Evolution – Evolution by natural selection

**Key Aims of Session:**

* All living things we see today have evolved over time and generations.
* Science explains how nature works. Scientific ideas can be tested by gathering observable evidence and by doing experiments. Scientific enquiry is a robust form of enquiry but it cannot tackle every kind of question.
* Religious creation stories explain that God created the universe. Evolution does not attempt to explain this. Evolution is the process of a change in features in a population over time.
* Natural selection is a mechanism (or driving force) behind the process of evolution. It acts on the variation in traits or features within a population. Over generations, successful traits become more prevalent in the population. These changes in how predominant the features are in a population over generations are evolution.

**National Curriculum Links**

Key Stage 2 (Primary)

* Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.
* Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

**Learning objectives:**

* Be aware that all life has evolved from a common ancestor (See poster)
* Understand that research on evolution is on-going today
* Understand that all life has evolved and is evolving today over generations
* Understand that the theory of evolution is robust because it is supported by many observations and facts

**Differentiated outcomes:**

ALL: Identify adaptations of certain living things. Know that all living things have evolved.

MOST: Will be able to explain how certain adaptations help a living thing to survive in its natural environment e.g. large strong beak to eat hard seeds. All living things have and are still evolving.

SOME: Explain that in the case of the Galapagos finches, different beak shapes evolved which specialise on different types of food, and be able to explain why some beaks are better than others at getting these food types. All living things are related and have evolved from a common ancestor or ancient relative. Evolution can occur as a result of natural selection.

**Lesson in context/prior learning:**

This unit investigates the ways in which all living things have and are evolving based on the pressures in their environment. Pupils will be asked to consider the idea that all life originates from the same ancient ancestor – all life, if you go back in time far enough, is all related.

Students will consider the idea that there are some questions that scientists are still figuring out about evolution. For example the evolutionary pressure behind the giraffe’s long neck.

The session looks at all life on earth and the process of natural selection acting upon variation within populations, which leads to evolution over generations. It also delves into how scientists today are still investigating cases of evolution. The focus on the webpage is to understand how the process of evolution occurs and understand the conditions for this to happen by natural selection.

The key idea for students is that all life on earth has and is still evolving. This process happens to a population or species over generations, rather than at the level of the individual.

Explain that living things are suited to their environment. Specific traits/characteristics help living things within their specific environment. During Darwin’s voyage on the Beagle he came across the Galapagos finches and realised that different islands had birds that had different evolutionary adaptations to suit the resources on that island. He came up with the idea that all the finches on th island originated from one species of finch that had evolved on the island. Here the children will be using tools to symbolise the bird-beaks to pick up different items that represent the food on the island.

**Resources:**

(For a class of 30 students – 10 groups of three for each beak type):

* 10 pairs of tweezers
* 10 spoons
* 10 straws
* 10 paper plates
* 30 cups
* 10 bags of rice, maltesers, marshmallows
* 15 bags of rice (drought scenario)
* 15 bags of marbles (drought scenario)

**Session Plan:**

(What the children (and teacher!) need to know before they start this lesson)

