

KS4 Tree of life

Challenge summary

How are the world's plants and fungi related to each other and how have they evolved over time? Carl Linnaeus's original system of classification grouped organisms by physical characteristic. Since then, advances in technology mean scientists can now classify plants by their DNA sequences. Kew's Plant and Fungal Trees of Life (PAFTOL) project is using DNA sequencing technology to help complete the evolutionary tree of life.

Your pupils' challenge is to construct an evolutionary tree for plants in their school grounds or nearby park/green space, then compare this with PAFTOL data.

Learning outcomes

- Understand the importance and applications of Kew's Plant and Fungal Trees of Life project
- Understand how the analysis of DNA sequence data has helped inform the modern classification system
- Understand that evidence for the modern theory of evolution by natural selection includes DNA sequence data
- Apply knowledge of sampling techniques to ensure a representative sample

KS4 specification links

Our KS4 Tree of life challenge is directly linked to the National Curriculum. View the various GCSE exam board specification links [here](#).

Scientific inquiry skills

Students will be developing their research, observation and data collection skills.

Prior knowledge

It would be useful for students to have prior experience of: DNA and genetics; planning and carrying out an investigation.

Resources

All resources and supporting information can be found in the "Resources" tab of the Endeavour platform, unless specified.

Key vocabulary

Classification, genetics, genome, DNA, evolutionary tree, fieldwork, sampling, methodology

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Part One: Introduction – Watch and learn (5 minutes)

Introduce the challenge to your class by playing the Tree of life ‘Watch and learn’ video with your class. When there is a question, pause the video for pupils to discuss and feed back.

Introduction – Odd one out (10-15 minutes)

This introductory activity invites pupils to choose the odd one out (the one that is not as closely related) from a selection of three images of plants.

You can do this activity in groups by printing the cards. We recommend 3 pupils and one set of cards per group. As a whole class approach, display the cards on the whiteboard. There is a teacher’s answer sheet for you to use.

The Taxonomy resource can be shared with pupils. They can read it for information and as part of their research.

Part Two: The challenge (3-4 hours)

Kew’s Endeavour challenges are open-ended to encourage pupils to design and carry out their own investigations. Pupils can use the “Indicator species guide” and “Sampling strategies” resources to assist them with the challenge.

Pupils will need to:

- Design a method for sampling an area
- Look for the indicator species provided
- Photograph or draw the species
- Decide on a system of classification based on physical characteristics: What do the plants look like? Can they be grouped by similarities or differences in appearance?
- Construct an evolutionary tree for these plants using the drawing/photographs and their classification system
- Use the PAFTOL project’s sequence data resource to find out how closely the plants are related genetically and construct a new tree based on their DNA
- Compare their two trees; how similar or different are they?
- Write up their findings along with their ideas on why this work is important – why would we need to know how different plants are related to each other?

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Completing the challenge

Pupils can complete the challenge alone or in groups. They can work on the challenge in class, or as a homework activity. The “Useful links” can be used as research or for inspiration.

Success criteria

Pupils will need to submit a report of their investigation. This can be in a format of their choice, including a poster, Prezi or Vlog. It must include the following elements: rationale, introduction, method, results, conclusion, evaluation and importance of PAFTOL

The report will be judged on:

- Accuracy of data
- Quality of design and presentation
- Quality of writing

Assessment opportunities

You can use the success criteria as a way for your pupils to self and peer assess their work. Throughout the challenge you could use strategic questioning to assess pupils' learning.

Judging the challenge

Only one entry can be submitted per school so you may wish to hold a judging panel to determine which entry will represent your school in the competition. You can upload your pupils' challenge-related work to the Endeavour platform.

Certificates

In the “Additional resources” page you will find downloadable certificate templates to fill in and award to pupils or classes who have completed Endeavour challenges.

Evaluation

Once you have finished a challenge with your class, please complete the post challenge evaluation form, which can be found under the “Getting started” tab.