

OLC learners know it, show it, think it, prove it

Science: Evolution and Inheritance

Vocabulary	adaptation inheritance ancestor kingdom animal kingdom microorganism artificial selection monera kingdom asexual reproduction multicellular bacteria natural selection characteristic naturalist classification origin deoxyribonucleic acid (DNA) palaeontologist dinosaur pathogen evolution plant kingdom evolve protista kingdom extinct sexual reproduction fossil species fungus kingdom theory gene unicellular genetics variation host virus	Prior Learning	<p>Identification and Classification</p> <ul style="list-style-type: none"> Scientists classify living things according to shared characteristics. A classification key is a set of questions that helps us identify a living thing or decide which group it belongs to. The animal kingdom is divided into vertebrates and invertebrates. A vertebrate is an animal with a backbone. An invertebrate is an animal without a backbone. <p>Survival</p> <ul style="list-style-type: none"> An animal's habitat must provide water, food, air and shelter for the animal to survive. Animals eat food that is found in their habitat. Herbivores eat plants. Omnivores eat plants and animals (meat). Carnivores eat other animals (meat).
Know It: essential knowledge	<ul style="list-style-type: none"> A microorganism is a living thing. It is too small to be seen without a microscope. Microorganisms can be found in the fungus, protista and monera kingdoms. Most microorganisms are beneficial. For example, cyanobacteria make oxygen, and a unicellular fungus called yeast is added to bread to make it rise. Some microorganisms are pathogens, which means they cause disease in other living things. Fossils are the remains of once-living things or traces of life, such as footprints, tracks, dung or burrows, that have been preserved as rock. Preserved remains and traces of life are called fossils if they are over 10,000 years old. The theory of evolution was first developed by the naturalists Charles Darwin and Alfred Russel Wallace in 1858. Living things that sexually reproduce pass on inherited characteristics to their offspring, such as skin colour and eye colour. Offspring inherit one copy of each gene from the female parent and one from the male parent. This mixing of genes means that offspring are unique, differing from their parents and each other. 		
Think It: discernment, oracy and RUAH)	RUAH	Oracy	Discernment
	<ul style="list-style-type: none"> Thinking and discussing how to better understand the natural world may help develop our personal disposition towards stewardship of the Earth and our respect for the environment. Understanding how looking at fossils and other natural artefacts may reveal information and allow for discoveries re the natural world, and in turn developing a sense of affection towards the natural world, and continuing to develop a sense of profound respect towards the natural environment and its continuing ability to reveal 	<ul style="list-style-type: none"> Discussing fossils' features and findings, and having to convey this information verbally in a discernible way to fellow group members. Explaining how traits pass from parent to offspring using key vocabulary (e.g. genes, inherited traits). Students participate in a structured discussion, using sentence stems (e.g. "I think... because...") to explain how a plant has adapted to its environment to make it fit to survive. Students are comparing inherited and environmental (nature vs nurture) characteristics through paired talk, using comparative language (e.g., "similar," "different," "caused by," etc.). 	<ul style="list-style-type: none"> Discussing along the following lines or using the following questions ... If something is alive but cannot be seen, how do we know it exists—and should we treat it as important as things we can see? If some microorganisms help life and others cause disease, how should we decide whether they are "good" or "bad"? If offspring are similar but not identical to their parents, what does this tell us about what makes each individual unique?

