

Variation and Ecosystems

Core Lesson 1	Option lesson 1a	Option lesson 1b	Core lesson 2	Core lesson 3	Option Lesson 3b	Core Lesson 4
1 ¼ hours	1 hours	40 minutes	1 hour	1 hour	60 minutes	1 ¼ hours
Variation in living things	Do people with longer legs jump further?	Investigating variation in a population	Inherited variation	Non-inherited variation	Risk factors for skin cancer	Microscopes
<u>Biology Objectives</u> Pupils describe similarities and differences within familiar species and describe how living things are grouped as species.	<u>Biology Objectives</u>	<u>Biology Objectives</u>	<u>Biology Objectives</u> Pupils develop their understanding of the causes of variation within a species. Genes are not covered until Year 9 but could be introduced here for some classes.	<u>Biology Objectives</u> Pupils understand better the causes of within-species variation.	<u>Biology Objectives</u>	<u>Biology Objectives</u> Pupils learn the names and functions of different parts of the microscope and how light reaches the eye.
<u>Key concepts and processes</u> Pupils carry out a class survey to measure, record and compare features, and hair colour, developing understanding of continuous and discontinuous variables and plotting appropriate graphs.	<u>Key concepts and processes</u> Pupils plan and carry out a pattern-seeking enquiry to investigate a possible correlation between leg length and ability to jump farther and whether leg length is also a cause of this ability. They evaluate their evidence critically to draw conclusions and test their theory.	<u>Key concepts and processes</u> Pupils plan and carry out an enquiry to further investigate variation within a population of the same species. They consolidate their skills in obtain sufficient data to ensure a valid comparison, and in plotting graphs.	<u>Key concepts and processes</u> Pupils evaluate observations, use scientific ideas to explain phenomena and communicate scientific information.	<u>Key concepts and processes</u> Pupils investigate, using primary (fieldwork) or secondary data, size whether environmental factors cause differences within species. They evaluate observations and use scientific ideas to explain phenomena.	<u>Key concepts and processes</u> Pupils plan and carry out a research enquiry and analyse data from secondary sources on risk factors for skin cancer, to test the hypothesis that these are both environmental and genetic.	<u>Key concepts and processes</u> Pupils make observations using a microscope and record these in accurate drawings. They measure the size of the viewed object by choosing the correct equipment and techniques. They understand the benefits of developments in microscope technology.
PLTS - Identify questions to answer and problems to solve by choosing a variable to measure and deciding on an appropriate sample size e.g. height	PLTS - Ask questions to extend their thinking by seeking a pattern between leg length and ability to jump distances, making predictions and suggesting other possible causes. Analyse information to decide if there is a correlation between the variables Support conclusions, using reasoned arguments and evidence	PLTS - Identify questions to answer and plan and carry out research by choosing a variable to measure and a method to measure it	PLTS - Analyse and evaluate information, judging its relevance and value by investigating variation within the same species and evaluating the evidence for causes of variation	PLTS - Plan and carry out research by choosing a variable to measure and deciding on an appropriate sample	PLTS - Identify questions to answer and problems to resolve by choosing a suitable area to study and suitable lines of enquiry suitable lines of enquiry	PLTS - Identify questions to answer and problems to resolve, by choosing the correct equipment and techniques to calculate the size of a specimen viewed under the microscope and to draw and label a scale drawing
Technician's notes Photos of various trees and their leaves/fruit of these trees, metre rulers, tape measures, graph paper.				Technician's notes For fieldwork : scissors, polythene bags, marker pens, rubber gloves, forceps to remove nettles from bags For both fieldwork and secondary data: 2 mm graph paper grid on acetate, 30 cm rulers		Technician's notes Explore: hand lenses, newspapers Extend: microscopes, bench lamp or substage illuminator, eyepiece graticules, prepared slides, microscope slides, sellotape, objects to measure transparent 15cm rulers.

Assessment: During each lesson each student should assess their own level using the pupil speak level ladders and show their partner where the evidence is for that level. They should record this in the grid at the front of the book. The member of staff should then assess the level of a maximum of 2 students work each lesson.

At the end of each lesson there will be an end of topic test to check the content level.

Homework: For each topic there is a task booklet that students should use for homework.