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Purpose | Timing | Summary |
| Learning orientation | Introduce the lesson and key definition of evolution | 5 minutes | Explain what we will be learning about, ask children to think-pair-share the definition of evolution. Explain that ideas of how evolution occurs change, but biologists do not disagree on that evolution happens. An example of how evolution occurs is by natural selection. The way we will learn about this is by looking at Darwin. |
| Examination of evolutionary tree poster | Give children the notion that all life is related as a result of evolution. Evolution does not explain the start of life, only how features of populations can change over time. | 5 minutes | Ask the children to examine the evolutionary tree poster. Explain that all life on Earth has a common ancestor or ancient relative. This is a result of evolution, where living things evolve as a result of their features changing over generations due to some individuals having a better fit with their environment and passing on these features to their , unsuccessful individuals do not. Explain that the theory of evolution does not look at how life started. It looks at explaining how living things change in features over time. |
| Whole class talk | Introduce Darwin and his ideas and how he came up with them on his voyage on the Beagle | 5 mintues | Explain that Charles Darwin was a Naturalist who wrote a book on his ideas of evolution by natural selection. He came up with these ideas on his voyage around the world on the beagle. He visited the Galapagos Islands and notices finches that had variations of beak shapes that were adapted t different types of food available on the island. He hypothesised that they all originated from one type of finch and these over time evolved in response to the food types available in the environment |
| Main activity | To re-inforce the idea of evolution by natural selection and how adaptations are specialised to their environment. Different beaks are better at getting certain foods. | 10 minutes | Following the lesson activity plan, give children groups and different beak types to see how different beak shapes are better at getting certain foods. Then change the ‘environment’ of the plate so only one food type is left. They will see one beak is better than the others at getting this food type. Over time only these beaks would be in the population. Over generations this leads to evolution. |
| Explaining Natural Selection | To explain and give understanding of how evolution can occur, by relating scientific framework of evolution by natural selection to the main activity just carried out. | 10 minutes | Explaining the framework of evolution by natural selection:1. Individuals in a population show variation.
2. In certain conditions, some pre-existing variations are favourable.
3. Individuals with those variations are reproductively more successful
4. Those variations become more frequent in the population
5. Over many generations the population evolves
6. As conditions change, other pre-existing variations are favoured
 |
| Mini-plenary | To check understanding | 5 minutes | Each group to feedback to class. Teacher to address any misinterpretation of the process of evolution by natural selection related to the activity or any other examples. |
| Main plenary | Children need to understand how living things are suited to their environment. They need to know that offspring are similar but not identical to their parents. The features that make parents successful are likely to do the same for offspring and this can lead to evolution over generations. | 5 minutes | Teacher – Talk to class about how all life is related as all things we see today have evolved from an ancient relative billions of years ago. Show the poster on the evolutionary tree of life and explain what the branches mean and what branches closer to the origin mean compared to branches further away. Talk about Darwin and his voyage and his theory of evolution. Hand out resources for bird beak investigation and gives the activity meaning by relating it to the Galapagos finches.Children – Ask children questions on what they learnt from the poster, as well as the theory of evolution and natural selection. Through the activity they will learn how adaptations are suited to their environment and how variation in a population can lead to evolution. |

**Plenary:** Conclude to the class that different beak shapes have evolved and are better suited to certain environments than others. On islands that have a lot of hard food types and not many small food types would favour a large strong beak, thus you would expect to find more birds with this type of beak. Give children certain scenarios and ask which beak fits. Ask how birds have certain beak shapes i.e. have evolved over time by natural selection making the beak shape prevalent. Explain that this has happened with finches on the Galapagos Islands, and Charles Darwin observed these relationships in many of the living things he saw!

Bird Beak Investigation Outline

Bird-beak activity. Using the materials outlined below, children will be divided into groups of 3 (or one child for each beak type – you can design more beaks!). Children will use their beaks (only the hand holding the ‘beak’ can be used to pick up food) to pick up as many items of food they can from the plate of food types and place them into their individual cups. After 30 seconds (the aim is to stop them before they have exhausted all the food on the plate) the children have to record how many pieces of food, what type of food and what type of beak they have used. Bring the whole class’ data together and work out which beaks were best at collecting which foods. Each group will have the same beak, then you can compare beak shapes to show that some foods are easier to handle.

The second part of the test requires the bags of only one food type. Explain to the students that the birds are separated on two islands (with one group of each beak type on each island). There has been a drought and most of the food types have died. The single food type still on the islands is different to each other. Half the groups have rice, the other have the marbles. Repeat the 30 seconds and see which birds survived the drought best on each island.

**Resources:**

(For a class of 30 students – 10 groups of three for each beak type):

* 10 pairs of tweezers
* 10 spoons
* 10 straws
* 10 paper plates
* 30 cups
* 10 bags of rice, maltesers, marshmallows
* 15 bags of rice (drought scenario)
* 15 bags of marbles (drought scenario)