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	<p>and expose its past and continuing development.</p> <p>Developing an appreciation for the Earth's flora and fauna by examining and engaging with all of its quirks and oddities with a humorous perspective or lens.</p>	<ul style="list-style-type: none"> • Students orally justify a hypothesis using a clear "If... then... because..." structure and explain the reasoning behind their prediction. • Students explaining their investigation plan to a group, correctly identifying variables (independent, dependent, controlled). • Students give and follow clear verbal instructions during practical work. • Students presenting their results orally, referring accurately to tables/graphs and describing patterns or trends using appropriate vocabulary. 																			
<p>Prove It: assessment)</p>	<ol style="list-style-type: none"> 1. What does a fossil tell us? 2. What are the key ideas about the theory of evolution? 3. Explain what a microorganism is. 4. Are all microorganisms beneficial? 5. Explain what inherited characteristics are. 																				
<p>Beyond Year 6</p>	<p><u>Biology: genetics and evolution</u> Inheritance, chromosomes, DNA and genes</p> <ul style="list-style-type: none"> • heredity as the process by which genetic information is transmitted from one generation to the next • a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model • differences between species ☐ the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation • the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection • changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction • the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material. 																				
<p>Lesson Sequence</p>	<table border="1"> <tr><td>Lesson 1</td></tr> <tr><td>Lesson 2</td></tr> <tr><td>Lesson 3</td></tr> <tr><td>Lesson 4</td></tr> <tr><td>Lesson 5</td></tr> <tr><td>Lesson 6</td></tr> <tr><td>Lesson 7</td></tr> </table>	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6	Lesson 7	<table border="1"> <tr><td>Engage</td></tr> <tr><td>Develop</td></tr> <tr><td>Innovate</td></tr> <tr><td>Express</td></tr> </table>	Engage	Develop	Innovate	Express	<table border="1"> <tr><td>Classifying fossils</td></tr> <tr><td>Theory of evolution</td></tr> <tr><td>Inheritance</td></tr> <tr><td>Natural selection and survival of the fittest</td></tr> <tr><td>Exploring plant adaptations</td></tr> <tr><td>Experiments</td></tr> <tr><td>Assessment and evaluation</td></tr> </table>	Classifying fossils	Theory of evolution	Inheritance	Natural selection and survival of the fittest	Exploring plant adaptations	Experiments	Assessment and evaluation
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<p>Show It: scientific skills and concepts</p>	<p>General skills</p>	<p>Questioning</p>	<p>Investigation</p>	<p>Observation</p>	<p>Gather and Record Data</p>
		<p style="text-align: center;">Year 5 Skill</p> <p>Ask a wide range of relevant scientific questions that broaden their understanding of the world around them and identify how they can answer them.</p> <p style="text-align: center;">Year 6 Skill</p> <p>Ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.</p> <p style="text-align: center;"><i>Questions can help us find out about the world and can be answered using a range of scientific enquiries, including fair tests, research and observation.</i></p>	<p style="text-align: center;">Year 5 Skill</p> <p>Plan and carry out a range of enquiries, including writing methods, identifying variables and making predictions based on prior knowledge and understanding.</p> <p style="text-align: center;">Year 6 Skill</p> <p>Plan and carry out a range of enquiries, including writing methods, identifying and controlling variables, deciding on equipment and data to collect and making predictions based on prior knowledge and understanding.</p>	<p style="text-align: center;">Year 5 Skill</p> <p>Within a group, decide which observations to make, when and for how long, and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.</p> <p style="text-align: center;">Year 6 Skill</p> <p>Independently decide which observations to make, when and for how long and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.</p> <p style="text-align: center;"><i>Accurate observations can be made repeatedly or at regular intervals to identify changes over time, identify processes and make comparisons.</i></p>	<p style="text-align: center;">Year 5 Skill</p> <p>Gather and record data and results of increasing complexity, selecting from a range of methods (scientific diagrams, labels, classification keys, tables, graphs and models).</p> <p style="text-align: center;">Year 6 Skill</p> <p>Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge.</p> <p style="text-align: center;"><i>Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.</i></p> <p style="text-align: center;"><i>Bar charts can be used to display for discontinuous variation when there is a set number of outcomes, such as eye colour and blood groups.</i></p> <p style="text-align: center;"><i>Line graphs can be used to display continuous variation when there is a range of values, such as the height or mass of different individuals of the same species.</i></p> <p style="text-align: center;"><i>Scatter graphs can be used when looking for a correlation between two data sets.</i></p>
		<p>Measurement</p>	<p>Report and Conclude</p>	<p>Parts and Functions</p>	<p>Living Things</p>
<p style="text-align: center;">Year 5 Skill</p> <p>Take increasingly accurate measurements in standard units, using a range of chosen equipment.</p> <p style="text-align: center;">Year 6 Skill</p> <p>Take accurate, precise and repeated measurements in standard units, using a range of chosen equipment.</p>	<p style="text-align: center;">Year 5 Skill</p> <p>Use relevant scientific vocabulary to report on their findings, answer questions and justify their conclusions based on evidence collected, identify improvements, further questions and predictions.</p>	<p style="text-align: center;">Year 5 Skill</p> <p>Describe how animals and plants can be bred to produce offspring with specific and desired characteristics (selective breeding).</p> <p>Identify that living things produce offspring of the same kind, although the offspring are not identical to either parent.</p>	<p style="text-align: center;">Year 5 Skill</p> <p>Describe the changes as humans develop from birth to old age.</p> <p style="text-align: center;">Year 6 Skill</p> <p>Explain that living things have changed over time, using specific examples and evidence.</p>		

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		<p style="text-align: center;"><i>Specialised equipment is used to take accurate measurements in standard units including light sensors measuring light intensity (lux).</i></p>	<p style="text-align: center;">Year 6 Skill</p> <p>Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.</p> <p style="text-align: center;"><i>A conclusion is an explanation of what has been discovered using evidence collected.</i></p>	<p style="text-align: center;"><i>Animals and plants can be bred to produce offspring with specific and desired characteristics. This is called selective breeding.</i></p> <p style="text-align: center;"><i>Inheritance is when living things pass on characteristics following sexual reproduction, such as height, skin colour and eye colour.</i></p> <p style="text-align: center;"><i>Variation is the natural differences in characteristics between individuals of the same species.</i></p> <p style="text-align: center;"><i>Continuous variation contains a range of values, such as the height or mass of different individuals of the same species.</i></p> <p style="text-align: center;"><i>Discontinuous variation has a certain number of outcomes, such as eye colour and blood groups.</i></p>	<p style="text-align: center;"><i>The theory of evolution was developed in the 19th century by the naturalists Charles Darwin and Alfred Russel Wallace.</i></p> <p style="text-align: center;"><i>The theory states that: all life on Earth has evolved from simple life forms to more complex ones over time; all life on Earth has common ancestors and is therefore related, and; living things with characteristics most suited to their environment are more likely to survive and reproduce.</i></p> <p style="text-align: center;"><i>The fossil record and the DNA of living and extinct things provide evidence of evolution.</i></p>
		<p>Changes</p> <p>Year 6 Skill</p> <p>Describe some significant changes that have happened on Earth and the evidence, such as fossils, that support this.</p>	<p>Identify and Classify</p> <p>Year 6 Skill</p> <p>Classify living things, including microorganisms, animals and plants, into groups according to common observable characteristics and based on similarities and differences.</p> <p style="text-align: center;"><i>The first and widest level in the biological classification system is called a kingdom, the second a phylum, then class, order, family, genus and species.</i></p> <p style="text-align: center;"><i>There are five kingdoms: animals, plants, fungi, protists and monerans.</i></p> <p style="text-align: center;"><i>Members of each kingdom have features in common.</i></p>		