

# BIG IDEA: EVOLUTION (BY NATURAL SELECTION)

## WHY IS IT IMPORTANT TO LEARN ABOUT EVOLUTION?

As well as being a fundamental cornerstone of biology, evolution has implications for many related topic areas. These include medicine (eg antibiotic resistance), climate change (eg effects of deforestation) and agriculture (eg animal and plant breeding). Understanding evolution feeds into many policy decisions, from how to control MRSA or Ebola to regulations on genetic engineering.

## WHAT ARE THE CORE CONCEPTS OF EVOLUTION?

Crucial:

- Natural selection
- Variation
- Adaptation
- Genetics

Less crucial:

- Speciation
- Extinction
- Geological time

Additional:

- Enlightenment
- Darwin
- Alternative scientific theories eg Lamarckism, punctuated evolution
- Religious/cultural creation stories (including intelligent design)

## ORDER OF TEACHING

Variation

Adaptation

(Speciation)

Natural selection

(Extinction)

(Geological time)

Genetics

“Additional” could be introduced in any order

## WAYS OF ASSESSING UNDERSTANDING

Bear in mind the common misconceptions eg:

- All species are optimally adapted – see 1
- Life is changed by “chance” – see 1, 2 and 3
- Natural selection is a choice – see 2 and 3
- Evolution is “just a theory” (using everyday definition of theory) – see 4
- Humans come directly from monkeys – 5 and 6
- Humans and dinosaurs existed at the same time – 5
- Religion and evolution cannot co-exist – see 4

1. Ask straightforward questions such as:
  - Natural selection happens over one generation. True or false
  - An animal that is adapted to its habitat is more likely to survive than an animal that is not adapted to its environment. True or false
  - It is important to have variation within a population of plants. True or false
2. Hand out cards, each describing one event from the process of natural selection, and ask students to put into the right sequence (eg population shows variation, one variant is better suited to the environment ... proportion of better-suited variant will increase). Ask them to fit story of peppered moth or bacterial resistance into this sequence.
3. Discuss evolution by natural selection using the example of Darwin's finches on the Galapagos islands eg “Why might some finches survive better than others on the same food sources?” (different shaped/sized beaks).
4. In what ways are scientific theories about evolution different from religious accounts of creation? In what ways are they similar? (to get at difference between science and religion; between theory with objective evidence and religious faith; questions that are suitable to answer using science, using religion, or using other frameworks).
5. Draw an approximate timeline indicating when various forms of life, including humans and dinosaurs, came into being and, where relevant, became extinct.
6. Sketch a rough tree of life/animal family tree, showing in particular the relationship between chimps and humans.