

**The National Curriculum for Computing**

**A Scheme of WorkNational Curriculum**

**Computing**

**Programmes of Study and Schemes of Work for Key Stages 1 and 2**

**This Scheme of Work covers all aspects of the National Curriculum Computing Curriculum Programme of Study. The Scheme of Work is divided into four elements. These are: Programming and Algorithms; Digital Content and the Internet, Understanding the Application of IT and Online Safety. Each element provides detailed guidance for each year group, including specific Knowledge, Skills, Understanding, Activities, Specialist Vocabulary and Teaching Points. There is an overview of each element from Years 1 – 6 providing continuity and progression within and across the Key Stages.**

**National Curriculum 2013**

**Computing Aims**

The national curriculum for computing aims to ensure that all pupils:

* can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation
* can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems
* 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.

**Programming in the Curriculum**

**Understanding and Creating Algorithms**

**Key Stage 1 and Key Stage 2**

**Progression**

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| **Programming in the Curriculum – Understanding and Creating Algorithms** | |
| Programme of Study  KS 1 - Understand what algorithms are, how they are implemented as programs on digital devices, and that programs execute by following precise and unambiguous instructions. Create and debug simple programs. Use logical reasoning to predict the behaviour of simple programs.  KS2 – 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 simple algorithm works and to detect and correct errors in algorithms and programs, |

**Understanding and Creating Algorithms Progression**

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| **Y1** | **Y2** | **Y3** | **Y4** | **Y5** | **Y6** |
| Know that instructions, and sequences of instructions, control devices and begin to understand that order and accuracy are important. | Plan, construct and record a simple sequence of instructions to control a device.  Understand why a routine did not perform as expected.  Review and modify their routine to enable a successful outcome.  Understand the importance of accuracy and precision. | Understand that sequences can be repeated to work more efficiently.  Be aware that things in the real world are controlled by input devices.  Be confident in explaining to others the reason why a sequence worked or had to be modified. | Understand what an input and output is in computing terms.  Understand simple control principles and processes. Begin to apply these logically to control devices.  Know that when creating sequences to control devices, accuracy is essential to a successful operation.  Understand and use simple sensors within their programming.  Understand that inputs and outputs impact on operational functionality. | Use variables and understand their impact on input devices.  Using their knowledge and understanding, predict the outputs of specific inputs.  Create, design, test and de-bug a single set of instructions using sensors incorporating single variables.  Be confident in explaining their program and what is needed to refine and improve. | Create programs to meet a given brief.  Create programs which have a number of separate sub routines, and which respond and interact depending upon inputs and outputs.  Use a number of variables to control more complex sequences to solve a given brief. |

**Programming in the Curriculum – Understanding and Creating Algorithms**

**Key Stage 1**

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| **Year 1 - Know that instructions and sequences of instructions control devices and begin to understand that order and accuracy are important.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| External devices respond to commands and can be controlled to achieve specific outcomes. | Be able to:  enter commands into a device to control movement/operation.  know where errors have occurred.  identify errors in instructions.  create a simple sequence of commands to meet a given outcome.  De-bug a command. | The importance of cause, effect, accuracy and sequence of instructions on the movement and/or operation of a device. | Control another child by giving simple commands or instructions to navigate a simple obstacle course or maze.  Talk about the outcomes and problems.  Use the first activity but build the sequence using command cards. Test the sequence and re-arrange cards to correct errors.  Use command cards to create a routine for a Beebot.  Run, test and de-bug the Beebot routine. | Commands  Control  Correct  Sequence  De-bug |
| **Teaching Points**  Encourage pupils to observe what happens when they test their sequences. Ask them to explain what happens.  Help them to modify the order or type of instructions to achieve a given result. | | | | |

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| **Year 2 - Plan, construct, record and de-bug a set of simple sequence of instructions to control a device. Understand why a routine did not perform as expected. Review and modify their routine to enable a successful outcome.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Devices can be controlled through series of commands and inputs created externally.  Instructions are written step by step to create a sequence which can be tested and amended. | Be able to:  use specific commands accurately and precisely within a routine/sequence to make a device respond in a given manner.  save or record their routine to enable editing and de-bugging  analyse which commands are needed to accurately control a device.  run and test their routine/sequence identifying errors and malfunctions  de-bug and amend their sequence of instructions to achieve the given manner/expected outcome | Accuracy is essential to ensure a given outcome  Routines can be stored and amended to alter functionality  Planning, testing and de-bugging are an essential part of successful operations | Provide a route which needs to be navigated.  Use a floor turtle, e.g. Roamer, which includes more complex instructions.  Use 2Simple or other control software such as Roamer World to control an on screen turtle.  Use grids for pupils to plan and record sequences and commands.  Run sequences. Identify errors, debug, and record amendments on the grid. | Commands  Test  Amend/correct/Edit  Routines  Device  Algorithm  Accurate  Precise  Debug |
| **Teaching Points**  Reinforce the teaching points of Year 1 and encourage pupils to observe what happens when they test their sequences. Ask them to explain the outcomes of their routines.. Reinforce the importance of accuracy and precision. Help pupils to debug the order or type of instructions to achieve a given result. Encourage pupils to use formal terminology when describing their work. | | | | |

