Curriculum Development Document

Computing

Achieve Believe Care

Curriculum Rationale

At Howley Grange we strive to ensure that our curriculum enables all children to gain the wisdom and courage to make positive choices now, and in their futures.

Howley Grange is committed to providing children with an ambitious curriculum that is broad and balanced. We recognise the upmost importance of ensuring children gain fundamental literacy and numeracy skills and that they have opportunities to develop their individual interests and specialisms in a wide variety of subjects.
Staff plan key questions to encourage the use of enquiry, as well as focus on the acquisition and application of key subject knowledge, concepts and vocabulary throughout our school. Our curriculum is designed to help learners to remember the content they are taught in the long term and to integrate new knowledge into larger concepts. Parents, staff and most importantly our children tell us that they enjoy their learning and are eager to find out about the topics and themes, often choosing to take their learning beyond the

Purpose of Study

A high-quality computing education equips pupils to use computational thinking and creativity to understand and change the world. Computing has deep links with mathematics, science, and design and technology, and provides insights into both natural and artificial systems. 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 ensures 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

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. Schools are not required by law to teach the example content in [square brackets].

Key Stage One: Coverage

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 Two: Coverage

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.

Overview of Computing - EYFS

The EYFS framework is structured differently to the National Curriculum as it is organised into seven areas of learning rather than subject areas, having said this, the skills taught in EYFS feed into National Curriculum subjects.

This table outlines the most relevant statements taken from the EYFS statutory framework and Development Matters . These are the prerequisite knowledge and skills for computing within the National Curriculum.

The most relevant statements for computing are taken from four of the seven areas of learning (see below). These are planned for and delivered through discrete 'ICT ' teaching sessions but are also incorporated into 'Choosing to Learn time'.

Reception	Physical Development	• Develop their small motor skills so that they can use a range of tools competently, safely and confidently.
	Expressive Arts and Design	• Explore, use and refine a variety of artistic effects to express their ideas and feelings.
	Personal, Social and Emotional Development	• Show resilience and perseverance in the face of a challenge. • Know and talk about the different factors that support their overall health and wellbeing e.g. sensible amounts of 'screen time'.
	Understanding the World	• Explore how things work.
ELG	Personal, Social and Emotional Development-Managing Self	• Be confident to try new activities and show independence, resilience and perseverance in the face of challenge. • Explain the reasons for rules, know right from wrong and try to behave accordingly.

	Expressive Arts and Design-Creating with Materials	• Safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function.
Additional Knowledge, skills and concepts:	Children will: • Follow a sequence of instructions. • Give clear instructions for others to follow. • Be confident to visit the computing suite. • Name basic hardware e.g. tablet, monitor, mouse, keyboard. • Understand that tablets are touch screen, but desktop machines are not. • Understand that keyboards are uppercase (capital letters) and begin to recognise the correlation between them and the lower case graphemes learnt. • Be able to log on to the network independently. • Practise finding letters on the keyboard in preparation for typing. • Use the mouse to navigate basic applications such as: paint. • Use the mouse to navigate appropriate webpages e.g. Top Marks-Teddy numbers. • Know how to select and undo within basic applications.	

Overview of Computing - EYFS

Y1	Y2	Y3	Y4	Y5	Y6
Unit 1.1: We are treasure hunters	Unit 2.1: We are astronauts	Unit 3.1: We are programmers	Unit 4.1: We are software developers	Unit 5.1: We are game developers	Unit 6.1: We are toy makers
Unit 1.2: We are TV chefs	Unit 2.2: We are games testers	Unit 3.2: We are bug fixers	Unit 4.2: We are makers	Unit 5.2: We are cryptographers	Unit 6.2: We are computational thinkers
Unit 1.3: We are digital artists	Unit 2.3: We are photographers	Unit 3.3: We are presenters	Unit 4.3: We are musicians	Unit 5.3: We are architects	Unit 6.3: We are publishers
Unit 1.4: We are publishers	Unit 2.4: We are safe researchers	Unit 3.4: We are who we are	Unit 4.4: We are bloggers	Unit 5.4: We are web developers	Unit 6.4: We are connected
Unit 1.5: We are rhythmic	Unit 2.5: We are animators	Unit 3.5: We are co-authors	Unit 4.5: We are artists	Unit 5.5: We are adventure gamers	Unit 6.5: We are advertisers
Unit 1.6: We are detectives	Unit 2.6: We are zoologists	Unit 3.6: We are opinion pollsters	Unit 4.6: We are meteorologists	Unit 5.6: We are VR designers	Unit 6.6: We are AI developers