Option lesson 4a	Option lesson 4b	Core lesson 5	Option lesson 5a	Core lesson 6	Option lesson 6a	Core Lesson 7
40 minutes	30-60 minutes	1-1 ¼ hours	20-30 minutes	1 hour	30-40 minutes	1 ¼ hours
How are microscopes used	Making slides	Cells	Seeing inside cells	Growing from one cell	Cell cultures	Life cycle of plants
Biology Objectives	Biology Objectives	Biology Objectives Pupils learn that cells are the basic unit of life and are organised into tissues, and that tissues make organs. They compare structural differences between animal and plant cells and learn the function of some cell parts.	Biology Objectives	Biology Objectives Pupils learn that cells make more cells by dividing and that growth occurs when the number of cells increases. Cell division starts with division of the nucleus.	Biology Objectives	Biology Objectives Pupils develop their understanding of plant reproductive organs and of sex cells. They use a flow diagram of the basic cycle, and describe fertilisation as the fusion of the nucleus of a male sex cell to the nucleus of a female sex cell.
Key concepts and processes Pupils plan and carry out a research enquiry on the benefits the invention of the microscope has brought to the development of scientific ideas and to medical applications. They select relevant sources of information and communicate their findings, possibly using ICT.	Key concepts and processes Pupils develop their competence in using microscopes and in the practical technique of making preparations for viewing under the microscope. They assess risk and take steps to carry out their practical work safely. They draw their specimens using the idea of scale.	Key concepts and processes Pupils make a model cell to help explain the key similarities and differences between animal and plant cells.	Key concepts and processes Pupils explain how evidence from microscopic observations of structures within cells has increased knowledge but there are questions about cell function that we cannot yet answer.	Key concepts and processes Pupils analyse data from secondary sources and use patterns in their findings to provide evidence for scientific explanations of when growth takes place.	Key concepts and processes Pupils find out about cell culturing and its applications. They contribute to a group presentation or discussion about issues surrounding their use in order to come to their own informed opinion. They select reliable sources of information and communicate, possibly using ICT, their informed opinion and any counterarguments using scientific terminology.	Key concepts and processes Pupils use microscopes to measure the length of pollen tubes at different stages of germination, and use their data to say when a pollen tube would reach the ovary of their plant.
PLTS - Identify questions to answer and problems to resolve by setting and answering a question about the contribution of microscopes to the advancement of scientific knowledge	PLTS - Anticipate, take and manage risks, by identifying risks and following instructions to safely prepare and view their slide	PLTS - Generate ideas and explore possibilities by using evidence and creativity to make a 3D model cell	PLTS - Identify questions to answer and problems to resolve by finding out how we know about cell structure and function	PLTS - Analyse and evaluate information, judging its relevance and value, by drawing and/or interpreting data from growth charts	PLTS - Consider the influence of circumstances, beliefs and feelings on decisions and events, by recognising that although science informs personal decisions, these are also affected by ethical and moral beliefs with related issues and implications regarding the use of cell culture	PLTS - Support conclusions, using reasoned arguments and evidence, by using their observations and data to describe how fertilisation happens
Technician's notes		Technician's notes Explore and Engage: prepared , stained slides of cheek and onion skin cells, microscopes Extend: cellulose paste or jelly (to represent the cytoplasm), small plastic bags and boxes (to represent the cell wall), bag ties, string or wool, plasticine, ping pong balls and other small balls, dried peas or coloured beads, cling film, small balloons, small clear plastic film containers, sticky tape - these should be unlabelled and left for pupils to use as they see appropriate.			Technician's notes	Technician's notes depending on season: vegetable seeds, germinating plants and the fruit; flowers with large stamens and ovaries; same species flowers at different stages o maturity /pollen production; seedheads lily plants and prepared cavity slides with cover slips of lily pollen in 10% sugar solution to show pollen tube growth at 1-, 2- and 3-hour intervals, labelled with time since preparation, compound microscopes with eyepiece graticules, dividers (See also http://www.saps.ptantsci.cam.ac.uk/pollen/pollen2.htm for other pollen to use.)

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Option lesson 7a	Option lesson 7b	Core Lesson 8	Option lesson 8a	Core Lesson 9	Option lesson 9a
40-50 minutes	30-40 minutes	1 hour	1 hour	1 ¼ hours	40 minutes
What liquids do seeds germinate in	How do plants stop self fertilisation	Plant growth	Hydroponics	Classifying organisms	The history of classification
Biology Objectives	Biology Objectives	Biology Objectives Pupils develop the idea that all plants are made up of cells, tissues and organs and investigate some of the environmental factors that influence plant growth.	Biology Objectives	Biology Objectives Pupils explain which criteria to use to put animals in groups, and assess their effectiveness. They consider the reasons why scientists use a common system to classify animals.	Biology Objectives
Key concepts and processes Pupils plan and carry out a fair-testing enquiry to investigate the best liquid for seed germination, draw conclusions from graphs and relate the findings to predictions made from their preliminary research.	Key concepts and processes Pupils use a model flower they have made themselves to explain how having variation in stigma and style length helps prevent self fertilisation in flowers.	Key concepts and processes Pupils plan and carry out a fair-test enquiry into a particular factor that affects plant growth, plot line graphs and analyse findings. This investigation will need to run over 2-3 weeks.	Key concepts and processes Pupils devise a test to find out the best combination and strength of minerals for hydroponically growing plants. They explain the importance of this application of science.	Key concepts and processes Pupils evaluate scientific evidence and working methods by determining disadvantages of Aristotle's system of classification and describing the advantages of Linnaeus' system. They use a key to identify and name a group of organisms.	Key concepts and processes Pupils recognise that modern taxonomy has its roots in 18th-century ideas. They understand that scientific ideas change over time. They use appropriate methods, including ICT, to communicate scientific information and contribute to presentations.
PLTS - Work towards goals, showing initiative, commitment and perseverance by setting suitable question/s to pursue, deciding on an approach, following appropriate procedures and arriving at an outcome that meets their target/s	PLTS - Work towards goals, showing initiative, commitment and perseverance by choosing materials to design a model flower to describe and explain how self-fertilisation is prevented in plants	PLTS - questions to answer and problems to resolve by choosing variables to frame a question for a plant growth enquiry	PLTS - Identify questions to answer and problems to resolve by planning and carrying out a test to find the optimum conditions for hydroponically growing plants	PLTS - Analyse and evaluate information, judging its relevance and value by evaluating and constructively criticising identification keys Identify improvements that would benefit others as well as themselves	PLTS - Explore issues, events or problems from different perspectives and analyse and evaluate information, judging its relevance and value, by comparing and evaluating Aristotle's and Linnaeus' classification systems
		Technician's notes Rapid-cycling brassicas have a life cycle of approximately 40 days. You will need a supply of germinated plants for the Explore and Extend phase of this lesson. Brassica seedlings, soil, light banks, data loggers for temperature, light, moisture, thermometers, seed trays or pots, clingfilm to cover seed trays		Technician's notes Cards with pictures of eight different animals (for example, spider, starfish, octopus, insect) or, using more detailed features, eight different types of the same animal (e.g. spiders); large sheets of paper.	