**Key Stage 2**

**PoS -Design and write 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 a simple algorithm works and to detect and correct errors in algorithms and programs**

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| **Year 3 - Understand that, in order to be efficient, sequences can be repeated. Be aware that things in the real world are controlled by input devices. Be able to explain to others the reason why a sequence worked or had to be modified.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Be able to name and describe instances where things around them are controlled through programmed routines and input devices. | Be able to:  design and write a routine which includes repeated commands to achieve a series of actions.  debug by correcting errors in a routine to enable accurate results.  articulate the reasons for errors and modifications. | The concept of repeated commands and how these can be used within routines to create more efficient and elegant programming. | Use software such as Roamer World, Flowbot or To Go. Introduce the repeat command to make the on screen turtle draw a simple shape. Extend this process to draw more complex patterns.  Test, identify errors and de-bug algorithms.  Pupils to describe what they need to do to make the sequence work correctly. | Repeat  Efficient  Routine  Sequence  Debug |
| **Teaching Points**  Expect pupils to use appropriate terminology – e.g. algorithm, repeat, sequence. Pupils should understand the importance of precision and accuracy. Encourage pupils to work together in pairs and collaborate on problems. | | | | |

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| **Year 4 - Understand what an input and output is in computing terms. Understand simple control principles and processes beginning to apply these logically to control devices. Know that when creating sequences to control devices, accuracy is essential to a successful operation. Understand and use simple sensors within their programming. Understand that input and outputs impact on operational functionality.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Sensors react to inputs managed through written procedures and programs.  Outputs from sensors have an impact on the control of external devices. | Be able to:  construct procedures/routines to control an external device  identify and correct errors in their routines  use simple sensors to react to an input with accuracy | The sequence and accuracy of written procedures are essential in order to ensure accurate operation.  External devices can be controlled through inputs/sensors which can be programmed to carry out specific functions. | Use programming software to devise a program for a floor turtle or robot which incorporates a single sensor – light, touch or sound. For example, when the robot hits a wall, it turns through 90 degrees⁰.  Introduce programming software such as Scratch to devise sequences to control a sprite on screen. Explore how blocks of commands can be used to control a sprite. | Sensors  Input  Output  Sequences  Program  Move  Repeat  Forever  Go to  Co-ordinates  Turn  Degrees |
| **Teaching Points**  Expect pupils to use appropriate terminology – e.g. algorithm, repeat, sequence. Expect pupils to be accurate in their writing of programs.  Encourage pupils to work together in pairs and collaborate on problems.  Provide opportunities for pupils to deconstruct blocks of commands to test each element. | | | | |

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| **Year 5 - Understand and use variables. Know about the impact of variables on input devices. Pupils should use their knowledge and understanding to predict the outputs of specific inputs. They should create, design, test and refine a single set of instructions using sensors incorporating single variables. They should be confident in explaining their program and what was needed to refine and improve.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Technology is controlled by sequences and routines which have been constructed by programmers.  Know which commands will be appropriate to achieve a specific outcome. | Be able to:  analyse, reflect on and improve their use of commands to control variables, sensors and sequences to achieve a given outcome. | Correct construction of sequences and routines is critical to the successful operation of a program.  Sensors respond to external inputs which action variables. | Use Scratch and robots to create routines which control other actions when conditions (variables)are met – e.g.: When a sprite hits the wall it makes a noise.  Routines should be planned and written in advance. Pupils should use a “Scratch” log book. Individual steps should be tested on screen, errors recorded, de-bugged and amended to meet the desired outcome.  Pupils should be able to present their work clearly and confidently and explain reasons the impact of de-bugging. | Command  Sensor  Variable  Input  Output  Repeat Until  Algorithm |
| **Teaching Points**  Expect pupils to use appropriate terminology – e.g.: algorithm, repeat, sequence. Expect pupils to work with precision and accuracy.  Require pupils to work together in pairs and collaborate on problems.  Expect pupils to deconstruct blocks of commands to test and debug each element.  Extend activities by providing other programs to build games or activities e.g. 2DIY builds simple Flash activities.  Introduce pupils to formal programming language e.g. Logo. Use this to achieve given problems. | | | | |

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| **Year 6 – Create programs to meet a given brief. Create programs which have a number of separate sub routines and which respond and interact depending upon inputs and outputs. Use a number of variables to control more complex sequences to solve the given brief.** |

