Progression in Computing
Version 2.00
Key Stage 2

Compliant with the Computing Curriculum (2014)
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Introduction

Computing 2014 - Purpose of study
The core of computing is computer science, in which 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. Computing also insures 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.

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.

The purpose of this document for Primary Schools is to provide primary teachers with a progressive Computing curriculum to deliver through cross curricular learning experiences. The materials, written in 2012 and updated in line with the Computing Curriculum Programmes of Study (PoS) 2014, provide support for EYFS, KS1 and KS2 and can be edited for educational purposes.

The suggested skills in each segment of this document were developed by ICTinspires in line with the NAACE Framework for ICT (May 2012) and again for the DfE Computing PoS for 2014.

This progressive scheme of work covers the breadth of Computing; Computer Science, Digital Literacy and Information Technology and includes progressive e-safety skills.

These materials will:

- Provide clear progressive ideas to teach all aspects of Computing from EYFS to Upper KS2 within three booklets to support the NAACE Framework for ICT and DfE’s Computing PoS.
- Provide guidance on the standards of Computing capability that are appropriate for children in each phase and suggestions of assessment criteria.
- Provide practical examples of how the ICT skills, knowledge and understanding can be integrated into planning across the curriculum as well as providing suggested resources.

The full NAACE ICT Framework can be found at: http://www.naace.co.uk/naacecurriculum

These documents provide a starting point. Schools can use the suggested objectives and progression of skills to further develop their own good practice.

Each school should also develop its own ICT software provision map to ensure the breadth of curriculum can be covered. A software map is provided populated with suggested freeware.
The Five Areas of the Naace ICT Framework

These are broad areas of ICT knowledge, skills and understanding that Naace considers essential for learners in the Third Millennium. It is important that learners develop their understanding within meaningful contexts in order to support their understanding and transferrable application of skills. Content cannot be fixed in time as the speed of technological advance means that the schemes of work must be flexible enough to enable teaching on new tools, ethical and safety issues and ways of working and learning to be adopted quickly, both within the subject of ICT and the wider use of ICT tools throughout learning and teaching. However, these are intended to be generic and not tied to particular tools or technologies.

We have defined the suggested areas of the Naace ICT Framework as follows:

Key Stages 1 and 2
Summary of each area of the Naace framework:

**Digital Skills**
Content develops skills for effective, efficient communication; creation of digital content (text, audio, visual media, programs); collecting, analysing and evaluating data.

**Digital Literacy**
Content develops digital literacy, including critical evaluation of digital artefacts; research skills including validating information found; using ICT to develop learning, communication and collaboration; awareness of their own (and others') online identities.

**Technology in the World**
Content develops an understanding of the range of devices used in the world; an awareness of how technology is used in the workplace; an awareness of the range of jobs that might use ICT and how a range of different roles might contribute to a creative project; an awareness of effective web design to support their own use of the internet; considerations of e-commerce, including security and advertising impact on web use; web design skills; where appropriate, development of specific work place skills.

Learning provides historical context and opportunity to “future-gaze” - generating a sense of awe and wonder for the range and rate of developments; respect for and awareness of key people in the history of computing and ICT; awareness of the impact on society as a whole and on individuals; encourages learners to creatively and imaginatively consider possible future developments.

**Technical Understanding**
Content develops technical understanding of hardware, software, networks, approaches to design in computing and ICT; computer science content is covered creatively in a way that links it with digital literacy and information technology.

**Safe and Responsible Use**
E-safety learning and safe, responsible use is embedded throughout the curriculum; safe and responsible use goes beyond e-safety and includes opportunities to develop awareness of and apply knowledge and understanding of current legislation including copyright; ethics; environmental impact; protection from cyber-attacks including hacking.
Computing programmes of study: key stages 1 and 2
National curriculum in England

Subject content

Key stage 1

Pupils should be taught to:

- 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
- use technology purposefully to create, organise, store, manipulate and retrieve digital content
- recognise common uses of information technology beyond school
- use technology safely and respectfully, keeping personal information private; identify where to go for help and support when they have concerns about content or contact on the internet or other online technologies.

Key stage 2

Pupils should be taught to:

- 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 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 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
- use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.