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Core lesson 10	Core Lesson 11	Option lesson 11a	Option lesson 11b	Core Lesson 12	Option lesson 12a	Option lesson 12b
1 ½ hours	1 hour	40 minutes	40 minutes	1 – 1 ¼ hours	50 minutes	1 hour
Food chains and webs	Where organisms live	Adaptations to seasonal changes	Study of a local habitat	Competition and co-operation	Biological control	Co-operative animal behaviour
<u>Biology Objectives</u> Pupils Learn about characteristics of predator and prey species and that arrows in a food chain represent energy transfer. They understand that all the organisms in a habitat can be linked together in food webs, each made up of a number of food chains which start with plants.	<u>Biology Objectives</u> Pupils understand that the distribution of organisms in different habitats is affected by environmental factors, such as light, nutrients or water availability, and can explain why some better adapted can live more successfully than others in different habitats.	<u>Biology Objectives</u>	<u>Biology Objectives</u>	<u>Biology Objectives</u> Pupils learn about the factors that affect the size of populations in a food web, that organisms with better adaptations are more successful in competing for resources and survive longer to pass on these advantages, and the use of predators to control pest populations.	<u>Biology Objectives</u>	<u>Biology Objectives</u>
<u>Key concepts and processes</u> Pupils identify a question and select relevant information to provide answers. They present scientific diagrams for food chains, food webs and number pyramids, and contribute to presentations.	<u>Key concepts and processes</u> Pupils identify a question to research and select relevant information from a range of sources in order to provide answers. communicate scientific information and contribute to presentations.	<u>Key concepts and processes</u> Pupils plan and carry out a research enquiry to develop ideas and explanations about the dependence of an endangered species on its habitat. They organise their research method and schedule, to produce a presentation about their chosen animal.	<u>Key concepts and processes</u> Pupils collect, display and interpret their own data from a local habitat. They assess risk and fieldwork safely.	<u>Key concepts and processes</u> A food web simulation is used to raise questions and test hypotheses in different contexts. The model allows pupils to rapidly plot data to help show patterns clearly.	<u>Key concepts and processes</u> Pupils apply knowledge of food chains to biological pest control and communicate scientific information on the advantages and disadvantages, explaining why it is considered a natural alternative to chemical pesticides and the possible implications to the environment of importing nonnative organisms.	<u>Key concepts and processes</u> Pupils find out how simple co-operative behaviours among predators or prey can benefit survival of the species. They plan and carry out a research enquiry in an area of personal interest, selecting sources of scientific information and appreciating that different explanations of observed behaviour may arise from preconceived ideas about animal behaviour.
PLTS - Collaborate with others to work towards common goals by working as part of a team to together in produce a presentation on time	PLTS - Identify questions to answer and problems to solve by choosing the quantifiable factor organisms to be recorded and thereby the approach to the enquiry	PLTS - Organise materials, timeframes, workloads and schedules, to complete projects by setting and meeting key milestones in the development and production of a presentation about their chosen animal	PLTS - Identify questions to answer and problems to carry out solve by framing a question to investigate and appropriate ways to display data and draw conclusions	PLTS - Analyse and evaluate information, judging its relevance and value, by analysing data from a food web model, using it to support conclusions and recognising its limitations	PLTS - Explore issues, events or problems from different perspectives by finding out about biological methods of pest control vs pesticide use	PLTS - Analyse and evaluate information, judging its relevance and value, by carefully distinguishing between subjective and objective observations to explain how social behaviour aids survival
	Technician's notes Optional – video camera, podcast equipment, access to a computer and multimedia projector		Pooters Disinfectant wipes Pitfall traps 0.5 m square quadrats Sweep nets or pond nets 30 m tape measures Rulers Hand lenses Pitfall traps White sheet one newspaper Small paintbrushes Sorting trays Small dishes for specimens	Technician's notes Cardboard, sellotape, previously photocopied rabbit ears and fox head template (the rabbit ears need to be of assorted sizes so some pupils will receive smaller ears than others), computer access	Technician's notes	

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