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| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Technology is controlled by efficient and accurate sequences and routines which have been constructed by programmers. | Be able to:  evaluate their work, describing how they have achieved the outcome and what was needed to refine and improve the process  construct complex sequences which incorporate:   * Repeated sequences * Sub –routines * Multiple and inter-related variables * Efficient operation to meet a required brief | The efficient use of procedures and algorithms is essential for effective programming.  The ability to select and apply the appropriate skills and processes is essential to achieve a desired outcome. | Write a program using software such as Lego Mindstorms to mimic an intruder alarm or other scenario. The alarm should be set and armed after a given time and activated when sensors detect an intruder. The program should use multiple and nested routines and a number of variables and sensors.  The program should be tested and de-bugged as necessary to produce a successful outcome. Pupils should present their work and describe what they have done to make the project a success.  Create a game using Scratch. Test and obtain feedback from other pupils. Use results to modify and improve game. | By Year 6 pupils should understand all of the following -  Procedures  Algorithms  Sequences  Routines  Input  Output  Device  Variables  Efficient (context)  Control  Program  Iteration  Nested  All specialist commands within the programming language used. |

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| **Year 6 Teaching Points**  Expect pupils to use appropriate terminology – e.g. algorithm, repeat, sequence  Expect pupils to address a given problem or scenario by planning, designing, deconstructing and de-bugging to achieve a successful result.  Provide opportunities for pupils to work collaboratively to design, plan, create and test routines to meet a specific brief or challenge.  Expect pupils to deconstruct blocks of commands to test each element.  Provide extension activities through use of other programming software such as Kudo.  Make sure that pupils understand that software programs have specific syntax which must be used.  Encourage pupils to design a game for other pupils to play. |

**Digital Content and the Internet**

**Key Stage 1 and Key Stage 2**

**Progression**

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| **Digital Content and the Internet Programme of Study**  **KS1 – Use technology purposefully to create, organise, store, manipulate and retrieve digital content.**  **KS2 -.Use search engines effectively. Appreciate how results are selected and ranked and be discerning in evaluating digital content.** | | | | | |
| **Y1** | **Y2** | **Y3** | **Y4** | **Y5** | **Y6** | |
| Covers:  Classification by different criteria.  Sorting by single and multiple criteria.  Representation of data graphically  Electronic data | Covers:  Remote and local storage of data  Textual graphical and numeric data  Saving and retrieving files with text, sound and graphical formats  Simple use of the internet including simple searches | Covers:  Searching local databases and online sites and understanding the need for accuracy.  Writing and publishing class blogs.  Within a “walled garden” or restricted list, using the internet to find information to support other class work. | Covers:  Importance of accuracy and learning about keywords  Checking and evaluating results Developing searches on two criteria.  Knowledge of web page design and external links | Covers:  Creating a database structure, collecting, entering, testing and correcting data  Construction of search criteria through planning research needs  Searching independently and responsibly  Developing critical evaluation skills  Using spreadsheets to model patterns and to use formula to carry out a range of mathematical functions. | Covers:  Review and critical analysis of information from the internet and other sources.  Database and spreadsheet creation to support other work  Critical review of “fit for purpose” in relation to databases including the internet  Keywords and their relevance to effective internet searches and the ranking of internet sites. | |

**Key Stage 1**

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| **Year 1 Use technology purposely to create, organise, store, manipulate and retrieve digital content.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Text, images and sound can be created and stored in digital format on computers and other devices  Objects have characteristics – i.e. colour, shape, size  Characteristics can be grouped and displayed graphically  Objects can be sorted by two or more criteria – e.g. colour, shape and size | Be able to :  sort manually by characteristic using different criteria – colour, size, type.  with the teacher’s input, talk about what is shown by simple charts and graphs  recognise that some objects need more than one criterion to be classified.  enter text and create pictures using simple word processors and graphics packages. | Sorting and grouping by a single criterion and then by two or more criteria.  Information stored electronically can be retrieved and re- used. | Using blocks or other objects, sort by colour or size and then by colour and size.  Use simple software to classify objects by given criteria.  Use simple word processors to create label or other written work.  Use graphics packages to create illustrations linked to other work.  With an adult use the internet to find materials and activities – e.g. CBeebies. | Sort  Characteristic  Criteria  Search  Word processor  Graphics package  Image  Text  Graph |
| **Teaching Points**  This element enables pupils to use a wide variety of software to create images, text and sound. It can be incorporated into a number of other subjects or topics. This element has links to Data Handling in Mathematics. | | | | |

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| **Year 2 – Use of pre-prepared databases. Use of a range of software. Simple internet searches.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| IT can be used to store and retrieve data.  Data of different kinds can be stored electronically both locally and remotely  Textual, graphical and numerical data are different and are identified by different file types  Information can be presented in graphical forms –e.g. histograms/pie charts, documents and graphics and can be stored locally or online.  The internet is used to store information in different formats. | Be able to:  find and open files saved within their learning platform or the classroom computer,  add to or edit work, and  re-save and rename their work    recognise the file types and file extensions for documents, picture, numerical data.  be able to explain what is shown by a histogram or pie chart on screen.  with help from an adult, find age related music and news. | Electronic information is stored and retrieved by type- including file type, date and size characteristics.  Graphical representation of data reflects grouping of classification characteristics.  The difference between information stored on the class computer and the world wide web. | Use a word processor to create a document. Save this. At a later date, find the file, open, edit and re-save the document with a new name.  Together, look at how computer folders are organised. Discuss how each folder holds a number of files. Discuss the file extensions and what these show.  Use a simple pre-prepared data base with data about class pets –use the graphs and ask pupils questions about the data – e.g. how many pupils have pets, how many have dogs/cats etc. | Find  Open  Save  Retrieve  Edit  File type  File name  File extension  Data  Histogram  Pie Chart  Document  Internet  Word processor  Database |
| **Teaching Points**  It may be useful to reinforce this element by letting pupils manually sort items into paper folders or boxes. | | | | |

