**ACTIVITY: DIY fern classification**

**Activity idea**

In this activity, students use fern specimens or image cards to group species of ferns according to their physical structures (rhizomes, fronds and sporangia).

The purpose is to encourage students to look more closely at fern structures and to introduce them to methods of classification.

By the end of this activity, students should be able to:

* name and describe the structures of ferns
* explain what general classification is and why it is important
* experience devising and revising their own classification system
* better understand why scientists do not always agree and why species may be reclassified as new information comes to light.

[Introduction/background notes](#intro)

[What you need](#need)

[What to do](#do)

[Discussion questions](#questions)

[Extension ideas](#extension)

[Image cards](#cards)

**Introduction/background**

Scientists use classification to identify organisms and to show how organisms are related to each other. Organisms are grouped by their characteristics. Botanists rely on the morphological characteristics (the form and structure of a plant) to classify ferns. Reproductive structures are particularly important for classifying ferns.

More recent technologies such as the scanning electron microscope helped botanists use spore shape and size for classification purposes. Similarly, DNA analysis is now allowing scientists to look for similarity at the molecular level. New information either confirms what botanists already knew or helps them to revise their classification of ferns.

This activity encourages students to take a closer look at the physical structures of ferns and to devise their own system for classifying ferns.

**What you need**

* Fern fronds – either a selection of fronds harvested from the school grounds, brought from home or the fern fronds used in the [Traditional fern collections](https://www.sciencelearn.org.nz/resources/1409-traditional-fern-collections) and/or [Alternative fern collections activities](https://www.sciencelearn.org.nz/resources/1410-alternative-fern-collections). Laminated fern fronds are particularly useful. It is helpful if the fronds are fertile (bearing spores). If actual specimens are unavailable, use the image cards provided.
* Access to the video [Parts of a fern](https://www.sciencelearn.org.nz/videos/598-parts-of-a-fern)
* Copies of the [image cards](#cards)
* Access to the video [Fern adaptations](https://www.sciencelearn.org.nz/videos/706-fern-adaptations)

**What to do**

1. Begin by watching the video clip [Parts of a fern](https://www.sciencelearn.org.nz/videos/598-parts-of-a-fern) in which Pat Brownsey describes the 3 physical structures of ferns: rhizomes, fronds and sporangia.
2. If possible, go for a walk around school and collect fern fronds. Observe their habitats, distribution, etc. Otherwise, pass around fern specimens and/or fern [image cards](#cards).
3. Structure the activity according to the needs of your students. Older, more capable students may be able to start the activity right away. For those students needing more direction, discuss the 3 structures and how they differ among ferns. Rhizomes are a good place to start because most students will be familiar with the vertical rhizomes of tree ferns as compared to the rhizomes of creeping ferns (thread fern) or those with short, erect rhizomes (crown fern). Discuss why there are variations among rhizomes. (For example, a vertical rhizome allows fern trees to grow tall, an advantage when competing for sunlight. Creeping rhizomes help ferns like the thread fern grow higher up into the lighter part of the forest habitat.)
4. Discuss fronds. They vary by shape; some are round or kidney shaped, others are triangular. The fronds can be simple (leather-leaf fern), lobed (hound’s tongue fern), once divided (gully fern) or divided more than once (hen and chickens fern). Some fronds have adaptations to help them survive in difficult conditions: leather-leaf ferns are fleshy and have hairs to protect from water loss; kidney ferns are able to curl up in dry weather, expanding again when conditions are moist. Discuss frond size: why do tree ferns have such large fronds as compared to most creeping and tufted ferns? Why does the thread fern have short fronds along the ground but the climbing fronds grow to 70 cm?
5. Discuss sori patterns. The sporangia are combined into small clusters called sori. Sori can be oval (lance fern), round (silver fern, hound’s tongue), oblong (hen and chickens fern) or elongated (shining spleenwort) and are either marginal (on the edge of the pinna like the king fern) or dorsal (away from the pinna edge like the rasp fern). Discuss why sori pattern and placement might differ between ferns. (As spores are transported by wind, placement may affect distribution.)
6. Working in small groups, students use the actual fern specimens or image cards to group the ferns according to a structural characteristic. There is no right or wrong way to do this but the group must agree on the choices they make and be able to justify these criteria to their class.
7. When the students have finished classifying the ferns, they need to name each group and record their selection criteria.
8. If time permits, each group can report back to the class, justifying their groups and selection criteria.

**Discussion questions**

* After viewing the classification systems other groups have used, would your group make any changes to the way you grouped your ferns?
* New Zealand is awash with books identifying and classifying ferns; information on fern structures is readily available. Why did your teacher ask you to group and classify ferns? What is the value of an exercise such as this?
* How do advances in microscopy and DNA analysis change the nature of classification?
* Why is it important to know about fern classification?

**Extension ideas**

One aspect of the nature of science is that, as new information comes to light, scientists need to consider how this information affects their current theories, for example, molecular DNA analysis has lead to a revised classification of extant ferns. Place your students in a similar situation by giving them new information.

Watch the video clip [Fern adaptations](https://www.sciencelearn.org.nz/videos/706-fern-adaptations). This video features images of the thread fern, king fern, filmy ferns, leather-leaf fern, silver fern and whekī tree fern among others. These ferns have adaptations that give them an advantage – either access to light or protection during periodic dry conditions. Challenge your students to fit these ferns into their existing classification system. Are they able to do this, or do they need to redesign their systems now that they have new information?

Introduce your students to the Latin names for family, genus and species for some of their ferns. Ask your students to work out what the names mean in English. Can they see the relationship between the name and the fern characteristics? Can they match up the species names to the fronds/images they have?

**Image cards** 