**ACTIVITY: Growing new plants without seeds**

**Activity idea**

In this activity, students learn how to grow plants from spores, bulbils rhizomes, stolons, tubers or cuttings.

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

* discuss one way of growing a new plant without using seeds
* experience one of the following: how to locate spores on a fern frond; how to locate and plant a plantlet growing as a bulbil, from a rhizome or from a stolon; how to divide a tuber or how to make a cutting.

[Introduction/background notes](#Introduction)

[What you need](#need)

[What to do](#Do)

**Introduction/background**

Not all plants come from seeds. Ferns grow from dust-like spores. Some plants reproduce sexually (by seeds) as well as asexually through vegetative reproduction – via side stems called stolons or underground stems called rhizomes. Tubers and bulbs grow underground and can be split to make more plants. We also grow new plants by taking cuttings from a parent plant or by grafting – inserting the tissue of one plant into another.

This activity outlines several methods for growing new plants without having to plant seeds. Some methods take a few minutes to complete. Others, like growing ferns from spores, need several weeks.

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| SSS-TEA_ACT_06_GrowingNewPlantsWithoutSeeds_FernSpores | SSS-TEA_ACT_06_GrowingNewPlantsWithoutSeeds_Bulbils | SSS-TEA_ACT_06_GrowingNewPlantsWithoutSeeds_Rhizomes |
| **Spores:** found on the underside of some fern fronds. Ferns grow from these dust-like spores. | **Bulbils:** found on the upper side of some fern fronds (for example, the hen and chickens fern) and can grow into new plants.  | **Rhizomes:** root-like stems that usually send roots into the soil and a shoot upwards to form a new plant.  |
| SSS_TEA_ACT_06_GrowingNewPlantsWithoutSeeds_stolon | SSS_TEA_ACT_06_GrowingNewPlantsWithoutSeeds_kumara_tuber | SSS_TEA_ACT_06_GrowingNewPlantsWithoutSeeds_Cutting |
| **Stolons:** special plant stems that grow out sideways along the surface of the ground. New plants grow up along it or just at the end.  | **Tubers:** Thick underground stems that store food so a plant can lie dormant over winter. It can produce new plants when split. | **Cuttings:** pieces of root, stem or leaf, cut from a plant and used to make a new plant.  |

**What you need**

* Fertile fern fronds (frond bearing spores)
* Magnifying glass
* Sheets of white paper
* Clean, sterile plastic pot (see below for how to sterilise)
* Sterile potting or seed raising mix (see below for how to sterilise)
* Sealable plastic bag large enough to hold the plastic pot
* Bulbils (e.g. from hen and chickens fern)
* Rhizomes (e.g. from New Zealand native iris *Libertia* sp.)
* Stolons (e.g from strawberry plants)
* Tubers (e.g. potatoes or kumara)
* Cuttings (e.g. from geranium or hebe)
* Spade or knife
* Potting or seed raising mix
* Plant trays/pots
* Rooting hormone powder or gel

**What to do**

[Growing ferns from spores](#spores)

[Growing ferns from bulbils](#bulbils)

[Growing plants from rhizomes](#rhizomes)

[Growing plants from stolons](#stolons)

[Growing plants from tubers](#tubers)

[Growing plants from cuttings](#cuttings)