**Digital Content and the Internet**

**Key Stage 2 Programme of Study**

**Use search engines effectively; appreciate how results are selected and ranked, be discerning in evaluating digital content.**

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| **Year 3** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Databases are used to store and manipulate information.  Know simple data base terminology – eg fields, records, search, data  Know that the internet is made up of many external collections of data, images, resources and information stored outside school systems. | Be able to :  undertake simple searches on a pre-compiled locally hosted computerised database or on the internet within a walled garden or with adult help.  use appropriate terminology when using data bases – e.g. field, record.  with help, create and write a class blog, upload a piece of work onto the school’s learning platform, email attachment or website. | Accurate use of key words when searching will have positive results.  Develop critical analysis skills to evaluate whether searches deliver expected and reliable results.  Data can be stored outside school and is accessible from anywhere by anyone with an internet connection. | Use a pre-populated database or pre-saved and cached internet sites to search for answers to questions set by the teacher – e.g. “How many pupils do not have pets?” What is the weather forecast for tomorrow?  Pupils develop simple hypotheses linked to the data base, and then check by searching the database or using the internet. . - e.g. We think that the most popular pets will be dogs.  With support, and from a restricted list, search the internet for information linked to a project.  Experiment with key word searches including deliberate errors to demonstrate the need for accuracy. Discuss results with pupils – did searches deliver expected results? – if not, why not? Discuss if the content, format and presentation is appropriate and helpful.  Create articles or blogs which are uploaded to the school website. | Data  Information  Database  Internet  Hypothesis  Field  Search  Record  Upload |
| **Teaching Points**  This work will be more meaningful if linked to a project or theme being covered in other subjects. Pupils need experience of manually collecting data and knowing that it has been entered into the database. Pupils should be given opportunities to work with this data manually, trying to answer questions by physically sorting and sifting data collected. Encourage pupils to work with a variety of software which they can use to create and publish information. | | | | |

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| **Year 4 – Understand and use electronic data locally and on the internet. Use a range of software to create information and content.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Data and digital content can be stored locally and externally.  Websites have external links which can be searched.  The internet is based on many interlinked computers/servers across the world. | Be able to :  enter data accurately into a database which has already been constructed.  test the accuracy of their data base through searching and knowing what to expect and what is inaccurate.  construct searches with two criteria to answer a given problem using locally created data bases and the internet under supervision.  enter searches in “Safe” internet search engines and evaluate the resulting information.  use a variety of software to create text, images and sound to be published online. | The construction of databases is built on fields and key words.  Accuracy and precision is important when compiling database structures and entering data.  Reliability is based on accurate data entry and resulting information can be skewed by accidental or deliberate errors in data entry.  Content on websites has been created by others and may include inaccuracies. | Collect data linked to a class project and enter into a pre- prepared database.  Work out manually some answers to questions and then test on the database. Identify/amend errors and re-test.  Create and run searches which contain two criteria – e.g. children with brown eyes and brown hair.  Use the internet to find information about different parts of the world.  Talk about remote servers.  Use “safe and tested” webcams or VC to demonstrate that the internet connects globally in real time. | Test  Edit  Fields  Criteria  Search engine  Servers  Local  Remote  Publish  Database |
| **Teaching Points**  Pupils need to make links between manual searches and those done on a computer. Try competitions on who can find the answer to questions with two criteria – one group of pupils sorting manually and one group using the computer database. Try to bring out the need for accuracy. Searches which contain more accurate detail will return appropriate and expected results.  The internet can be used to research information for topics and projects in other subjects. Pupils should be aware that they need to use the internet responsibly. Teachers should constantly remind pupils of the school’s Acceptable Use Policy and what to do if they find inappropriate information.  Provide opportunities for pupils to work with a variety and range of software which can be used to create and publish information online. | | | | |