Key Stage	Year	Enquiry Question	Main Curriculum Focus	Knowledge, skills and concept	Main hardware/ software
Key Stage 1	Year 1	**Unit 1.1:** **We are treasure hunters**	Solving problems using programmable toys	**In this unit, pupils will learn:** ● that a programmable robot can be controlled by inputting a sequence of instructions ● to develop and record sequences of instructions as an algorithm ● to program a robot to follow their algorithm ● to predict how their programs will work ● to debug programs.	• Blue-Bots • Blue-Bot app
		Unit 1.2: **We are TV chefs**	Filming the steps of a recipe	**In this unit, pupils will learn to:** ● break down a process into simple, clear steps (an algorithm) ● use different features of a video camera ● use a video camera to capture moving images ● record a video using ground rules for filming ● edit a video to include an audio commentary ● develop collaboration skills ● discuss their work and think about how it could be improved	• iPads • Camera app • iMovie
		Unit 1.3: **We are digital artists**	Creating work inspired by great artists	**In this unit, pupils will learn:** ● how to select and set brushes and colours ● to create artwork in a range of styles on iPads ● to use the undo function if they make mistakes and to encourage experimentation ● to use multiple layers in their art ● to transform layers	• iPads • Brushes Redux • Autodesk Sketchbook

				● to paint on top of photographs.	
		Unit 1.4: **We are publishers**	Creating a multimedia eBook about our achievements	**In this unit, the pupils will learn to:** ● plan a small multimedia eBook ● choose and import images ● record audio commentary ● add and format titles and other text ● think carefully about protecting their privacy ● respect other people's copyright ● revise and improve their work.	• iPads • Book Creator • Google Photos
		Unit 1.5: **We are rhythmic**	Creating sound patterns in ScratchJr and GarageBand	**In this unit, the pupils will learn to:** ● record audio on a digital device ● program sprites to playback recorded audio in ScratchJr ● program ScratchJr to create repeating rhythms ● explore different effects that can be applied to audio ● create a repeating percussion pattern using a virtual drum machine ● experiment with a range of virtual instruments.	• iPads • GarageBand • ScratchJr
		Unit 1.6: **We are detectives**	Using data to solve clues	**In this unit, pupils will learn:** ● how data can be structured as records with fields for information ● how data can be organised into groups and subgroups ● how data can be structured as a tree ● how data can be organised into a table ● how data in a table can be filtered and searched.	• iPads • Popplet • Google Forms • Google Sheets
	Year 2	**Unit 2.1:** **We are astronauts**	Programming on screen in ScratchJr	**In this unit, pupils will learn to:** ● plan a sequence of instructions to move sprites in ScratchJr ● create, test and debug programs for sprites in ScratchJr ● work with input and output in ScratchJr ● use repetition in their programs ● design costumes for sprites.	• iPads • ScratchJr

		Unit 2.2: **We are games testers**	Working out the rules for games	**In this unit, pupils will learn to:** ● observe and describe carefully what happens in computer games ● use logical reasoning to make predictions of what a program will do and test these ● think critically about computer games ● create sequences of instructions for a virtual robot to solve a problem ● work out strategies for playing a game well ● be aware of how to use games safely and in balance with other activities.	• iPads • Scratch Laptops/desktops • FixTheFactory
		Unit 2.3: **We are photographers**	Taking, selecting and editing digital images	**In this unit, pupils will learn to:** ● consider the technical and artistic merits of photographs ● use the iPad camera app ● take digital photographs ● review, reject or pick the images they take ● edit and enhance their photographs.	• iPads • Camera app • Photos app • Snapseed
		Unit 2.4: **We are safe researchers**	Researching a topic	**In this unit, pupils will learn to:** ● develop collaboration skills through working as part of a group ● develop research skills through searching for information on the Internet ● think through privacy implications of their use of search engines ● be more discerning in evaluating online information ● improve note-taking skills through the use of mind mapping ● develop presentation skills through creating and delivering a multimedia presentation.	• iPads • Popplet • Google Slides • Google custom search
		Unit 2.5: **We are animators**	Creating a stop-motion animation	**In this unit, pupils will learn:** ● how animation works ● to use storyboards to plan an animation ● to create their own original characters, props and backgrounds for an animation ● to film, review and edit a stop-motion animation ● to record audio to accompany their animation ● to provide constructively critical feedback to their peers.	• iPads • Stop Motion Studio

