**The struggle for existence**

C O M P E T I T I O N

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Charles Darwin recognised that all organisms are in a “struggle for existence”.

They are in competition with one another for limited resources.

They need the resources to survive.

**To do in your pair or group**

Draw a **concept map** to show:

* what resources organisms compete for
* features (adaptations) that could help an organism to compete successfully for each resource

*Biology > Big idea BVE: Variation, adaptation and evolution > Topic BVE3: Evolution > Key concept BVE3.1: Explaining evolution*

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| **Response activity** |
| **The struggle for existence** |

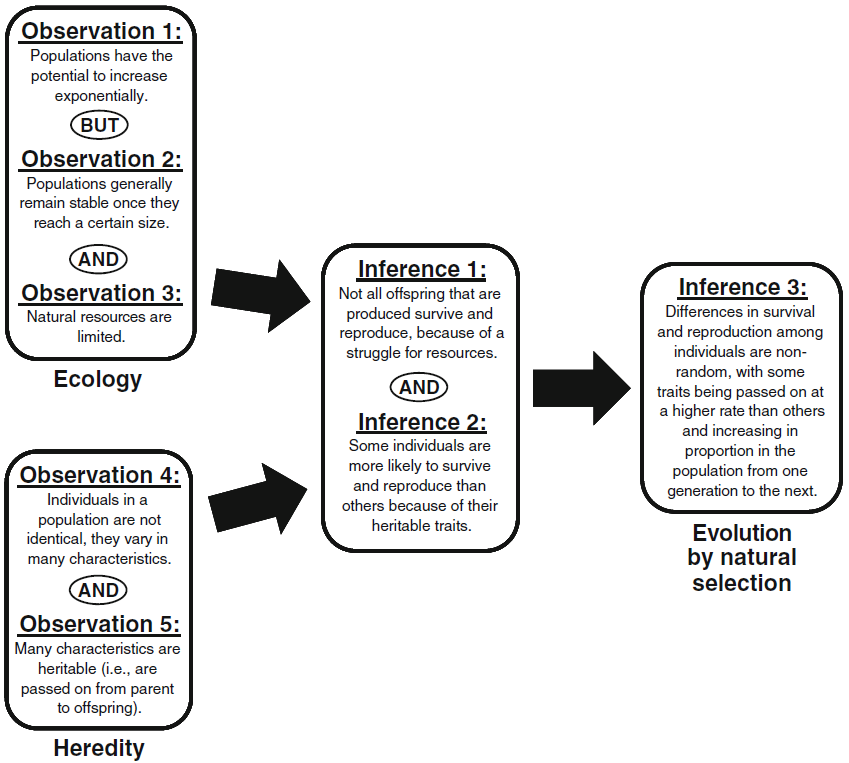
**Overview**

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| 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. |
| Observable learning outcome: | 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. |
| Activity type: | Concept map, discussion |
| Key words: | competition, population |

This activity can help develop students’ understanding of competition in populations and what organisms compete for, via small group discussion and concept mapping, and could be used in response to the following diagnostic questions:

* Diagnostic question: Penguin population
* Diagnostic question: Forest dwellers

**What does the research say?**



A summary of Darwin’s theory of evolution by natural selection; adapted from Mayr (1982) by Gregory (2009).

**Ecology**

**Heredity and variation**

**Competition and natural selection**

**Evolution**

At the end of the 1700s, Thomas Malthus described a struggle for existence associated with a population exceeding resources upon which it depends. This idea inspired both Charles Darwin and Alfred Russel Wallace in their thinking about natural selection and adaptation. The third chapter of Darwin’s book *On the Origin of Species by Means of Natural Selection* is titled “Struggle for existence”.

Darwin’s explanation for evolution has been summarised by Mayr (1982) and others into five observations (or facts) and three inferences.

This activity enables students to explore and develop their understanding of observation 3 and inferences 1-3.

Evolution-related terminology can be associated with misunderstandings (Andersson and Wallin, 2006). The phrase “survival of the fittest” is often used without (or in order to avoid having to demonstrate) understanding of the mechanisms involved, and many students incorrectly think “fittest” refers to the most athletic or strongest individuals rather than to the individuals best adapted to compete and survive to reproduce in their environment (Gregory, 2009).

Concept maps have been used with students of various ages to probe and develop their understanding of natural selection and evolution (Trowbridge and Wandersee, 1994; Schwendimann and Linn, 2016).

**Ways to use this activity**

Students should complete this activity in pairs or small groups. The focus of the activity should be on group discussion to decide what to include and where on the concept map.

It may be helpful to encourage the students in each pair/group to think about a familiar ecosystem, such as a woodland or a park, and construct their concept map to include the resources that organisms in that ecosystem compete for, and ways in which they could compete for them. There is substantial research evidence suggesting that fieldwork helps students to develop their knowledge and skills in ways that add value to their experiences in the classroom (Dillon et al., 2006), so this activity could be based on a local ecosystem that the students have visited.

It may be helpful to prompt students to think about:

* plants as well as animals (students could use different colours or shapes to indicate which resources animals compete for and which resources plants complete for)
* resources beyond just food that organisms compete for
* adaptations beyond just strength and athleticism that help organisms to compete and survive.

It is through the small group discussions that students can check their understanding and develop their explanations. Listening in to the conversations of each pair/group will often give you insights into how your students are thinking. The quality of the discussions can be improved with a careful selection of pairs/groups, or by allocating specific roles to students in each pair/group. For example, you may choose to select a student with strong prior knowledge as a scribe, and forbid them from contributing any of their own answers; they may question the others and only write down what they have been told. This strategy encourages contributions from more members of each group.

After their discussions, each pair/group should be prepared to report the key points of their discussion to another pair/group, or to the class.

*Differentiation*

You may choose to read the instructions to the class, so that everyone can focus on the science. In some situations it may be more appropriate for a teaching assistant to read for one or two students.

**Equipment**

For each pair/group:

* paper
* pencils or pens

**Expected answers**

Students’ concept maps could include many specific resources that organisms complete for, but broadly they should recognise the following major categories of resources:

* food
* water
* minerals
* mates
* space/territory/shelter
* light
* pollinators
* seed dispersers.

Students who apply their understanding of photosynthesis and cellular respiration may include carbon dioxide and oxygen as resources that organisms need. Students could be challenged to think about whether these gases are resources that are usually in limited supply (and hence whether organisms need to compete for them), and to suggest some conditions under which these could be limited (e.g. high altitude).

Students’ concept maps could include many specific features, adaptations and behaviours that could help an organism to compete for a resource. If these are focussed mainly on strength and athleticism, this could be evidence that students believe competition only relates to fighting or racing for resources, or that the term “fittest” (as in “survival of the fittest”) only refers to the most athletic or strongest individuals rather than to the individuals best adapted to compete and survive to reproduce in their environment. Other things they could mention include, for example:

* shape/size of beaks, teeth, claws etc.
* shape/size/positioning of leaves and flowers
* positioning and effectiveness of sense organs for sight/hearing/smell
* colourations and camouflage
* venom
* …and many others!

**Acknowledgments**

Developed by Alistair Moore (UYSEG).

**References**

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