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Reference: DFE-00171-2013
Organisation of these materials

These materials have been organised to cover the Computing curriculum 2014, and include the suggested breadth in the NAACE Framework. Each booklet covers a primary phase with approximate suggested year groups for teaching the progressive skills. These should be flexible according to the individual child. To aid integrating these ideas into an established curriculum structure, they have been organised into four main headings:

**Digital Literacy**

*Communicating in the Digital World*
- Digital Communication and Sharing Information (Inc. Presentations)
  - Text Processing and Multimedia
  - Electronic Communication
- Producing and Editing Media
  - Graphics Packages
  - Digital photographs and video
  - Animation
  - Sound and Music

**Digital Literacy/Information Technology**

*Exploring the Digital World*
- Collecting, Analysing, Evaluating Real World Data/Problem Solving
  - Research
  - Data Handling
  - Datalogging

**Computer Science**

*Shaping the Digital World*
- Modelling and Simulations
- Control and Programming

**Digital Literacy**

*E-Safety (for EYFS and KS1, 2)*
- Linked to Research and Electronic Communication Elements
  - Content
  - Contact
  - Conduct

The structure is as follows:

Each sub-strand is broken down into:
- Learning Objectives - aims of the strand
- Digital Skills
- Digital Literacy (where applicable)
- Technology in the World (where applicable)
- Technical Understanding (where applicable)
- Suggested Resources (freeware or websites)
- Cross Curricular ideas (Some of the cross curricular ideas have been based on those presented in the ICT progression documents produced by Herefordshire Council).

The last pages of this document give criteria and ideas for assessment and break the objectives into year groups to help ensure children are on target for end of key stage achievement. There is also a map of suggested freeware and a planning sheet.
Communicating in the Digital World

Digital Communication and Sharing Information (incl. Presentations)

Objectives - work towards:

- 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.

Digital Skills

Text Processing and Multimedia

- Use different font sizes, colours and effects to communicate meaning for a given audience. Insert and edit simple tables.
- Use layout, format, graphics and illustrations for different purposes or audiences. Recognize key features of layout and use design features such as text boxes, columns and borders.
- Use page setup to select different page sizes and orientations.
- Use appropriate editing tools to ensure their work is clear and error free (using tools such as spell checker, thesaurus, find and replace). Use cut, copy and paste to refine and reorganize content.
- Select suitable text, sounds and images from electronic resources (e.g. Espresso or websites) and use it appropriately in their own work.
- Select and import images from digital cameras, graphics packages and other sources and prepare for use (cropping, resizing, editing).
- Create a range of hyperlinks to produce a non-linear, interactive presentation.

Electronic Communication (e.g. email, Learning Platform, messaging, blogging)

- Log on to email account, open emails, create & send appropriate replies, attach files & create address book.
- Contribute to discussion forums, blogs and surveys on a Learning Platform and create their own.
- Create their own pages on a Learning Platform.
- Begin to use video to communicate as a class (e.g. Skype or Face Time with another school).

Transferability of skills

- Skills need to be applied in different applications and contexts with pupils starting to make choices.

Digital literacy

Online identities/Social Networking

- Begin to understand about online identities and differences between private (Learning Platform) or public presence (social networks).

Creating and Sharing content

- Begin to make choices about when and when not to use ICT and in what form.
- Start to independently select ways to communicate their own ideas.

Technology in the World

Collaboration/Communication/Web design

- Discuss and evaluate blogs/wikis/websites (e.g. Primary Blogger, school websites etc.). Explore safe social network sites.
Years 3&4 | Digital Communication and Sharing Information (incl. Presentations)
---|---
**Suggested Resources**

**Freeware/Websites**
- Create presentations: [http://prezi.com/](http://prezi.com/)
- [http://www.openoffice.org/](http://www.openoffice.org/)
- [http://www.safesocialnetworking.org/](http://www.safesocialnetworking.org/)
- Social networking: [https://www.makewav.es/](https://www.makewav.es/)

**Cross Curricular Ideas**

**English**
- Children to compose a story to accompany a game they have been playing (link with Shaping the Digital World - Modelling and Simulations).
- Children to write instructions for the game they have been playing (link with Shaping the Digital World - Modelling and Simulations).
- Children create a persuasive trailer for a film, with sound effects, music, voice over and their own images (Persuasive texts).
- Children use email for collaborative story writing.
- Children create an explanation text with image snap shots from video and hyperlinks to further detail.
- Children create a PowerPoint presentation or PhotoStory video of a poem incorporating altered digital images and/or recorded speech or sounds.
- Using the Learning Platform to create an online survey on books they have read. Complete a friend's surveys to contribute to class book reviews.

