

Key concept (age 11-14)

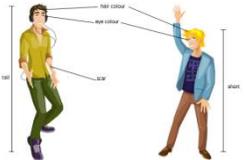
BVE3.1: Explaining evolution

Learning focus	The characteristics of a species can change over generations as advantageous adaptations become more common; this is evolution, and can be explained by a process of natural selection.				
As students' conceptual understanding progresses they can:					
As students' conceptual understanding progresses they can:	<p>Explain how the fossil record provides evidence that species change over time.</p> <p>P</p>	<p>Recognise that there is variation between individuals within a species, and that only genetic variation can be inherited.</p>	<p>Recognise that organisms compete for limited resources, and that some individuals have traits that help them compete more successfully than other individuals in the same population.</p>	<p>Use ideas about heritable variation, competition, fitness and natural selection to explain why an advantageous trait became more common in a population over a number of generations.</p>	<p>Apply the idea that evolution by natural selection occurs within populations, over generations and without foresight.</p>
Diagnostic questions	<p>What can we learn from fossils?</p>	Variation	Penguin population	The changing faces of evolution	Is it evolution?
	The fossil record	Heritable variation?	Forest dwellers		Silence on the island
Response activities		<p>Observing and explaining variation</p> <p>Can it be inherited?</p>	The struggle for existence	Evolution in the garden	

Key:

P Prior understanding from earlier stages of learning

B Bridge to later stages of learning

<h3>What can we learn from fossils?</h3>  <p>Confidence grid</p>	<h3>The fossil record</h3>  <p>Linking ideas</p>	<h3>Variation</h3> <p>Two-tier multiple choice</p>	<h3>Heritable variation?</h3>  <p>Two-tier multiple choice</p>	<h3>Penguin population</h3>  <p>Simple multiple choice</p>
<h3>Forest dwellers</h3>  <p>Two-tier multiple choice</p>	<h3>The changing faces of evolution</h3>  <p>Simple multiple choice</p>	<h3>Is it evolution?</h3>  <p>Confidence grid</p>	<h3>Silence on the island</h3>  <p>Talking heads</p>	

Observing and explaining variation	Can it be inherited?	The struggle for existence	Evolution in the garden
<p>BEST STUDENT WORKSHEET</p> <p>Observing and explaining variation</p> <p>Humans</p> <p>Humans are all one species (Homo sapiens).</p>  <p>There are differences between individual humans.</p> <p>Differences between members of a species are called variation.</p> <p>To talk about in your group</p> <ol style="list-style-type: none"> 1. What are some examples of variation between humans? 2. What are the causes of this variation? <p>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. Download the original from www.bestevidencescienceteaching.org © University of York Science Education Group 2014. Licensed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</p>	<p>BEST TEACHER NOTES</p> <p>Introduce the idea of variation, adaptation and evolution in their most essential and simplest form.</p> <p>Response activity Can it be inherited?</p> <p>Objective</p> <p>Learning focus: The characteristics of a species can change over generations as advantageous adaptations become more common. This is evolution, and can be responsible for a process of natural selection.</p> <p>Observable learning outcome: Recognise that there is variation between individuals within a species, and that some genetic variation can be inherited.</p> <p>Activity type: Discussion</p> <p>Key words: heredity, reproduction, genome</p> <p>This activity can help students to evaluate misconceptions about inheritance and acquired characteristics through small group discussion. It can be used in response to the following diagnostic questions:</p> <ul style="list-style-type: none"> Diagnostic question: heritable variation? <p>What does the research say?</p> <p>Research reported by a number of authors (Dover et al., 2014; Williams, 2012; Curran, Williams, and Martin, 2012; Aloni, 2012) suggests that children up to age 11 have numerous misconceptions about basic hereditary and evolutionary characteristics and that one generation to the next, including that acquired characteristics resulting from interaction with the environment or from learning can be passed from parents to offspring.</p> <p>An organism's characteristics are not only affected by the genes but by the organism's fitness and environment as well. Research indicates that most parents in education hold one idea of genes as the only determinants of an organism's characteristics – a conception dubbed 'genetic determinism' (Lambert and Reed, 2012).</p> <p>Remember these useful formative assessment questions with group discussions to develop students' understanding of ideas about inheritance (Al, 2014 and York, 2012).</p> <p>In order to explore evolution using ideas about natural selection, students must appreciate that only genetic variation can be inherited.</p> <p>What to use this activity for</p> <p>Students should complete this activity in pairs or small groups, working together to sort characteristics into groups under headings such as:</p> <ul style="list-style-type: none"> • is not inherited • is not affected by genetic information in the genome • is affected by genetic information in the genome • is inherited <p>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. Download the original from www.bestevidencescienceteaching.org © University of York Science Education Group 2014. Licensed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</p>	<p>BEST STUDENT WORKSHEET</p> <p>The struggle for existence</p>  <p>Charles Darwin recognised that all organisms are in a 'struggle for existence'. They are in competition with one another for limited resources.</p> <p>They need the resources to survive.</p> <p>To do in your pair or group</p> <p>Draw a concept map as shown:</p> <ul style="list-style-type: none"> • what resources organisms compete for • features (adaptations) that could help an organism to compete successfully for each resource <p>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. Download the original from www.bestevidencescienceteaching.org © University of York Science Education Group 2014. Licensed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</p>	<p>BEST STUDENT WORKSHEET</p> <p>Evolution in the garden</p>  <p>Finch is just a species of bird.</p> <p>In the UK, this species of bird often goes to feed from bird feeders in people's gardens.</p> <p>Scientists have made an observation:</p> <ul style="list-style-type: none"> • larger beaks are becoming more common in the Finch major population in the UK. <p>To talk about in your pair or group</p> <p>What could you explain the scientist's observation?</p> <p>In your explanation you should include ideas about:</p> <ul style="list-style-type: none"> • variation • inheritance • competition • natural selection. <p>Developed by the University of York Science Education Group and the Salters' Institute. This document may have been edited. Download the original from www.bestevidencescienceteaching.org © University of York Science Education Group 2014. Licensed under a Creative Commons Attribution-NonCommercial (CC BY-NC) license.</p>
<p>Challenge to thinking, discussion</p>	<p>Discussion</p>	<p>Concept map, discussion</p>	<p>Discussion</p>