Science & Engineering Education Research and Innovation Hub

Progression in **PLANTS** key for use Fair & comparative testing | Research using secondary sources | Identifying, classifying & grouping | Pattern seeking | Observing over time

Year group	English National Curriculum statement	Child led enquiry opportunities (write as questions)	Maths opportunities	Story opportunities	Resources links	Enquiry type (highlight)	Working scientifically links (highlight)
Year 1	1 identify and name a variety of common wild and garden plants, including deciduous and evergreen trees 2 identify and describe the basic structure of a variety of common flowering plants, including trees.	What is the plant's name? Can you sort the parts of a plant into the correct groups?	Counting plants. Sorting leaves based on number of lobes.	Jack and the Beanstalk Ten Seeds by Ruth Brown Oliver's Vegetables by Vivian French	Images of plants. Real plant samples. Seeds to plant.	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	• asking simple questions and recognising that they can be answered in different ways • observing closely, using simple equipment • performing simple tests (3,4) • identifying and classifying (1,2,) • using their observations and ideas to suggest answers to questions (1,2,3,4) • gathering and recording data to help in answering questions. (1,2,3,4)
Year 2	3 observe and describe how seeds and bulbs grow into mature plants 4 find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	How long does it take for a seed to grow to grow? What conditions are needed for a plant to grow?	Counting seeds. Measuring growth over time.	Titch by Pat Hutchings The Tiny Seed by Eric Carle	Seeds to plant	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	

Year 3	identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant investigate the way in which water is transported within plants explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.	What do the different parts of a plant do? What is needed for a plant to grow? How does water get from the roots to the leaves? Why do plants have flowers? How does a plant disperse seeds?	Measuring growth, time and temperature. Measuring volume of water taken up. Measuring length of time for spinners to reach the ground.	Oh Say You Can Seed by Bonnie Worth A Tree is a Plant Clyde Robert Bulla	Pictures and samples of plants Seeds	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	● asking relevant questions & using different types of scientific enquiries to answer them ● setting up simple practical enquiries, comparative & fair tests ● making systematic and careful observations &, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers & data loggers ● gathering, recording, classifying and presenting data in a variety of ways to help in answering questions ● recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, & tables ● reporting on findings from enquiries, including oral & written explanations, displays or presentations of results & conclusions ● using results to draw simple conclusions, make predictions for new values, suggest improvements & raise further questions ● identifying differences, similarities or changes
Year 4	● explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment	How can we group plants based on their features? Can you use a key to identify a plant?	Venn Carroll Diagrams Pictograms Bar Charts		Samples and pictures of plants Fieldwork	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	

							related to simple scientific ideas and processes ● using straightforward scientific evidence to answer questions or to support their findings.
Year 5	describe the life process of reproduction in some plants ~~and animals.~~	What stages are there in the life cycles of plants? What happens during pollination? Do all flowering plants disperse their seeds in the same way?		The Tiny Seed by Eric Carle	Variety of flowers to dissect. Seeds and bulbs. Pictures to order.	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	● planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary ● taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate ● recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs ● using test results to make predictions to set up further comparative and fair tests ● reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms
Year 6	describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including ~~micro-organisms~~, plants ~~and animals~~ give reasons for classifying plants ~~and animals based~~ on specific characteristics.	How can plants be sorted into groups based on their features?	Comparing data sets.		Samples and pictures of plants.	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking	

						Observing over time	such as displays and other presentations ● identifying scientific evidence that has been used to support or refute ideas or arguments.
Key Stage 3	***Structure and function of living organisms*** **Cells & Organisation** cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts the similarities and differences between plant and animal cells the structural adaptations of some unicellular organisms the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms **Nutrition and Digestion** ● plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots. **Gas exchange systems** ● the role of leaf stomata in gas exchange in plants	What are the parts of a plant cell and their functions? How are plant and animal cells similar and different? How organisms in terms of scale from the parts of a cell upwards? How do plants make glucose during photosynthesis? How are roots adapted to take up as much water as possible? Which gas is needed for photosynthesis? Which gas is produced? How do gases get into and out of a leaf?	Counting bubbles of oxygen to compare rate of photosynthesis. Graphs and mean calculations.		Microscopes, onion cells, iodine. Pondweed Nail varnish, leaves,	Fair & comparative testing Research using secondary sources Identifying, classifying & grouping Pattern seeking Observing over time	**Scientific attitudes** ● pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility ● understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review ● evaluate risks. **Experimental skills and investigations** ● ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience ● make predictions using scientific knowledge and understanding ● select, plan and carry out the most appropriate types of scientific

	Reproduction reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. ***<u>Material Cycles and Energy</u>*** **Photosynthesis** the reactants in, and products of, photosynthesis, and a word summary for photosynthesis the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere the adaptations of leaves for photosynthesis. **Cellular Respiration** ● aerobic and ~~anaerobic~~ respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life ● a word summary for aerobic respiration	What role do the parts of a flower play in reproduction? How are wind and insect pollinated plants different? How do different plants disperse their seeds? What are the reactants and products involved in photosynthesis? Why are plants and algae needed for life on Earth? How are leaves adapted for photosynthesis?			microscopes and slides Flowers, seeds for seed dispersal. Hand lenses Microscopes for pollen tube growth etc. Plants for testing with iodine to show production of starch from glucose. Elodea (canadian pondweed to count bubbles produced. Leaves, colourless nail varnish, spreaders, hand lenses or microscopes to look at stomata.		enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate ● use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety ● make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements ● apply sampling techniques. **Analysis and evaluation** ● apply mathematical concepts and calculate results ● present observations and data using appropriate methods, including tables and graphs ● interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions ● present reasoned explanations, including

	Interactions and Interdependencies **Relationships in an ecosystem** ● the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops ● the importance of plant reproduction through insect pollination in human food security ● how organisms affect, and are affected by, their environment, including the accumulation of toxic materials.						explaining data in relation to predictions and hypotheses ● evaluate data, showing awareness of potential sources of random and systematic error ● identify further questions arising from their results. **Measurement** ● understand and use SI units and IUPAC chemical nomenclature ● use and derive simple equations and carry out appropriate calculations ● undertake basic data analysis including simple statistical techniques.