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| **Year 5 – Collect, organise and store data. Plan, research and select information sources.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Know that:  data can be recorded and amended for use by third parties.  the reliability of key word searches depends on the accuracy of data and that it can be skewed deliberately or accidentally at the time of creation or by others at a later date.  the internet contains many interlinked databases globally and these can be interrogated simultaneously.  the order of presentation can be influenced by search engine technology.  data can be represented in spreadsheets and that this can be manipulated to create models and patterns. | Be able to :  plan and design the construction of a database to meet a specific need – e.g. Gaining awareness of healthy eating habits.  develop routines to test for accuracy and appropriateness  plan research based on other class topics and identify what information is needed before searching the internet.  define relevant search criteria and use these to search the internet for appropriate resources to support their learning.  Use formula to undertake basic calculations, create graphs from data within a spreadsheet. | The importance of accuracy when creating database structures and compiling data.  Which data is relevant to the purpose of the database and the relevance of key words.  That searches will only be successful if there is a match between search words and those entered into the database.  That information from the internet may not always be accurate and is open to challenge.  The immediacy of online activity.  Understand the use and relevance of spreadsheets in financial modelling and creating patterns. | Working with support, create the structure of a database. Collect data and enter into the structure. Test the suitability of the database. With support, edit and amend records.  Use a number of different search engines to search for the same information. Compare and contrast the outcome of these.  Look at a news site on a daily basis to see how news is amended as stories develop and time passes. Compare these to the same stories printed in the newspapers.  Use spreadsheets to create financial models of enterprise ventures in school. | Internet search engine  Bias  Accuracy  Database structure  Spreadsheet  Formula  Graph  Modelling |
| **Teaching Points**  Ensure that websites have been checked and cached.  Remind pupils of the school’s Acceptable Use Policy and what to do if they see inappropriate content.  Knowledge, skills and understanding will be enhanced by linking all the activities here to other work or topics being taught in other subjects. | | | | |

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| **Year 6 – Work safely and confidently with the internet and other data sources. Develop effective searches and enquiries. Develop critical awareness.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Databases work by using key words which must be accurately created.  Information found on the internet relies on appropriate keywords being identified by the search engine to locate and present information accurately.  The order in which searches are presented can be affected by search engine optimisation tools.  Begin to know about Internet standards, conventions, language and protocols needed to upload information to the internet. | Be able to:  explain and use keywords appropriately to prepare a project for uploading to the internet.  accurately and efficiently find, review, verify, compare and contrast information from the internet and other sources to meet a given brief or need.  independently design, construct, compile and test a data base linked to a specific project or topic.  analyse and be able to critically evaluate the results of searches from the internet. | How to analyse the effectiveness of database design and make proposals to improve.  Independently, apply previous knowledge and understanding about data and data management to design, create, review and deliver a database meeting a specific brief.  That the internet has standards and protocols which must be met if information is to be found effectively.  That search engine optimisation tools use keywords and high number of keywords matches will promote a website to a higher position. | Search the internet to identify relevant information to a topic. Re-purpose internet information to present in different formats – e.g.. For a news broadcast.  Use an external “expert” to work with pupils to prepare a joint piece of work ready for uploading to the internet which meets internet standards | Search criteria  Keyword  Search engine optimisation  Internet protocols  Verify  Data and information sources |
| **Teaching Points**  Work with the local secondary school, college or company to use “experts” to help explain and demonstrate internet protocols and language.  Ensure that pupils know about the school’s AUP and what to do if they find inappropriate content. Ensure that visitors understand the school’s AUP. | | | | |

**Understanding the Application of IT**

**Key Stage 1 and Key Stage 2**

**Progression**

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| **Understanding the Application of IT**  **Programme of Study**  **KS 1 - recognise common uses of information technology beyond school.**  **KS 2 - understand computer networks including the internet; how they can provide multiple services, such as the world-wide web; the opportunities they offer for communication and collaboration; 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 to accomplish given goals, including collecting, analysing, evaluating and presenting data and information.** | | | | | |
| **Y1** | **Y2** | **Y3** | **Y4** | **Y5** | **Y6** | |
| Covers:  Knowing about technology in the home, and school.  . | Covers:  Knowing that objects in the wider world are controlled by technology. | Covers:  Communication with technology  Storage and retrieval of electronic information  Real time and virtual worlds | Covers:  Communication and the internet  Developing critical evaluation skills | Covers:  Greater independent and autonomous usage.  Increased selectiveness about identifying and using resources. | Covers:  Technical infrastructure and architecture.  Application of all skills learnt to deliver a specified product or outcome. | |

**Understanding the Application of IT**

**Key Stage 1 Programme of Study - Recognise common uses of information technology beyond school.**

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| **Year 1** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Technology controls everyday electrical or electronic objects. | Be able to:  recognise and talk about things within the home and school which are operated by technology | Objects can be controlled via switches and program settings. | With an adult use a microwave, mobile phone and other everyday electrical objects. | Switch  Operate  Control technology |
| **Teaching Points**  Children should be encouraged to draw and collect pictures of electronic and electrical objects. | | | | |

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| **Year 2 – Begin to know about and use simple technology for a specific purpose** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Which objects in and outside school are controlled electronically.  Technology is used for a wide range of communication – eg mobile phones, email, printed documents. | Be able to:  talk about and use everyday appliances and objects outside schools which are electronic and controlled by electronic systems.  use simple word processors and other software to create simple presentations to support their work | Objects are controlled by sequences which have been pre-programmed.  Messages can be saved, edited and re-purposed using software applications. | Pupils to bring in pictures of objects which are controlled electronically.  Pupils to sort objects or pictures of objects which can be programmed by users and those which have closed programs – e.g. the home central heating can be programmed and changed but things such as automatic doors are pre-programmed.  Use graphics programs to enable pupils to find, print and present examples of electronic equipment. | Control  Program  Electronic |
| **Teaching Points**  Children could be encouraged to keep a running record or tally sheet of programmable and fixed programmed objects.  Encourage pupils to discuss why the program of some objects can be altered but some are fixed.  Simple word processors, graphics or presentation software can be used as a medium for these learning outcomes. | | | | |