**Mathematics**
- Take photos to create a Maths trail around the school based on symmetry and/or angles.

**Science**
- Create a poster to promote good dental health, evaluate poster and add refinements.

**Geography**
- View from the window - set up link with overseas school. Email pictures of view from window with details of what your school is like. Receive pictures from overseas school and comment on differences.
- Children use email to share information in a locality study.

**DT/RE**
- Children create a guide book about a local place of worship.

**History**
- Children create a set of estate agents details to sell a Roman Villa.
- Children produce a presentation on an historical topic.

**Generic**
- Children collate information for a school project in their e-Portfolio.
- Contribute to group pages on the learning platform pulling together information, text and images for presentation of a topic.
- On a school trip children collect digital images, video, and sound samples and use these to produce a multimedia presentation to show either their parents or other children in the school.
Years 3&4 Communicating in the Digital World

Producing and Editing Media

Objectives - work towards:

- 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.

Digital Skills

Graphics packages

- Acquire, store and retrieve images from cameras, scanners and the internet and begin to use paint packages or photo-manipulation software to change an image (e.g. apply different effects).
- Select specific areas of a painting, copy and paste to make repeating patterns. Resize elements. Investigate symmetry and reflection tools.

Digital photographs and video

- Independently capture, store, retrieve and edit a digital image.
- Develop greater control over the digital stills and video camera and use the enhanced tools (Macro, Landscape, Zoom).
- Discuss and evaluate the quality of their own and others’ captured images and videos and make decisions (e.g. keep, delete, change).
- Capture video footage into simple movie editing software. Arrange, trim and cut clips to create a short film to convey meaning. Import music and stills into video editing software and add to film projects.

Animation

- Create a short animated sequence from captured images in simple storyboarding software to communicate a specific idea.

Sound and Music

- Use ICT to select and record voice and sounds and use recorded sound files in other applications.
- Locate and use sound files from internet, network file, learning platform and Espresso (if applicable). Edit existing sound files in sound editing software (e.g. Audacity).

Transferability of skills

- Skills need to be applied in different applications and contexts with pupils starting to make choices.

Technology in the World

Collaboration/Communication

- Start to evaluate media used in the world around us (video clips, images, sounds etc.). What is the message of the clip/image/sound? Does it work? Why?
## Years 3&4 Producing and Editing Media

### Suggested Resources

**Freeware**
- Drawing programme: [http://drawing.gamemaker.nl/](http://drawing.gamemaker.nl/)

### Cross Curricular Ideas

#### English
- Use a digital camera to capture freeze frame in drama to show different shapes and emotions. Annotate the images.
- Children use the filters and cutting tools in photo editing software to create their own fantasy settings to support their writing (Stories set in imaginary worlds).
- Create a photo-fit image for a ‘Wanted’ poster of a story character.
- Children write, record and edit an audio play.
- Children create a persuasive trailer for a film using Photo Story, with sound effects, music, voice-over and scanned children’s art or their own digital images (Persuasive texts).
- Children record an MP3 commentary (e.g. a guide to a tour round their school. This could be uploaded as a podcast to the school’s Learning Platform).

#### Mathematics
- Take photographs which illustrate different real life shapes for a display.

#### Science
- Use sound editing software (e.g. Audacity to investigate sound waves and patterns).
- Make an animation of a food chain or the life cycle of flowering plants.
- Create an advert for healthy food, using either live action or animation.

#### Geography
- Children make a video with a focus on one country to share with peers. Include a still image from Google Earth or online maps.
- Use animation to illustrate water cycle.

#### DT/Art
- Children design wrapping paper.
- Create pop art-style images by changing effects of a still image.
- Children use digital images to create a collage based on a theme (e.g. local area).
- Children create a photomontage of parts of faces from a variety of sources.

#### MFL
- Add spoken French/Spanish to a presentation/image.

#### Music
- Compose music or sound effects to accompany poems, stories, drama, dance.
- Children create a musical portrait of a character for a story or to describe a setting.
- Compose pentatonic compositions to accompany images/film clips focusing on the Far East.
- Locate and download copyright free music and sounds and edit for addition to presentations.
Linked to Research and Electronic Communication Elements

Objectives - work towards:

- Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.

