

Tooty Fruity Evolution

Teacher Notes



Background information

This activity emphasises the variety that exists within a species and how certain variable traits become more common by a process of natural selection.

The activity is based on the research carried out in the University Department of Plant Sciences by Dr Barrie Juniper http://www.valbourne.co.uk/apple_story

It was long thought that modern apple characteristics were developed by artificial selection of the attractive traits from crab apple like ancestors. However DNA studies were able to show that apples evolved into something that wouldn't look out of place in a supermarket without human intervention.

Apples evolved in northern China. Over about 12 million years many animals including brown bears fed on apples naturally found on wild trees. Unlike us, bears ate the whole fruit, including the seeds. Apple seeds passed through the gut of the bears without being broken down. The bears moved away from the fully-grown trees taking the seeds with them. When they did a poo the seeds started to grow into new apple trees. Seeds that were scattered far away from fully-grown trees had a better chance of growing, surviving and producing fruit.

Bears spent more time feeding on trees with the largest and sweetest fruit. Seeds from large sweet fruit were scattered more successfully than seeds from small bitter fruit. Seeds from fruit carrying these traits developed in trees that produced fruit with similar traits. Fruit evolved to become apples we would recognise today.

Activity 1: The Apple Contest

This activity emphasises the variety that exists within a species and how variable traits affect seed dispersal by animals.

Choose four apple varieties that vary in size and colour. One apple of each variety will be enough for a group of six students. Chop the apple in half so that students can see the size and colour clearly and chop the remaining half for tasting.

Students test 4 varieties of apple and rate each one for sweetness, colour and size. Students choose a winning apple. Students might choose the apple with the highest overall score.

It's an interesting and important point to make that not all the factors are equally important. They might choose the one with the sweetest flavour even though it's smaller than the others.

Students think about the following questions:

How is each feature tested important for the dispersal of seeds by animals?

Animals spend more time feeding on the sweetest apples dispersing more seeds.

Red apples are more conspicuous than green apples and easier for animals to spot.

Some animals might eat the largest fruit first.

Why do you think there are lots of different types of apples?

There are lots of different animals that feed on apples and different traits are more attractive to different types of animal in the same way that people prefer different apples.



Activity 2: Tooty Fruity Top Trumps

All of the features tested are important features for seed dispersal.

Sweetness: Animals often choose the sweetest fruit.

Colour: Red fruits are seen more easily than green fruits

Size: Animals often choose the largest fruit.

Number of fruit per tree: Each fruit contains a certain number of seeds. If a tree produces lots of individual fruit it will produce lots of seeds.

Top trump cards rate features of different apple varieties. Students play the top trumps game.

Students then think about the following questions:

Which are the best cards in the pack?

Likely choices include King Henry and Sweet Sarah as they have high overall scores. Students could work out the highest yield by multiplying average number of fruit per tree and average size of fruit.

What do you notice about the size and number of fruit?

Students might be able to explain why it's not possible to have lots of large fruit. Students might be able to appreciate that there is a trade off between features and constraints limiting certain combinations.

If apples grew in an environment where there were lots of apple trees but not many bears, which would be the best cards in the pack?

Students might pick out varieties with the largest, sweetest or reddest fruit such as King Henry, Autumn Gem and Mars Mellow because they are more likely to be eaten when there are lots of fruit to choose from.

If apples grew in an environment where there were lots of bears but not many apple trees, which would be the best cards in the pack?

Students might choose the card with the highest number of small fruit. If fruit are small, trees can produce lots of them and therefore more seeds. (Each apple will have the same number of seeds regardless of size.) Because there is more competition between bears they have to be less fussy to survive. Sim's Wonder, Harry's Pride, Silver Sparkle and Sweet Sarah might be the best choices in these circumstances.

Can you think of any other things that might affect your choice of the best card?

Different animals see colour in different ways. Other animals that eat apples might have a preference for different colour. If a different animal came along that was very good at seeing purple, would we have ended up with purple apples? This is unlikely as natural selection can only work on existing traits.

Students revisit the question; why are there lots of different types of apple?

They have evolved in lots of slightly different environments.

Different animals select different features.

Humans choose the features they prefer and people have different preferences.

Activity 3: Plant the apple seeds from your different apple varieties and see which ones grow best?

Get students to think about other features that might help an apple tree to survive, such as how quickly the seeds germinate and the speed at which seedlings grow.