**Key Stage 2**

**PoS - Understand computer networks including the internet; how they can provide multiple services, such as the world-wide web; the opportunities they offer for communication and collaboration**

**Select, use and combine a variety of software (including internet services) on a range of digital devices to accomplish given goals, including collecting, analysing, evaluating and presenting data and information.**

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| **Year 3 – Develop and extend the range and use of software applications for different purposes.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Information is stored electronically, retrieved, edited and shared with others.  Information can be transferred and transmitted from computer to computer. | Be able to :  create, save, edit and re-purpose work through common software applications such as word processors, graphics packages and databases.  send simple emails.  save work to their learning platform. | Technology offers many communication services in real and virtual time using services such as email, text, shared photo albums, live VC, live and recorded streaming. | Working in groups, prepare news and information for a class newsletter.  Under adult supervision, send the newsletter to other classes.  With help, upload the newsletter to their work area on the learning platform to share with parents at home. | Create  Save  Edit  Word processor  Graphics package  Communication Technology  Video Conferencing (VC)  Live streaming |
| **Teaching Points**  All the learning outcomes in this section can be delivered as part of other work within other subject areas. Teachers are encouraged to find real and meaningful opportunities for pupils to create work for another audience and to share this within safe and secure online environments. | | | | |

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| **Year 4 – Understand and independently and confidently use a range of digital applications.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Files can be stored and accessed remotely.  Information can be accessed across a range of devices – via wireless, on mobiles and desktop computers connected to the internet.  Technology can be used to present information and data in different forms for different purposes. | Be able to:  find their work from an identified folder or work area on a learning platform or online application, renaming as a new version and re-saving.  use desktops and hand held devices to work with a range software such as online word processors.  choose an appropriate application to present information for a given audience and purpose. e.g. – word processors, presentation or graphics program.  be selective about the type and quality of resources identified and used to support learning. | Technology offers opportunities to access work and applications anytime and anywhere with an internet connection.  Pupils should be increasingly confident in using technology and work independently and/or in groups to prepare a presentation for a specific purpose. | Provide homework which is accessed across the school’s learning platform or online work area.  Ask pupils to submit their work from home or the library.  Ask pupils to find resources online which can be used to support other work – e.g. work in history or geography.  Ask pupils to decide which application is best to create a poster, a leaflet or a newsletter. | Remote and local storage  Mobile and hand held devices  Files and folders |
| **Teaching Points**  Most of the learning outcomes in this theme will be delivered by using technology within other subject areas. Teachers should look for opportunities to offer meaningful tasks which enable the knowledge, skills and understanding to be delivered. There are direct links to Information and Data Handling. | | | | |

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| **Year 5 – Be selective in their use of digital applications and able to articulate the reasons for their choices.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| The world wide web and other online applications provide libraries of information, content and resources.  How to select and copy relevant information and insert within other programs to support their work or projects.  Know that the original work of others must be respected and not damaged or used without permission.  .  Know the basic functions of broadband and wireless technologies. | Be able to :  select from and use text, sound and pictures, synthesise data found on news and information sites. Begin to re-purpose these to support their learning.  independently, access information or services which are stored outside school or home.  identify and reference work which is not their own.  use a wide variety of software and applications to produce work to meet a given brief or specification. e.g. be able to use a wide range of tools within a presentation package and incorporate content from other online archives.  connect to an approved wireless network | How data and information are selected, using discriminating search and retrieving methods.  Which applications are most relevant to meet a given brief.  The principles and processes needed to meet copyright requirements.  The relevance and the need for fast and reliable broadband and wireless access.  The importance of only using approved wireless. | Ask pupils to work in groups to find and present information to support an area of work in history or geography – for example a presentation about another country. | Application  Copyright  References  Broadband  Wireless  Bandwidth  File size  File types and file extensions |
| **Teaching points**  Many of the learning outcomes are best delivered through work in other subject areas or themes. For example, creating information about another country may include developing a database and using this to create graphs within a newsletter.  Link to the Online Safety theme by stressing that only approved wireless networks with adequate security should be used. | | | | |