All Areas

Content

- Be aware of the school Acceptable use Policy and the SMART online rules: Safe/Meeting/Accepting/Reliable/Tell.
- Know what to do if content is inappropriate or upsetting (e.g. school policy, know who to report to and talk to).
- Be aware that taking text or images from some sites may be stealing other people’s work.
- Understand the Internet contains fact, fiction and opinion and begin to distinguish between them.
- Know when an email should not be opened or messages ignored.
- Know whenever they are online they are creating a digital footprint.
- Know that the aim of many sites is to sell something or gain personal information and can be linked to from other sites.

Contact

- Know to keep personal information and passwords private when communicating online (including email, blogging and instant messaging).
- Understand that online communication is not always confidential and that it can be monitored.
- Know that anyone can create a user showing any age or gender and people you meet online may not be who they say they are (social networking, chat rooms and instant messenger).
- Know they can create an alias or avatar when online.

Conduct

- Know how to respond to unpleasant communications via mobile phone, text, IM or email, chat rooms. (Save the message and show to a trusted adult).
- Know there are writing conventions for electronic communication (language, tone, accuracy).

Assessment

Although there are broad ICT outcomes for e-Safety, the assessment can be included in the other ICT strands where pupils should be questioned to ensure they understand the key issues surrounding e-safety, relevant to their key stage.
Pupils should be taught to face new challenges positively by collecting information, looking for help, making responsible choices, and taking action.

Pupils should be taught to realise the consequences of anti-social and aggressive behaviours, such as bullying and racism, on individuals and communities.

Pupils should be taught to explore how the media present information.

Pupils need to recognise the different risks in different situations and then decide how to behave responsibly and judging what kind of physical contact is acceptable or unacceptable.

Pupils should be taught that there are different types of teasing and bullying, that bullying is wrong, and how to get help to deal with bullying.

Children should consider social and moral dilemmas that they come across in everyday life.

Resources

Know It All for Primary
http://www.childnet.com/kia/primary/

Captain Kara and Winston’s Smart adventure

Think U Know for KS2
Cyber Café
http://www.thinkuknow.co.uk/8_10/cybercafe/Cyber-Cafe-Base/

KidSmart
http://www.kidsmart.org.uk/

BBC Stay safe
http://www.bbc.co.uk/cbbc/help/web/staysafe

NetSmartz
http://www.netsmartzkids.org/

Safe Social Networking
http://www.safesocialnetworking.org/

https://www.makewave.es
Exploring the Digital World

Collecting, Analysing, Evaluating Real World Data/Problem Solving

Objectives

- 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.
- Work with various forms of input and output

Digital Skills

Data handling
- Design questions using key words, to search a large pre-prepared database. Use complex searches (and/or, is greater/less than) to search data when looking for relationships and patterns in data.
- Check for accuracy by checking data, using different views, search tools, and graphing. Identify and correct inaccuracies.
- Construct, refine and interpret frequency tables, bar charts with grouped discrete data and line graphs; interpret pie charts.

Data Logging
- Use the pre-programming features of data logging software and devices to set up a specific data capture, perhaps overnight. Use graphical information to answer questions and solve simple problems.
- Use a range of sensors (temperature, light, sound, heart rate monitors, light gates etc.) in a variety of situations in the course of scientific investigations (inputs and outputs).

Digital Literacy

Using ICT to help learning
- Develop their own methods of solving problems through the use of ICT.

Finding, retrieving & validating information
- Find ways of validating information to ensure it’s correct (e.g. does any data from datalogger look spurious?).

Technology in the World

ICT specific jobs/How other jobs use ICT
- Discuss jobs where dataloggers are used in the world (e.g. meteorologists, volcanologists, seismologists). Research to find out how they log data.

Technical Understanding

Information/data storage
- Understand that information (including personal) can be stored in different places (e.g. removable USB drive, CD/DVD, hard drive, small local network server and remote servers known as ‘cloud technology’).

Evolution of technologies
- Look at various methods of handling data through the ages (Abacus, Difference Engine, Colossus, World Wide Web etc.).
### Suggested Resources

**Freeware**

- French database: [http://primary.naace.co.uk/activities/Le_Voleur_des_Saucisses/index.htm](http://primary.naace.co.uk/activities/Le_Voleur_des_Saucisses/index.htm)
- 19th Century Database: [http://primary.naace.co.uk/activities/greenfield/private/start.htm](http://primary.naace.co.uk/activities/greenfield/private/start.htm)

### Cross Curricular Ideas

#### English

- Children gather data about local issues and use it to make a presentation to an audience.
- Use and explore different question types and different ways words are used, including formal and informal contexts.