***Growing ferns from spores***

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| 1. Gather fern fronds that are producing spores. Various species produce spores at different times of the year.
2. Look on the underside of the fronds. If you use a magnifying glass, you’ll see that fully ripe sporangia look like shiny, round balls or clusters.
3. Choose a frond in which a few of the sporangia have burst open. The rest of the sporangia should be intact and shiny.
 | SSS-TEA_ACT_06_GrowingNewPlantsWithoutSeeds_SporesLargerSize |
| 1. In a warm, dry, draught-free area, lay the frond on a piece of white paper, spore side down, and leave it to dry overnight. When you lift the frond the next morning, there should be a brown spore print on the paper (see photo.) If there is no print or it is very faint, the frond was collected either too early or too late in the season. Try again with a different plant/species.
2. Sterilise the plastic pot by immersing in boiling water.
3. Place the potting mix in the sterilised pot and pour boiling water through the soil to sterilise it. Allow the soil to cool.
4. Gently pour the spores from one sheet of paper to another. The heavier chaff (fragments from the sporangium) will separate from the lighter spores. Tap the remaining spores over the soil. A light dusting of spores is sufficient.
 | SSS-TEA_ACT_06_GrowingNewPlants_SporePrint |
| 1. Pour a little water into a sealable bag, add the pot, and seal.
2. Seal the bag to keep moisture in and to keep mould spores out (see photo).
3. For the spores to germinate, they need 100% humidity, warmth and light. Place the pots in a warm, light area and leave them for a few weeks.
 | SSS-TEA_ACT_06_GrowingNewPlants_PlasticBag |
| 1. After a few weeks, a green layer of fuzz should form on the soil (see photo). These are tiny prothalli – the small, heart-shaped gametophytes. Once fertilisation occurs, the first frond emerges from the underside of the gametophyte. The fern has moved into its sporophyte phase and will grow into the more recognisable fern. The fern still needs a warm, humid and light environment. Keep it in the plastic bag but only keep it partially sealed to allow some air circulation.
2. Small ferns can be pricked out and potted into sterilised soil. Be patient, though. It can take several months to reach this stage.
 | SSS-TEA_ACT_06_GrowingNewPlants_Germinating |

***Growing ferns from bulbils***

1. **Collect bulbils from the parent plant (see photo). Ensure part of the old frond is left attached.
2. Place the bulbils in a tray of soil. Keep the tray in a shaded, humid environment. Roots should form within a couple of weeks. Transfer the individual ferns to larger pots once good root systems develop.

***Growing plants from rhizomes***

1. This is best done with plants already established in or around your school environment. A common garden plant, the New Zealand native iris *Libertia* sp., is ideal. Other plants to use are irises, canna lilies or bamboo.
2. Locate a plant that reproduces via rhizomes. Look for any new plants growing around the parent plant. Use a sharp, clean spade or knife to dig out a new plant and remove it from the soil. Try to keep as much of the rhizome attached to the plant as possible.
3. Rinse the soil from the roots and rhizome. Point out the roots and the rhizome and discuss their purposes with the students.
4. Return the plant to the garden or plant it in a container.

***Growing plants from stolons***

1. This is best done with plants already established around your school environment. Strawberry plants are ideal.

1. Find a young plantlet and dig it from the soil. Try to keep as much of the stolon attached to the plant as possible.
2. Rinse the soil from the roots. Point out the roots and the stolon and discuss their purposes with the students.
3. Return the plant to the garden or plant it in a container.

***Growing plants from tubers***

1. Tubers are often divided into two groups: stem tubers and root tubers. Stem tubers produce shoots from buds – sometimes called eyes – from an underground stem. Root tubers produce their buds in a similar manner, but from the root of the plant. Potatoes are a common stem tuber. Kumara or dahlia flowers are examples of root tubers.
2. Collect potatoes or kumara that have sprouting buds. You can either leave the tubers in a dark, dry place to sprout further or prepare the tubers for planting. Divide the tuber into pieces, ensuring there is an eye on each piece. Both kumara and potatoes are frost tender, so in cold conditions, sprouts should be kept indoors. Both tubers make good container plants but note that some potatoes produce potentially poisonous green or white berries.
3. Dahlia tubers also bud, but these do not resemble eyes, like on a potato. Their appearance is more like ‘fingers’ growing off of the parent bulb. Divide the dahlia tuber as you would the kumara. They are best divided in the spring.

***Growing plants from cuttings***

1. A cutting uses the stem or branch of a plant. A rooting hormone powder or gel will speed up the root growing process. It’s available in plant centres and most grocery stores. Geranium and hebes are ideal plants to use.
2. Find a node (bud) on the stem of an actively growing plant. The stem should be 7–15 cm long. Cut the stem directly underneath the node. Remove some of the leaves and any flowers or flower buds. The plant’s energy needs to go into producing roots.
3. Dip the base of the cutting into water then into the rooting hormone.
4. Plant the cutting in a container with a mix of pumice and peat or other seed-growing medium that allows for both good drainage and water retention.
5. Keep the cutting in a warm, light area. You can make a type of glasshouse by placing the cutting in a plastic bag. Do not let the bag touch the leaves.
6. Check the cutting for root growth after a week or so. Once it has sufficient roots, plant it outside or in a bigger pot.