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| **Year 6 – Be independent, autonomous, knowledgeable and responsible users of digital technologies.** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Be familiar with and describe simply how the school network operates.  How the internet works, and the role of broadband and wireless technologies in providing access.  Cloud computing and the benefits offered by it.  How to use independently a wide variety of applications such as word processors, databases, graphics and animation packages. | Be able to :  design, create and evaluate a piece of work within a given brief which needs to be researched, planned and developed using a wide range of material from a number of online and physical sources.    use online resources and online communication safely to gather opinions and data to support the project.  make work available to an external audience by uploading files to a remote host.  describe how others can access work remotely. | The internet consists of multiple and large networked systems which communicate electronically.  The principles of cloud technology and how this can be used to offer many applications and services to many users at the same time.  The benefits of technology, online communication and applications to research, gather and share ideas and information with others in real and virtual time. | Create a project based piece of work over a term which needs to be developed to support younger children. This may be linked to a subject or a theme such as Online Safety. | Fit for purpose  Research  Evaluation  Cloud Technology  Remote hosting  Virtual environments |
| **Teaching Points**  This theme is the culmination of all other learning regarding the delivery of the Computing Curriculum. It is suggested that this theme is delivered through other subjects and across one term to allow for in-depth and meaningful work, and developments. | | | | |

**Online Safety and Appropriate Use**

**Key Stage 1 and Key Stage 2**

**Progression**

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| **Online Safety and Appropriate Use**  **Programme of Study**  **KS 1 – Use technology safely, respectfully keeping personal information private; know where to go for help and support when they have concerns about material on the internet. KS2 – Use technology safely, respectfully and responsibly, recognise acceptable/unacceptable behaviour, identify a range of ways to report concerns about content and contact.** | | |
| **Key Stage 1** | **Lower Key Stage 2** | **Upper Key Stage 2** | |
| Covers:  General principles of safety including the real and virtual worlds  Privacy of personal information  Permanency of information on internet  Know how to deal with concerns | Covers:  The use of passwords, security and electronic communication protocols.  Appropriate actions to be taken regarding inappropriate content or usage.  Awareness of the school’s Acceptable Usage Policy and its sanctions  Awareness of ownership of material and content  Know how to deal with concerns and inappropriate contact  Risks and benefits of content and contacts through online communication. | Covers:  Password protocols  Reporting  Monitoring  Acceptable Use  Copyright permissions and protocols  Responsible behaviours and bullying  Knowing how to deal with concerns and inappropriate contacts. | |

**Online Safety**

**Key Stage 1 Programme of Study -**

Use technology safety and respectfully, keeping personal information private; know where to go for help and support when they have concerns about material on the internet.

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| **Early Years and Key Stage 1** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Personal information is private and other people’s private information should be respected.  Personal information should not be given out to strangers – online and in real life.  Personal information is stored on the internet and that once information is published online, it is there forever. | Be able to:  identify personal information.  recognise that electronic communication is between real people.  discriminate between people they know and strangers.  name who to tell if they are worried. | The differences between real and imaginary situations online.  It is important to be polite when communicating electronically. | Talk with the teacher about keeping safe in a range of contexts – e.g. road safety, stranger/danger.  With help as a group, construct and reply to emails within a safe and closed environment.  Talk about asking for help | Email  Private  Internet  Send  Receive |
| **Teaching Points**  These concepts can be exemplified through role play and drama lessons. | | | | |

**Key Stage 2 Programme of Study - Respect individuals and intellectual property; use technology responsibly, securely and safely**

Use technology safely, respectfully and responsibly, know a range of ways to report concerns and inappropriate behaviour.

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| **Lower Key Stage 2** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| Online systems outside school may not have the same secure environments of the educational setting.  The reasons for logging off and logging on.  The process for reporting any inappropriate use by others.  Information can be attached to email and transmitted to others.  Real time communication can take place through Forums.  To ask permission when using other people’s work, including that found online.  How to ask for help. | Be able to :  use individual passwords and know that these are private.  consistently log on and log off.  be consistent in the polite use of electronic communications.  have good password usage and behaviours.  attach a file to an email and send to others.  recognise content which is freely available and that which needs permission for use. | Protocols for creating effective and safe passwords.  The risks of communicating with strangers.  The consequences of allowing others to use their passwords.  The benefits and risks within different kinds of electronic information – eg email, VC  Attachments can carry viruses and that these should not be opened if received from unknown sources  Understand the school’s acceptable use policy (AUP). | Discuss the features of effective passwords.  Support pupils to create their own passwords.  Change these termly.  Use role play or simulation to encourage pupils to act out the consequences of poor security protocols.  Compare and contrast the effectiveness of email versus standard letters. Use VC to bring an expert into the classroom.  With the teacher’s help, access age appropriate forums. | Password protocols  Attachments  Aliases  Copyright  Cyber-bullying  Forums |
| **Teaching Points**  The teacher can encourage good password protocols by using a branching tree game – e.g. is it a family name?  In lower Key Stage 2, emails should be restricted to the school’s internal email system. | | | | |