#### Mathematics

- Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols.
- Plan and pursue an enquiry; present evidence by collecting, organising and interpreting information; review information; identify and answer related questions; draw conclusions.
- Construct frequency tables, pictograms and bar and line graphs to represent the frequencies of events and changes over time.

#### Science

- Search a large pre-prepared database of the planets and stars to compare them according to a range of criteria.
- Record and analyse the results of an experiment stretching elastic bands.

#### Geography

- Search prepared data and search for anomalies (e.g. tide table).
- Research real world applications of data logging (e.g. environmental monitoring).

#### PE

- Children compare data about themselves with a younger class (e.g. do children with longer legs run faster); create a simple database. Use the database to test the hypothesis.
- Children use a data logger to investigate the effects of exercise on the body and manipulate the resulting graphs to present the findings.

#### History

- Search a large pre-prepared historical database to draw conclusions about differences in lifestyles then and now and the impact of social history.
Exploring the Digital World

Collecting, Analysing, Evaluating Real World Data/Problem Solving

Objectives

- 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.

- 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 search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content.

Digital Skills

Research

- Select an appropriate search engine to find information related to their topic. Develop strategies for finding information checking for bias and different viewpoints (using different keywords, cross checking with other sources etc.). Discuss how internet search engines find, store and rank data.

- Discuss issues of copyright and downloading material (e.g. mp3s, images, videos etc.). Reference sources used in their work.

- Develop skills to question where web content might originate and understand that this gives clues to its authenticity/reliability (by looking at web address, author, linked pages etc.).

Transferability of skills

- Becoming increasingly proficient and discerning when finding information and data, using higher level thinking skills to evaluate its veracity.

Digital Literacy

Using ICT to help learning/Finding, retrieving & validating information

- Copy, paste, save and use pictures, text and sound by importing into another application for a specific audience or task (links to Communication in the Digital World).

Technology in the World

e-commerce

- Evaluate the effectiveness of different marketing methods used on the internet. Does it appeal? Why? What do you like/not like? How relevant is it to the product etc.?

ICT specific jobs/How other jobs use ICT

- Web designer. What makes a web page useful, helpful or interesting? Think about designs for their own websites.

Evolutions and impact of technology/Impact on society

- Learn about and discuss the evolution of the internet. How long has it been around? What has been the impact on the world in which we live?

Collaboration/Communication

- Discuss computer networks and how they can provide multiple services, such as the world-wide web; and the opportunities they offer for communication and collaboration.
Years 5&6 | Collecting, Analysing, Evaluating Real World Data/Problem Solving

Suggested Resources

Websites
- Teacher’s guide to evaluating websites: http://lrs.ed.uiuc.edu/students/rtrieger/evalwebsites.htm

Cross Curricular Ideas

English
- Explore journalistic examples from a range of media: TV, radio and Internet sites. Consider the way different communication modes are used by different media and with what impact or effect. Evaluate the effectiveness of various journalistic forms, modalities and media. (Journalistic writing).
- Evaluate examples of hoax websites. Create a hoax website, how realistic can they make it?
- Evaluate a website specifically for younger children. Report on its effectiveness and design.
- Research a famous person or character, compare information from different websites.

Mathematics
- Solve problems by collecting, selecting, processing, presenting and interpreting data, using ICT where appropriate; draw conclusions and identify further questions to ask.

Science
- Research where micro-organisms grow and how they support all life.

Geography
- Children use web based resources to research a viewpoint on a controversial issue.
- Locate images and information to create a river guide for walkers showing river features.
- Children research counties and cities of the United Kingdom, select images, resources and key words and phrases to use in a presentation or fact file. Note sources of information where appropriate.

RE
- Children research religious signs and symbols related to class work (e.g. Five Pillars of Islam).

History
- Children carry out research using a search engine and more than one website to find out information about focused areas of class work.

