

Breeding, bones and wings

60 minutes • A4.1.3 to A4.1.5 • Chapters 3, 4

Selective breeding, the pentadactyl limb, and homologous against analogous structures

BY THE END, STUDENTS CAN

- ☐ Explain how crops and domestic animals show how quickly heritable characteristics can change A4.1.3
- ☐ Name the bones of the pentadactyl limb and tell homologous structures from analogous ones made by convergent evolution A4.1.4, A4.1.5

TIMING

0-5	5 min	Do now: which are the same species?	
5-20	15 min	Six vegetables, one species	
20-35	15 min	One bone plan	
35-45	10 min	Homologous or analogous?	
45-55	10 min	Evidence organiser, rows 2 and 3	
55-60	5 min	Exit	
	60 min	One lesson	

STARTER

5 min Do now: which are the same species?

Six vegetables on the front bench (or six pictures): kale, cabbage, Brussels sprouts, kohlrabi, broccoli, cauliflower. How many species? Most students guess four to six. The answer is one.

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.

03 Six vegetables, one wild weed

CHAPTER 03 IN THE SLIDES

Step through the figure (4 steps, the arrow keys on a projector). Stop on each caption and ask what changed before you go on.

- Wild cabbage: **leaves**, buds at the tip and along the stem, and yellow flowers.
- Selected for **leaves**: kale. Selected for a big **terminal bud**: cabbage.
- Selected for **side buds**: Brussels sprouts. Selected for a swollen **stem**: kohlrabi.
- Selected for **flower stalks and buds**: broccoli and cauliflower. All six can still interbreed: **one species**.

Predict box: Kohlrabi and Brussels sprouts look nothing alike. A grower lets them cross-pollinate. What happens? Hands up or mini whiteboards first.

Answer B: Seeds form and grow into fertile plants: one species

Remember it: Darwin's Big Hunch (DNA and protein sequences, Breeding, Homologous structures).

04 Same bones, different jobs, and the reverse

CHAPTER 04 IN THE SLIDES

Switch the figure through Homologous and Analogous, and have the class say what will change before each.

Predict box: A bat's wing and a bird's wing: homologous or analogous? Hands up or mini whiteboards first.

Answer C: Both: homologous as forelimbs, analogous as wings for flight

THE LESSON

15

min

Six vegetables, one species

The practical below, then [chapter 3](#)'s figure. Ask why this counts as evidence for evolution, and why it is not an example of new species forming.

15

min

One bone plan

[Chapter 4](#)'s figure on the board: tap each bone group across all four limbs. Students colour the same five groups on a blank limb outline, then learn the order with the mnemonic tiles. Ask: why would anyone build a wing, a paddle and a leg from the same parts?

10

min

Homologous or analogous?

The card sort below, in pairs. Take feedback on the two trap cards (the flippers, and the bat and bird wings) before anything else.

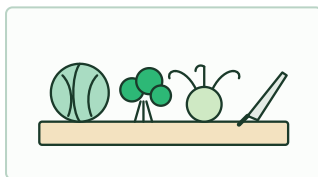
10

min

Evidence organiser, rows 2 and 3

Selective breeding and homologous structures. Students swap with a partner and add one thing to each other's rows.

ACTIVITIES

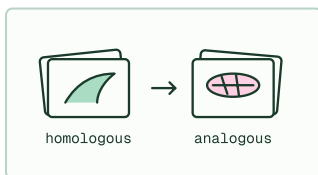


PRACTICAL

Six vegetables, one species

Groups get one of each cultivar of *Brassica oleracea* and a drawing of wild cabbage ([chapter 3](#)'s figure). They cut each vegetable lengthways, find which organ has been enlarged (leaf, terminal bud, side bud, stem, flower stalk, flower buds) and label it on the wild plant. Finish by asking what farmers chose each time, and what that shows about how fast heritable characteristics can change.

Needs: kale, cabbage, Brussels sprouts on the stalk if you can get them, kohlrabi, broccoli, cauliflower; knives and boards; hand lenses.



CARD SORT

Homologous or analogous?

Ten pairs of structures, each on a card, to sort into homologous, analogous, or both. Include the bird and bee wing, a human arm and a bat wing, a horse and a cat foreleg, octopus and human eyes, a cactus stem and a euphorbia stem, and two traps: whale and penguin flippers (homologous as forelimbs, analogous only in their flipper shape), and bat and bird wings (homologous as forelimbs, analogous as wings).

Needs: printed cards, one set per pair.

PLENARY

5

min

Exit

Name one pair of analogous structures and say why they are not homologous.

WHAT STUDENTS GET WRONG

Looking different means a different species. Dog breeds and cabbage cultivars are one species each.

Analogous means "looks similar". It means same function, different origin; the flippers are the classic trap.

Pentadactyl means five fingers. It names the bone plan; a horse has one digit on the same plan.

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.

IN THE GUIDE

- 3** [Six vegetables, one wild weed](#)
- 4** [Same bones, different jobs, and the reverse](#)
- 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.