments etc) so that we can build on this knowledge in later Python units.

Onscreen python Assessment

4. Desktop publishing: Making a DVD cover

While computing focuses on understanding how computing systems operate, ICT elements (Essentially using computer systems) are also an important part of the national curriculum. Throughout key stage 3 we aim to expose students to a range of well used software packages and occasionally offer a chance for students to show their creative side using ICT. After completing the Python unit that most students find challenging, we felt this was a good place to put this unit.

This unit also offers us the chance for students to learn about the systems life cycle (Research, Design, implement, test and evaluate) and to import data across different packages (Drawing software to DTP)

Finished product assessed

5. Spreadsheets

Microsoft Excel has been at the top of the world's most popular software package list for several years now (Except when zoom overtook at the start of the pandemic). We therefore believe it is valuable for students to learn about spreadsheets and it is likely most students will encounter them in one form or another when they enter the working world. Further students learn how to model, use functions (Which are used frequently in programming) and formulae.

Assessment on all topics so far

6. Scratch programming

Most students have encountered Scratch during their primary school years. We now go back to the topic, linking what they are doing to the Python and programming constructs they have learned earlier in year 7. This acts as our second programming language and it helps students use what they have learned to make functional programs such as simple games. We hope they see Scratch in a more computational light following their Python experience and believe it is an engaging topic to end the year with.

No Assessment/year 7 exam (Review)

<u>Year 8</u>

1. Boolean algebra

This short unit builds on the binary from year 7 and shows students how zeros (False) and ones (True) can represent various combinations of conditional statements using the Boolean operators AND, OR, NOT and XOR (This is also used in the GCSE and at A level where we add in NOR and NAND). This knowledge is needed in the later Python units for If statements and while loops, database queries and to understand how the CPU processes logic. For a GCSE topic, students find this fairly manageable and so we are able to introduce this topic early on during year 8.

Boolean logic assessment

2. Technology

This unit covers the basics of computer hardware (input, output and storage devices), software, the internet and the history of computing. All but the latter is relevant to the GCSE and the A level but we feel it is beneficial for students to understand how the digital age came to be. We believe this unit will give students basic knowledge in these topics and that knowledge can be developed in later units in year 9.

Boolean logic + technology assessment

3. Basic Python programming (Data types, variables, if statements etc)

As before programming is fundamental to the GCSE and A level. In our second python unit we re-cover the previous topics in more detail while adding on important programming concepts such a selection and iteration which gives students the ability to create much more dynamic programs.

Boolean logic + technology + Python multiple choice, online assessment

4. E-Safety – Google forms

Around the time of Safer internet day, we take a lesson or two to revisit e-safety. This involves students creating a working, interactive e-safety quiz using google forms. This teaches a new useful skill while ensuring students are reminded about the staying safe online.

No assessment

5. Databases

Databases are a fundamental part of the digital age, students use them (possibly without realising) and are frequently the subject of them whether that be in school or when they sign up to a website or service. We therefore feel having the knowledge of how databases work is an important aspect of their ICT repertoire. We have tried to spread out the learning of software across key stage 3 and think this is a suitable place as Booleans play a role in queries and a rudimentary understanding of data types is required to design a database with suitable fields (So should be after unit 1 and 3). Databases are also part of the A level.

Boolean logic + technology + Python +Database assessment

6. Sorting and searching

A small unit which fulfils an aspect of the national curriculum. This theoretical knowledge is used for our year 9 Python module (Linear search), is revisited at GCSE (Merge/bubble sort and linear/binary search) and developed further at A level where students are expected to be able to program many of these.

No Assessment

7. Website Design and programming in HTML

All students will be exposed to websites in some capacity and therefore we believe that students should have the opportunity to make their own. We do this using two methods, firstly using a text editor to manually create HTML tags and then displaying the results in a web browser. This gives students an understanding of how websites work at a base level. Secondly, we use web authoring software to give students a chance to produce a creative piece of work using ICT software. Here we can introduce the concept of a master page, internal/external hyperlinks and other such knowledge to increase digital literacy. We also think this is an engaging unit to end the summer term with and is the one creative unit we try to include in each year.

Finished website Assessed

<u>Year 9</u>

The outline here is for the academic year 2022/2023. As this entire year 9 course has replaced the previously studied ICT functional skills, this year has been one of building and refining therefore some of the ordering and assessments are different to what is being done in 2021/2022.

1. Bigger picture (File types, the environment, laws (copyright etc))

This is a short unit to introduce the year and covers important aspects of computing not covered in other areas. The first lesson targets digital literacy and gives students a better awareness of file

types, while the lessons after are all components of the GCSE and A level. We also think both topics are important for all students to have some understanding on, regardless of if they are taking the subject further.

No Assessment

2. Networks

This unit builds on the network unit done in year 7 and to a lesser extent the internet/WWW work of year 8. Students learn about the components of a network, how they might be set up and then go in to more detail about the various types of malware. All these topics are part of the GCSE and as some of the concepts are quite advanced, this is most suitable for year 9.

Assessment: covers units 1 and 2

3. Intermediate Python programming (Lists, Iteration, subprograms etc)

As before programming is fundamental to the GCSE and A level. This third Python unit reinforces elements of the second such as selection but extends further to focus on manipulation of simple data structures and more use of iteration. At this point the problems the students solve also develop computational thinking skills and naturally this unit must come after Python unit 1 and 2. It is also useful to put this here, so it can be completed before year 9 options, so students have a better idea of what is involved for GCSE programming.

Assessment: Python project

4. Computer Hardware

This unit builds on the hardware lesson in year 8 by looking at the components within a digital computer outside of input/output/storage devices. We introduce the concept of the fetch-decode-execute cycle so all students have some basic awareness of how a computer actually operates, something we deem important as all students use such systems. Further this topic is a big topic at both GCSE and A level. As with units 2 and 3 these are more advanced topics which is why these are done in year 9.

No assessment

5. Cybersecurity

We have placed this unit here to hopefully coincide with Safer Internet Day. Clearly as most students are frequently using digital devices this unit is important for them to stay safe online. Although this topic is touched on at various points in year 7 and 8, this unit goes in to much more detail of various threats and goes beyond the standard advice students are often reminded of, at the point they are starting to get more digital freedom. This will be useful for all students, not just those taking the subject for GCSE.

Assessment: Covering all year 9 topics

6. Representation of images and sound using binary

In this unit, students explore how binary can be used to store both images and sound. This is a big step forwards in concept and logically should come after numbers/Boolean. These topics are significant for the GCSE. It is also a useful unit to improve digital literacy as we revisit file types and students learn about multiple different software packages including audio/image editing software.

Assessment: covering all topics.

7. **General ICT skills for GCSEs: Word processing, Presentation software, Spreadsheets (formulae, filters and graphs) etc**

This unit gives students experience using both presentation and word processing software while also looking more in depth at spreadsheets. We look at features in these packages that students are unlikely to have encountered properly before (Such as setting up tabs, contents pages, fields, slide handouts and auto animation) These are all packages that have the potential for students to find useful at GCSE and the workplace, even if they do not take the subject. Therefore, we consider it to be a fairly engaging topic for students to finish their key stage 3 computing journey.

No assessment

All years: Bebras Challenge:

From their website:

- The Bebras Computing Challenge introduces computational thinking to students.
- It is organized in over 50 countries and designed to get students all over the world excited about computing.
- Each participant answer questions that focus on computational and logical thinking.

This is a one-off lesson that many students appear to enjoy and the skills tested are directly relevant to computer science. Students will get a score and feedback from Bebras shortly after the competition ends.