Generic
- Investigate blogs, wikis etc. for evidence of bias and implausibility.
## Shaping the Digital World

### Modelling and Simulations

**Objectives**
- Work with variables and various forms of input and output

### Digital Skills

#### Modelling/Simulations
- Enter labels and numbers into a spreadsheet. Enter formulae into a spreadsheet and modify the data, (simple calculations + - × ÷).
- Identify and enter the correct formulae into cells, modify the data, make predictions of changes and test them. Use more advanced formulae (Sum, average, mode etc.).
- Change data and formulae in a spreadsheet to test variables to answer ‘what if?..?’ questions and check predictions.
- Use a spreadsheet to draw a graph to help answer specific questions.
- Explore a range of ICT games (including multi-player) in a safe environment (e.g. Pora Ora).

### Digital Literacy

#### Gaming
- Evaluate different ICT games and design their own, writing rules and objectives.

#### Impact of ICT on society
- What is the impact of games in our society (e.g. able to play games with friends/strangers all over the world)?

### Technology in the World

#### Creative Industries incl. media and games creation/Evolution and impact of technologies
- Discuss how ICT games have evolved. What were the early games like?

### Technical Understanding

#### Games and apps creation
- How are games written? Which programming languages are used? Find some examples of game code. Are there common elements of code?
Years 5&6  Modelling and Simulations

Suggested Resources

Freeware/websites
- http://primarygamesarena.com/ICT
- http://primarygamesarena.com/Simulation
- Google Sketchup: http://sketchup.google.com/download/
- Duck Builder game: https://www.cgpbooks.co.uk/duckBuilder
- http://primary.naace.co.uk/activities/Locks/game/locksgame.htm

Cross Curricular Ideas

Mathematics
- Create a spreadsheet to model costs of a school outing, trip or party.
- Explore the relationship between area and perimeter using a spreadsheet.
- Set up a spreadsheet to explore square numbers and cube numbers.
- Create a function machines in a spreadsheet to help younger children with mathematical concepts.
- Children plan a family holiday or school trip, taking into account children’s prices and the cost of travel and accommodation.
- Express one quantity as a percentage of another (e.g. express £400 as a percentage of £1000); find equivalent percentages, decimals and fractions (write a spreadsheet to do this Y6).
- Create a spreadsheet to discover the cheapest way to buy crisps (multipacks or singly) or which size of drinks containers is cheaper or whether a 3 for 2 deal is better or worse than a percentage discount; use graphs to illustrate.

Science
- Use simulation programs to explore change: www.bbc.co.uk/schools/ks2bitesize/science
- Use simulations of electrical circuits to consider the effects of changes.

DT
- Use a spreadsheet to calculate the cost of ingredients for biscuits, answering questions about price or quantity changes.

Generic
- Design and create a prototype of something that will enhance the environment. Create and use a spreadsheet to display costs for a business model and present your idea to the class (dragon’s den).
Shaping the Digital World

Control and Programming

Objectives

- 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 algorithms work and to detect and correct errors in algorithms and programs.

Digital Skills

Control/Programming

In Logo and/or coding programs (e.g. Scratch, Kodu), develop more complex flow diagrams/sequences for a specific purpose using selection, repetition and variables in algorithms (more complex loops, repeats or timed events). Detect and correct errors (debug) to improve desired outcomes.

Write sequences which use outputs and inputs (using selection ‘if…then…’ type commands) to control events in response to conditions. Use sub routines to decompose the problem into smaller parts (e.g. Use Flowol, CoCo 2, Junior Control Insight or Go software). Explain the logical steps of the flow diagram in the design process.

Design own game, simulation or app and use a programming tool to create it for use by others (e.g. Scratch, Kodu and Appshed - apps don't have to be published). Explain the algorithms to show an understanding of the logical steps and debug where necessary.

Digital Literacy

Gaming

- Evaluate ready-made games, apps and simulations before designing own to know what makes a good game. What will their own game look like?

Technical Understanding

Games and apps creation

- View code in their own games to start to understand how commercial games are created (e.g. Kodu).
Years 5&6  Modelling and Simulations

Suggested Resources

Freeware
- Kodu: http://fuse.microsoft.com/page/kodu
- Scratch: http://scratch.mit.edu/
- Create Apps: http://appshed.com/
- MSW Logo: http://mswlogo.en.softonic.com/download

Cross Curricular Ideas

English
- Create a game (e.g. Scratch, Kodu) and write instructions and rules.

