

What evolves, and what DNA shows

60 minutes • A4.1.1, A4.1.2 • Chapters 1, 2

Evolution as a change in a population's heritable characteristics, and what base and amino acid sequences show

BY THE END, STUDENTS CAN

- ☐ Explain why evolution is a change in the heritable characteristics of a population, and why a change gained in one lifetime is not A4.1.1
- ☐ Use differences in base and amino acid sequences to judge which species share the most recent common ancestor A4.1.2

TIMING

0-8	8 min	Do now: two stories of a long neck	
8-20	12 min	The drought on Daphne Major	
20-25	5 min	"Just a theory"?	
25-45	20 min	Sequence detectives	
45-55	10 min	Evidence organiser, row 1	
55-60	5 min	Exit: back to the vote	
	60 min	One lesson	

STARTER

- 8 min** **Do now: two stories of a long neck**
- On the board: "Giraffes stretched for high leaves and passed longer necks on" against "Giraffes with longer necks happened to feed better and left more young". Students vote, then defend their vote in pairs. Leave the votes up; come back to them at the end.

ON THE BOARD, FROM THE GUIDE

Open the guide on the projector at each chapter (the links work in this PDF). Every figure plays from its own buttons, and the lesson's slides have the same figures, step by step, in the order of this plan.

01 Evolution is a change in what a population inherits

CHAPTER 01 IN THE SLIDES

Step through the figure (5 steps, the arrow keys on a projector). Stop on each caption and ask what changed before you go on.

- Each dot is one finch. Beak depth **varies**, and the variation is heritable: chicks resemble their parents.
- A drought leaves only big, hard seeds. Most finches with shallow beaks **starve**.
- The survivors breed and pass on their **alleles**, deep-beak alleles included.
- The next generation's beaks are deeper on average: the population has **evolved**. (Numbers simplified from the real study.)
- A beak chipped on a hard seed is not passed on: the chick hatches with a whole beak. An **acquired** change is not evolution.

Play the animation, Watch it happen: a population changes. It loops; pause it on each moment below and ask what is happening (in the lesson slides it is a video).

- Birds spot the beetles that stand out. The **best hidden** survive and breed.
- Then soot from a fire darkens the ground. Now the **pale** beetles stand out.
- No beetle ever changed its shell. The **population** changed: that is evolution.

Predict box: A gardener clips a hedge into a perfect cube every year for 40 years. Seeds from the hedge are sown. What shape do the seedlings grow into? Hands up or mini whiteboards first.

Answer C: The usual shape for the species: clipping never touched their alleles

02 Sequences remember common ancestors

CHAPTER 02 IN THE SLIDES

Switch the figure through Bases and Amino acids, and have the class say what will change before each.

Predict box: Before you compare: which species' sequence will differ from the human one at the most positions? Hands up or mini whiteboards first.

Answer D: Frog

THE LESSON

12

min

The drought on Daphne Major

Play [chapter 1's](#) figure step by step. At each step students sketch the dot plot and say what changed and what did not: no bird's beak changed, the population did. Write the definition only after the sketches: evolution is a change in the heritable characteristics of a population.

5

min

"Just a theory"?

Think, pair, share: why is evolution called a theory when nothing contradicts it? Land on the nature of science point: it explains and predicts a huge range of observations, but no theory can be proved true, only fail to be disproved.

20

min

Sequence detectives

Students predict the most different species ([chapter 2's](#) predict box), then use the sequence figure in pairs: compare each species, record the differences in a table, and watch the tree build. Switch to amino acids and ask why some differences vanish. Then the cytochrome c facts: identical in chimpanzees, one difference in rhesus monkeys, over 40 in yeast.

10

min

Evidence organiser, row 1

A grid with a row for each kind of evidence (sequences, selective breeding, homologous structures) and columns for what it is, a sketch, a named example and why it supports evolution. Fill the sequences row now; the others come in lesson 2.

ACTIVITIES



DATA

Sequence detectives

Pairs use the sequence figure in [chapter 2](#), or a printed copy of its five sequences. They count differences from the human sequence, put the species in order, and draw the tree. Extension: why are there more differences between base sequences than between amino acid sequences? Teachers who want real data can give the cytochrome c difference counts from a database.

Needs: the guide on devices, or printed alignments; squared paper.

PLENARY

5

min

Exit: back to the vote

Which giraffe story was Lamarck's, and why is it wrong? One sentence each, using the word "allele".

WHAT STUDENTS GET WRONG

"Animals evolve to survive." Individuals do not evolve, and nothing changes because it is needed. Insist on "the population" and "more offspring".

Acquired changes are inherited. Use the hedge and the chipped beak: only alleles in gametes are passed on.

Evolution as a ladder. Pictures of a line of apes walking into a human are wrong: every living species is the tip of a branch, and humans did not come from chimpanzees.

STRETCH AND SUPPORT

Support: give the captions of each figure as a cut-up storyboard to put in order, and use the key terms (tap the dotted words) as a glossary.

Support: the three mnemonics (Dragons Breathe Heat; Hungry Rats Chew My Pencils; Grumpy Birds Tweet) as a starter on each lesson.

Stretch: use a sequence database to compare one real protein across five species and build a tree.

IN THE GUIDE

- 1** [Evolution is a change in what a population inherits](#)
- 2** [Sequences remember common ancestors](#)
- A11** [The whole guide, with the figures that play](#)
- PPTX** [This lesson's slides, in the order of this plan](#)

PRACTISE AND REVISE

BUILD FOR YOUR CLASS

- [Tarsia puzzle, dominoes and picture reveal](#) on A4.1, built from its key terms and ready to print
- A [pub quiz](#) with rounds on A4.1, to present or run with no projector
- An [escape room](#) built from the [question bank](#) on A4.1

ALREADY ON THE SITE FOR A4.1

- [Quiz: Evolution & Speciation](#)
- Revision map: [A4.1 Evolution and speciation](#), to fill in
- Exam questions: [A4.1 in the exam maker](#), a paper with its markscheme

CARD SETS ON SPLYCR

Open a set to host it as a class game, or make a copy to edit.

- [A4.1 Evolution and Speciation \(SL\)](#)
- [A4.1 Evolution and Speciation \(HL\)](#)

EXAM PRACTICE

Check yourself

Set it for homework: a fresh paper of exam-bank questions on A4.1 at standard level each time, marked as students go and saved to their Exam practice when they are signed in.

biologybybradford.com/exam-maker/sit?topics=A4.1&level=SL&paper=quiz&marks=15&src=ep



How this was made. The course structure, the activities and the teaching choices come from my own classroom, my presentations and my years of teaching IB and AP Biology. I use Claude, an AI, to help write and build the interactive guides, lesson plans, slides and practice questions, and to draw the diagrams and code the interactives. I direct the work and review it against the IB and AP specifications before it goes live.