		Unit 2.6: **We are zoologists**	Collecting data about bugs	**In this unit, pupils will learn to:** ● sort and classify a group of items by answering questions ● collect data using tick or tally charts ● take, edit and enhance photographs ● use Google Sheets or Microsoft Excel to produce basic charts ● record information on a digital map ● summarise what they have learned in a presentation.	• iPads • Google My Maps • Google Docs/Sheets/Slides • Camera and Photos apps
Lower Key Stage 2	**Year 3**	**Unit 3.1:** **We are programmers**	Programming an animation	**In this unit, pupils will learn to:** ● plan and create an algorithm for an animated scene in the form of a storyboard ● write a program in Scratch to create the animation, including characters, dialogue, costumes, backdrops and sound ● review their animation programs and correct mistakes.	• Laptops/desktops • Scratch
		Unit 3.2: **We are bug fixers**	Finding and correcting bugs	**In this unit, pupils will learn to:** ● develop a number of strategies for finding errors in programs ● build up resilience and strategies for problem solving ● increase their knowledge and understanding of Scratch ● recognise a number of common types of bugs in software	• Laptops/desktops • Scratch • Screen recorder software
		Unit 3.3: **We are presenters**	Videoing a presentation against a green screen	**In this unit, pupils will learn to:** ● develop their web-based research skills ● structure, prepare and deliver a talk about a given topic or subtopic studied in another curriculum area ● record a piece to camera ● edit a movie using static images and green screen footage ● give constructive, critical feedback on recorded presentations.	• iPads • Green screen background • Tripods and iPad mounts • Popplet • iMovie
		Unit 3.4: **We are who we are**	Creating presentations about ourselves	**In this unit, pupils will learn to:** ● create a number of structured presentations ● create a narrated presentation ● consider issues of trust and privacy when sharing information	• Laptops/desktops • Google Slides • Screen recorder software

		Unit 3.5: **We are co authors**	Producing a wiki	**In this unit, pupils will learn to:** ● understand the conventions for collaborative online work, particularly in wikis ● be aware of their responsibilities when editing other people's work ● become familiar with Wikipedia, including potential problems associated with its use ● practise their research skills ● write for a target audience using a wiki tool ● develop collaboration skills ● develop proofreading skills	• Laptops/desktops • Google Sites • Popplet
		Unit 3.6: **We are opinion pollsters**	Collecting and analysing data	**In this unit, pupils will learn to:** ● understand some elements of survey design ● understand some ethical and legal aspects of online data collection ● use the Internet to facilitate data collection ● gain skills in using charts to analyse data ● gain skills in interpreting results	• Laptops/desktops • Google Forms • Google Sheets • Google Slides • Google Drive
	Year 4	**Unit 4.1:** **We are software developers**	Developing a simple educational game	**In this unit, pupils will learn to:** ● develop an educational computer game using selection and repetition ● understand and use variables ● start to debug computer programs ● recognise the importance of user interface design, including consideration of input and output.	• Laptop/desktop computer • Scratch
		Unit 4.2: **We are makers**	Coding for micro:bit	**In this unit, pupils will learn:** ● about the input – process – output model of computation ● about the inputs and outputs available on a BBC micro:bit ● to program using the MakeCode blockbased environment ● to test and debug programs they write, using an on-screen simulator and the micro:bit ● how to convert and transfer a program written on screen to the micro:bit.	• Laptop/desktop computer • micro:bit • Microsoft MakeCode

		Unit 4.3: **We are musicians**	Creating a piece of music in GarageBand	**In this unit, pupils will learn to:** ● create a repeating percussion rhythm ● play music using virtual instruments ● compose or edit tunes using the piano roll (pitch and duration) tool ● perform electronic music using pre-recorded loops, and create their own loops ● create a multi-track composition or performance using multiple instruments ● give feedback to others on their compositions and performances.	• iPad • GarageBand
		Unit 4.4: **We are bloggers**	Sharing experiences and opinions	**In this unit, pupils will learn to:** ● become familiar with blogs as a medium and a genre of writing ● create a sequence of blog posts on a theme ● incorporate additional media ● comment on the posts of others ● develop a critical, reflective view of a range of media, including text.	• Laptop/desktop computer • Digital camera • WordPress or Blogger
		Unit 4.5: **We are artists**	Fusing geometry and art	**In this unit, pupils will learn to:** ● develop an appreciation of the links between geometry and art ● become familiar with the tools and techniques of a vector graphics package ● develop an understanding of turtle graphics ● experiment with the tools available, refining and developing their work as they apply their own criteria to evaluate it, and receive feedback from their peers ● develop some awareness of computer-generated art.	• Laptop/desktop computer • Scratch • Inkscape • Terragen
		Unit 4.6: **We are meteorologists**	Recording and presenting the weather	**In this unit, pupils will learn to:** ● understand different measurement techniques for weather – both analogue and digital ● use computer-based data logging to automate the recording of some weather data ● use spreadsheets to create charts ● analyse data, explore inconsistencies in data and make predictions ● practise using presentation and video software.	• Equipment for measuring weather • Microsoft Excel • Microsoft PowerPoint • Keynote