Mathematics
- Draw shapes with Logo with increasing accuracy and apply knowledge of their properties.
- Control a buggy to follow a specified course.
- Identify, visualise and describe properties of rectangles, triangles, regular polygons; use knowledge of properties to draw 2-D shapes.

Science
- Control a car park barrier to lift or fall in response to push switches or light sensors.
- Control a lighthouse with a sequence of lights and warning sounds only at night.
- Control a physical system (e.g. burglar alarm with a sensor or a mimic of a level crossing), controlling variables where necessary.
- Control an environment for an alien involving heat, light, sound.

DT (Physical system)
- Create procedures to control a fairground model (physical system) that they have made including motors, lights and buzzers.

Generic
- Control a castle drawbridge, including motors, lights and buzzers.
- Explore Bitesize Games: http://www.bbc.co.uk/bitesize/ks2/ and evaluate a selection of the games or visit http://www.bbc.co.uk/cbbc/games/
Attainment targets

By the end of each key stage, pupils are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study.

Key stage 2 Programme of Study (the colour bullets correspond to the curriculum strands in this document). Bullet points may be covered within more than one curriculum strand.

- 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 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 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
- use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact

Below are suggestions for helping when assessing whether the child has met the criteria above and are again split into the coloured Computing curriculum strands. Pupils will achieve the goals at various times throughout the key stage. The pupil self-assessment book will help the teacher identify when a child is ready for being assessed within a specific strand. If the criteria are evident within different computing strands the child must show evidence within each.

Can the child:

- design and write a program to accomplish a specific goal? (e.g. Program ‘traffic light sequence’ or similar using Flowol, CoCo 2 or similar control software)
- design and write a program to accomplish a specific goal? (e.g. Write a game where players win points or a game scenario in Kodu or Scratch type software)
- correct their own errors by debugging their program?
- use sub routines to break the problem into manageable parts?
- use loops, repeats, timed events to control a program (e.g Data loggers, Flowol, Go, CoCo2, Scratch)
- use inputs (What if) and demonstrate they are used as variables in programs. (e.g. a sensor to detect light or a game where if battling a monster and your strength value is greater than theirs you win).
- use logical reasoning to explain what outcomes a simple algorithm would produce when executed.
- identify and correct errors in a given algorithm.
- discuss different computer networks (e.g. school network, remote servers-cloud technology, www).
- show they understand which network offers the best solution for a given task (e.g. collaborate on work in school (school server), collaborate with another school (cloud based, shared drive, learning platform) and information research (www)).
- discuss how website search results are selected and ranked (e.g. sponsored links, higher activity)
- Show an understanding of the importance of being discerning and analytical when using the Internet? (do they know online info is not necessarily accurate?)
- select, combine and present information from a variety of sources for a specific goal? (e.g. Text, saved images, Internet resources, video, sound files, databases, spreadsheets)
- collect, analyse, evaluate and present data and information? (E.g. Use a data logger to investigate a problem, using the data to present findings by copying and pasting a graph into Word. Use databases to collect and present information. Use a spreadsheet and graphical model to evaluate data).
- talk about the school e-safety rules?
- show an understanding of plagiarism and copyright issues?
- show respectful and responsible use of technologies? (e.g. respecting other’s work and digital privacy, awareness of age appropriateness of materials, sharing information, digital footprint)
- talk about ways to report concerns and inappropriate behaviour?
By the end Key Stage 2, pupils are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study. This document will help assess whether a child is on target for end of KS1.

