WOW Lab
Science Education R&D

a WOW Lab
BLUEPRINT
Selection in Action

Inquiry Approaches

Initial Inquiry

Attempt to define the term "species". Are there any problems that might occur when trying to classify populations?

A species is a group of animals that can reproduce with each other, which will result in offspring that will be able to reproduce. Students may note the differences between populations of plants and animals. Mention some of the difficulties with the biological species concept and explain that boundaries between populations may not always be so cut and dry.

Are humans a species? Has our lineage changed over time?

Yes, humans are a species *(Homo sapiens)*. Students should understand that human evolution is best represented by a tree rather than a line—despite what classic images of chimps progressing into an upright man indicate.

Do mutations play an important role in evolution? Why or why not?

Students may think mutations always cause defects in organisms; it is important to explain that mutations are not necessarily bad. It is helpful to engage students in a discussion on why mutations are so vital for evolution by means of natural selection; without these random, hereditary occurrences, there would be no genetic variation between individuals. Provide some examples of mutations within humans, such as the ability to digest milk and wheat products.

How do species change over time?

Species change over time by acquiring germline mutations and passing them on to their offspring.

Experimental Procedure Inquiry

Whose car survived Round One? Can you think of any reasons why these cars survived?

Valid responses are numerous and may mention the size or shape of the cars.

How many "parent" cars had offspring that survived the second round? Are there any characteristics that may have increased the chances of cars surviving?

Inherited traits (for example, the size of the wheels) may be suggested.

Are the cars a genetically diverse population? Why might it be important that each individual is slightly different? What would happen if all the cars were the exact same size and had to pass through the arch obstacle, but they all happened to be too large?

Yes, the cars are a genetically diverse population. Students will provide examples of how all the cars are different. Genetic diversity is very important because if there is environmental change, at least some of the individuals are likely to possess traits that enable them to survive in the new environment. For example, if the arch was a "must pass" obstacle and all the cars were the same size and were too large, the population might face extinction.

What role did the environment (the obstacles) play in the survival of the cars?

Each individual lives in an environment and is subject to its pressures. If a car possesses traits that are beneficial in the particular environment, it will have a greater chance of surviving. Therefore, the environment is key for the survival of the cars.

Would more cars have survived if the environment stayed the same for Round Two?

It is likely that more cars would have survived. The cars from the previous generation possessed characteristics that were helpful for surviving in the environment and it was those traits that were passed on.

What else in addition to a change in the environment may have influenced the survival of the cars?

There is the element of chance or luck. For example, students may bring up surviving a natural disaster such as a tsunami, asteroid impact or hurricane.

Were the mutations helpful, harmful or neutral to the survival of the cars?

The answer to this question depends on many factors and will be different each time the activity is run.

In-Depth Inquiry

In the real world and in real environments, what obstacles might plants or animals face?

Some possible answers include predators, finding food and water, access to mates, climate change and other environmental pressures.

How can this activity be used to explain the difference between Darwin's theory of natural selection and Lamarck's theory of inheritance?

Lamarck would have said that individual cars could adapt to the environment (i.e. change their dimensions in order to pass through the arch) and then pass this trait on to offspring. Darwin would explain that some cars, by chance, will possess characteristics that are favourable to survival (i.e. some cars will already be small enough to fit through the arch). This trait will be selected, and these cars will be more likely to survive and pass on this trait to their offspring.

Why do offspring resemble their parents in many ways yet also possess different traits?

In sexually reproducing species, each offspring inherits a unique combination of genes from both parents. This results in variation among the population.