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| **Upper Key Stage 2** | | | | |
| **Knowledge** | **Skills** | **Understanding** | **Activities** | **Specialist Vocabulary** |
| What to do if inappropriate material is found or they are the subject of or are aware of inappropriate behaviour.  Online work is monitored.  Original work of others must be respected and not damaged or used without permission.  Photos must not be posted unless permission has been given.  Online profiles and files/pictures loaded on to the internet are permanent.  Phishing, spam and collection of data via search engines. | Be able to :  act with confidence and deal appropriately with inappropriate material or receive inappropriate approaches online.  apply practices to protect users’ identities.  recognise ownership with confidence and acknowledge other’s work and intellectual property.  follow established and good practice for passwords and logging off.  recognise instances of junk mail, phishing and spam  . | The risks of poor password protection.  The school’s AUP and the consequences of  inappropriate behaviour.  Online etiquette and the impact of cyber bullying.  The consequences of identity theft.  The risks and consequences linked to spam and phishing.  Other’s work should not be copied without permission or reference i.e. plagiarism. | Develop scenarios to demonstrate the risks.  Brainstorm and categorise appropriate practices. | Monitoring  Reporting  Spam  Phishing  Acceptable Use Policies  Cyber-Bullying  Intellectual property  Copyright  Online etiquette  Search engines  Log on  Log off |
| **Teaching Points**  Example scenarios can be found online and some are referenced at the end of this document. Teachers should encourage pupils to share their experiences in a supportive environment, understanding that some pupils may need sympathetic support and individual counselling.  Teachers should ensure that pupils develop respect for themselves and for one another. | | | | |

**Glossary**

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| **Alogrithm** | **A step by step logical procedure which is created to solve a problem.** |
| **AUP** | **Acceptable Use Policy** |
| **Cached** | **Files and web pages which are temporarily stored in a computer memory.** |
| **Cloud computing** | **Integrated remote servers which host and store software, applications and users data.** |
| **Copyright** | **Legal protection of intellectual property to prevent plagiarism.** |
| **De-bug** | **A process of testing a procedure or routine to establish and fix errors.** |
| **Field** | **A category which a data base record- eg Name, Age** |
| **File Extension** | **Three letters at the end of a file name which denote the type of file – eg ppt = Powerpoint** |
| **Input** | **A command or action which controls a sensor.** |
| **Intellectual Property** | **Written material, sound, images or resources which have been created by and belongs to others.** |
| **Iteration** | **Repetition or a cycle of repeated commands within a procedure** |
| **Logo** | **A computer programming language.** |
| **Nested Procedures** | **Where minor procedures are embedded within a major procedure.** |
| **Online Etiquette** | **Accepted and acceptable standards of online communication.** |
| **Outputs** | **An action or change of state from a sensor or switch as a result of an input.** |
| **Password protocols** | **The rules and routines which are used to establish secure protocols – eg length of passwords, mix of numbers, letters and symbols.** |
| **Phishing** | **Online techniques which are used to find out personal and confidential information which can lead to “identity theft”.** |
| **Procedure** | **A set of instructions which, if programmed correctly, will complete a process.** |
| **Remote servers** | **Computers which are located outside the physical environment of an organisation.** |
| **Roamer** | **A programmable electronic device devised by Valiant Technology.** |
| **Scratch** | **A computer programming language developed by MIT.** |
| **Search Engine** | **A web based software application which undertakes online searches for specified information** |
| **Search Engine Optimisation** | **A process used by web developers to raise the profile of a website within online searches.** |
| **Sensors** | **An electronic device which can be programmed to react to certain conditions – eg changing light.** |
| **Spam** | **Unsolicited email which blocks up email and computer systems.** |
| **Spreadsheet** | **A programme which enables the manipulation of figures to undertake modelling exercises.** |
| **Sprite** | **A character or icon which can be programmed to undertake defined actions. Sprites are found within the game “Scratch”.** |
| **Technical Infrastructure and architecture** | **The design and construction of computers including local and remote computer networks.** |
| **Variable** | **A numerical value which can be changed.** |
| **Virtual Environments** | **Worlds and locations which have been created by computer programs.** |

**Online Safety Scenarios**

These example scenarios are based on real situations within schools in England. These scenarios and others can be found within the Online Safety support materials within the archived BECTA material. These can be found at: web**archive**.national**archives**.gov.uk/.../http:/www.**becta**.org.uk‎

These should be used as discussion materials. Resolutions should be agreed based on organisations’ policies and procedures, taking account of legal and criminal requirements.

1. **A teacher finds a USB memory stick in the playground. The files on it are photographs which include some of the teenage girls partially dressed. The owner of the USB stick is not known and the teacher does not recognise the girls in the photos.**
2. **Mubo in Year 5 has her own Flickr website. A teacher at another school stumbles across it. Mubo has put up photos which are labelled showing her full home details, her route to school, her social activities each week and more.**
3. **Sharon overhears some classmates talking about a personal website. She visits it and finds that it’s horrible about her and there is even a “vote” to see who hates her.**
4. **On the way to school Liam had his trousers pulled down by other pupils who videoed the incident on their phones.**
5. **Jack is in Year 6 has been talking to an online friend for some time. The “friend” seems really nice and they have loads in common. They’ve sent Jack a photo of themselves. The holidays are coming up and they ask Jack to meet in the park.**
6. **A Year 5 class are researching Thailand on their android phones. Robert tells the teacher that the search results include a link “adult sex”. The teacher says “Don’t click the link” and then moves away to talk to another group of children elsewhere in the class.**

1. **Parents take photos and videos of their child at the Christmas concert.**