<table>
<thead>
<tr>
<th>PoS achieved by the end of KS2</th>
<th>Approx. Y3</th>
<th>Approx. Y4</th>
<th>Approx. Y5</th>
<th>End of Y6</th>
<th>Approx. Y7+</th>
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<tbody>
<tr>
<td><strong>Design, write and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts</strong></td>
<td>Program appropriate software to create simple shapes/patterns (e.g. Logo). Use some basic features to design and write a program to change or move a character in an application (e.g. Scratch).</td>
<td>Create more complex shapes/patterns by breaking instructions into smaller parts (decomposing). For example, in Logo create a procedure (e.g. to draw a square) then create a sequence that draws the procedure, rotates x degrees then draws another procedure (square) and so on. Write a simple program to achieve a specific outcome in appropriate software (e.g. Create two characters in Scratch that have a conversation).</td>
<td>Develop more complex flow diagrams/logo algorithms for a specific purpose. Refine procedures and algorithms to improve desired outcomes. Use sub routines to decompose the problem into smaller parts. Create a simple game or simulation (e.g. Create a game in Scratch using support sheets or instructions).</td>
<td>Design own game, simulation or app and use a programming tool to create it for use by others (e.g. Scratch, Kodu and Appshed). Use a text based programming language to solve a problem.</td>
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<td>PoS achieved by the end of KS2</td>
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<td><strong>Work with variables and various forms of input and output</strong></td>
<td>Know methods of input include keyboard, mouse, touch, microphone, camera, sensors, and output may include screen, printers, speakers, switches and simulated or physical control devices. Begin to control devices using outputs only e.g. using sensors to monitor and measure external events/switching on a light in a flow diagram control program/moving a Sprite in Scratch.</td>
<td>Create simple flow diagrams to control physical devices (real or screen simulations) using outputs only (e.g. Flowol, or Go). Begin to use computer inputs to control the outputs (e.g. a light coming on in response to a light/movement sensor). Create own simple scenarios (e.g. Make a Scratch Sprite bounce if he touches a wall). Begin to use computer inputs to control the outputs (e.g. a light coming on in response to a light/movement sensor).</td>
<td>Create simple flow diagrams to control physical devices (real or screen simulations) using inputs and outputs (e.g. Flowol, or Go). Know numbers and text can be stored and referred to in programs as 'variables' and the value of the variable could come from user input by typing a value. Create simple games in programs (e.g. Scratch and Kodu) using simple variables. Begin to use programming so a random variable is selected or set by programmed instructions (e.g. score = +1).</td>
<td>Write control sequences which use outputs and inputs (using if... then... type commands) to control events in response to conditions. Know numbers and text can be stored and referred to in programs as 'variables' and the value of the variable could come from user input, programmed instructions or by producing a random variable. Create games in programs using a range of variables e.g. using arrow keys as input in a game, create challenges which have an assortment of scores depending on action.</td>
<td>Enter labels and numbers into a spreadsheet. Use a spreadsheet to explore simple number patterns. Make simple number sentences. Enter label and numbers into a spreadsheet. Use a spreadsheet to explore simple number patterns. Enter formulae into a spreadsheet and modify the data, (use range of formulae: sum, average + - × ÷). Link formulae to other cells to test input against output. Enter formulae into a spreadsheet and modify the data, (use range of formulae: sum, average + - × ÷). Link formulae to other cells to test input against output. Enter formulae into a spreadsheet and modify the data, (use range of formulae: sum, average + - × ÷). Link formulae to other cells to test input against output.</td>
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<td><strong>Use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and programs</strong></td>
<td>Begin to explain the steps of their written algorithm and start to correct errors if needed. With support test programs to detect errors and modify procedures or sequences where necessary.</td>
<td>Explain simple logical steps of their flow diagrams in the design process. Detect and correct errors if needed.</td>
<td>Explain algorithms written during design process to show an understanding of the logical steps. Correct errors to debug the program where necessary.</td>
<td>Understand some key algorithms that reflect computational thinking [for example, ones for sorting and searching]. Use logical reasoning to compare different algorithms for the same problem.</td>
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<td>Class: ____________________</td>
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<td>Communicating in the Digital World</td>
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<td>Digital Photos &amp; Video Editing</td>
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<td>Animation</td>
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<td>Sound Music</td>
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<td>Data Handling</td>
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<td>Modelling &amp; Simulations</td>
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Naace are happy to support ICTinspires using the Naace ICT Curriculum Framework to support the development of school curriculums and to share this work more widely with other professionals. The Framework provides the basis for many different approaches to the curriculum and it is anticipated that it will be tailored to individual learning contexts. These materials provide one such example, showing how the Framework can be used as the basis for a broad and balanced ICT curriculum in school. Further information about the Naace ICT Curriculum Framework can be found here: www.naace.co.uk/naacecurriculum

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Updating your ICT curriculum is a complex and often daunting task for a school. Schools often have legacy software which is no longer fit for purpose but are not aware of more up to date alternatives.

ICTinspires can help you develop your own ICT curriculum and review your current provision.
Tailored support includes:

- Software audit, mapped to the ICT curriculum
- Curriculum planning to fully integrate ICT
- Staff skills audit and training
- Monitoring Sheets to ensure breadth of ICT is taught
- Assessment ideas

For further information please contact:
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