Upper Key Stage 2	Year 5	**Unit 5.1:** **We are game developers**	Developing an interactive game	**In this unit, pupils will learn to:** ● create original artwork and sound for a game ● design and create a computer program for a computer game, which uses sequence, selection, repetition and variables ● detect and correct errors in their games ● use iterative development techniques	• Laptops/desktops • Scratch
		Unit 5.2: **We are cryptographers**	Cracking codes	**In this unit, pupils will learn to:** ● be familiar with semaphore and Morse code ● understand the need for private information to be encrypted ● encrypt and decrypt messages in simple ciphers ● appreciate the need to use complex passwords and to keep them secure ● have some understanding of how encryption works on the Internet.	• Laptops/desktops • iPads • Scratch
		Unit 5.3: **We are architects**	Creating a virtual space	**In this unit, pupils will learn to:** ● understand the work of architects, designers and engineers working in 3-D ● develop familiarity with a simple CAD tool ● develop spatial awareness by exploring and experimenting with a 3-D virtual environment ● develop greater aesthetic awareness.	• Laptops/desktops • iPads • Trimble SketchUp • Screen recorder
		Unit 5.4: **We are web developers**	Making sense of the Internet and building a website	**In this unit, pupils will learn:** ● the name and function of components making up the school's network ● how information is passed between the components that make up the Internet ● what the source code for a web page looks like and how it can be edited ● how a website can be structured ● how to add content to a web page.	• Laptops/desktops • iPads • Google Chrome • Google Sites
		Unit 5.5: **We are adventure gamers**	Creating an interactive adventure using	**In this unit, pupils will learn:** ● how to plan a non-linear presentation ● to create text as part of a presentation ● to add and edit images in a presentation	• Laptops/desktops • Google Slides • Voice recorder

			presentation software	● to use hyperlinks for navigation between the slides of a presentation ● to record and add audio narration to a presentation ● to use commenting tools to give feedback on a presentation.	
		Unit 5.6: **We are VR designers**	Experimenting with virtual and augmented reality	**In this unit, pupils will learn to:** ● explore real-world and imagined locations in VR ● create 360° photosphere images ● link physical objects to digital content using QR codes ● create their own VR scene ● program objects and interactions in VR	• iPads • Google Cardboard • Google Street View • GarageBand • CoSpaces
	Year 6	**Unit 6.1:** **We are toy makers**	Coding and physical computing	**In this unit, pupils will learn:** ● how computers use stored programs to connect input to output ● how to generate and evaluate designs in response to a brief ● to plan a complex project by decomposing it into smaller parts ● to work with physical components of a system ● how to design and write a program for an embedded system ● to use criteria to provide others with feedback on their work.	• Laptops/desktops • micro:bits • MakeCode • Scratch
		Unit 6.2: **We are computational thinkers**	Mastering algorithms for searching, sorting maths	**In this unit, pupils will learn to:** ● develop the ability to reason logically about algorithms ● understand how some key algorithms can be expressed as programs ● understand that some algorithms are more efficient than others for the same problem ● understand common algorithms for searching and sorting a list	• Laptops/desktops • Scratch
		Unit 6.3: **We are publishers**	Creating a yearbook or magazine	**In this unit, pupils will learn to:** ● manage or contribute to large collaborative projects, facilitated using online tools ● write and review content ● source digital media while demonstrating safe, respectful and responsible use ● design and produce a high-quality print document.	• Laptops/desktops • Digital cameras or iPads • Google Docs

		Unit 6.4: **We are connected**	Developing skills for social media	**In this unit, pupils will learn:** ● about appropriate rules or guidelines for a civil online discussion ● how search results are selected and ranked ● how to argue their point effectively, supporting their views with sources ● how to counter someone else's argument while showing respect and tolerance ● how to judge the reliability of an online source ● some strategies for dealing with online bullying.	• Laptops/desktops • Digital cameras or iPads • School blogging platform • Padlet
		Unit 6.5: **We are advertisers**	Creating a short television advert	**In this unit, pupils will learn to:** ● think critically about how video is used to promote a cause ● storyboard an effective advert for a cause ● work collaboratively to shoot original footage and source additional content ● acknowledge intellectual property rights ● work collaboratively to edit the assembled content to make an effective advert.	• Laptops/desktops • Digital cameras or tablets • iMovie
		Unit 6.6: **We are AI developers**	Learning about artificial intelligence and machine learning	**In this unit, pupils will learn:** ● how decision trees can be trained automatically to classify data ● how speech recognition works ● how a neural net recognises images ● to train a neural net to classify images ● to train a machine learning system to identify sentiments ● to consider some ethical principles in designing AI systems.	• Laptops/desktops • IPads • Scratch • Machine Learning for Kids • Audacity • Google Chrome