DNAScope – Decode DNA traces and discover animals!

Background for parents or teachers

Every living being, every animal and every plant contains DNA. DNA is like a book, written with only four letters: G, A, C, T. This book is the blueprint for every organism. The text in the book is the order of DNA letters, also called DNA sequence. It is unique for every organism. Many different DNA sequences of plants and animals have already been identified.

DNA can be found in every cell. This means it is present in every leaf, every hair and even in excrements of animals. In the laboratory, we can extract traces of this DNA from the soil or even from water. Scientists use this 'environmental DNA' to find out which animals and plants live in a certain place without ever having seen them.

DNAScope includes two versions of a game. Both provide knowledge about these connections for children from primary school age. The more the activity is packed into a story, the more fun it is. Maybe you and your children can think of another game variant!

Learning objectives

- DNA is present everywhere in our environment. It can also be found in soil, water or excrements.
- Every organism has a unique DNA sequence.
- One part of a DNA sequence can belong to several species.
- By comparing newly found DNA sequences with already known sequences using a computer, DNA traces can be assigned to certain species.

Preparation and materials:

Required materials: printer, pieces of paper, scissors, and internet access

The puzzle pieces are printed and cut out. There are 9 pieces in total, 3 of which have the same shape.

Game version 1 – Which animals live in the zoo?

For 1 to 3 players aged 6 years and older.

The zoo is closed due to the Corona virus, but near the entrance, there is a big manure heap of the excrements of all the animals that live at the zoo. We reach through the fence to take a small sample and examine the DNA contained in it at home.

Goal: Find out which animals live in the zoo. Can you identify all of them?

1. Sequencing DNA

- ⊠ Sequencing DNA means determining the order of DNA letters. In the laboratory, this is done by a machine. Here, the players are the machine—dthe sequencers.

The first player draws 3 puzzle pieces of different shapes and assembles the puzzle. The result is a sequence of 9 letters.

2. Assigning the DNA sequence

- ⊠ We know the DNA sequence of thousands of different species. To assign found DNA sequences to an animal or a plant, there are large databases on the internet that store known sequences. Efficient computer programs then find out which species the sequence matches.

Our search engine is DNAScope: https://scopeseducation.org/dnascope_en

Enter the found sequence in DNAScope. Click "Search Sequence" to identify which animal it belongs to. If an animal is found, the player writes it down on a list. The puzzle pieces are put back to the other pieces and shuffled for the next round.

Now it is the turn of the next player to match and sequence the pieces of DNA. Will it be a new sequence, or is it an already known one? Which and how many animals can you find? And are there DNA traces of other creatures than zoo animals?

For further thinking: How come there are so many different animals when there are only nine DNA puzzle pieces?

Game version 2 - DNA Safari

For 1 to 3 players aged 6 years and older

We are on a safari in a national park, but the shy animals are hiding from us. However, when we crawl through bushes, climb trees and search near waters, lots of animal traces can be found: a hair, a feather, a pile of excrements, or even a bone. They all contain DNA and reveal which animals live in the national park.

Goal: Find out which animals live in the park!

1. Hide and seek – DNA version

A player draws 3 puzzle pieces with different shapes and hides them at *one* place. For example, under a cushion, in a pot, or if you can go outside, maybe under a stone. The player does the same with another 3 matching puzzle pieces as well as with the remaining 3.

Now, all the other players search for the DNA traces together.

2. Sequence and assign DNA

- ☒ Sequencing DNA means to determine the order of DNA letters. In the laboratory, this is done by a machine. Here, the players are the machine—the sequencers.

After finding the 3 puzzles, put each of them together.

- ☒ We know the DNA sequence of thousands of different species. To assign found DNA sequences to an animal or a plant, there are large databases on the internet that store known sequences. Efficient computer programs then find out which species the sequence matches.

Our search engine is DNAScope: https://scopeseducation.org/dnascope_en

Enter the found sequence in DNAScope. Click "Search Sequence" to identify the animal it belongs to. Which three animals do you find?

In the next round, roles are swapped. The cards are shuffled, and another player hides three DNA traces, each at a certain spot. The remaining players find out which animals they belong to. Some traces were not from animals at all. Can you find them?

For further thinking: How come there are so many different animals when there are only nine DNA puzzle pieces?