**Part 1: Learning outcomes plan**

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| **Main idea:**  Flowering plants reproduce via pollination and use animals or the wind to get pollen from one flower to another. | | **Science strand:**  Living World   * Ecology – recognise that living things are suited to their particular habitat. * Evolution – recognise that there are lots of different living things in the world and that they can be grouped in different ways. | | **Level:** 1–2  **Year:** 1–4 |
| **Overarching learning outcomes:**  In building understandings about pollination, students will integrate:   * understanding of how and why pollination occurs (scientific knowledge) * an investigation, via role play, into how animals and the wind transfer pollen (scientific practice) * understanding of why scientists use models to explain scientific principles (nature of science) | | | | |
| **Conceptual learning outcomes** | **Procedural learning outcomes** | | **Nature of science outcomes** | **Technical learning outcomes** |
| Students will understand that:   * flowering plants require pollination to bring male and female gametes together * plants cannot move so they need animals or wind to transfer pollen * plants attract birds and insects by colour, scent and reward * wind-pollinated flowers need to produce a lot of pollen. | Students will be able to:   * identify ways that flowering plants attract pollinators * identify flower or plant structures that aid pollinators * use specific content vocabulary where appropriate. | | Students will understand and appreciate that:   * scientists use models to explain scientific principles * scientists use scientific vocabulary to communicate effectively. | Students will be able to:   * construct simple models (finger puppets) to demonstrate pollination * write about pollination methods using content vocabulary. |
| **Assessment:**   * Completion of the student handout Pollination methods in the student activity [Pollination role-plays](https://www.sciencelearn.org.nz/resources/107-pollination-role-plays).   Cross-pollination art activity (optional). Students verbally explain or write about the features of their flowers and how they attract pollinators, the function of the flower parts and why the flowers need to be the same species. | | | | |

**Suggestions to consider while using the Pollination unit plan**

**Setting the scene**

Sometimes, students are not aware they are doing science. To counter this, consider beginning each science lesson by addressing the students as botanists. Botany is the branch of science that deals with plant life. Scientists who work in this field are called botanists.

**Linking new concepts**

Begin each new session with a recap of what was learned before. Explain how the new concept you are about to teach is linked to existing knowledge. For example, when introducing nectar and pollen rewards for insects and birds, connect this with prior learning about the need for plants to attract pollinators because they are unable to move around to find a mate.

Each time you use an image to initiate or discuss a concept, consider printing a colour copy of it. Add a caption detailing what you’ve learned/discussed. Create a wall display and add to the display as you progress through the lesson. This provides opportunities for students to see, read and process information and pick up the connections between the lessons.

**Planned interactions**

The planned interactions provided in the planner are brief. These are simply suggestions to begin a discussion. Use opportunities to ask questions and to explore the concepts in greater depth as the occasions arise. Make use of student knowledge and/or curiosity to broaden the interactions.

**Resources**

The science articles listed in the resource section are written for teachers, so read them beforehand for your own background information. Each article has links to related content – articles, video clips or teaching activities that provide additional information about the topic. Use these to broaden your knowledge and/or provide ideas for extension. (Look for the Related Content box on the right-hand side of every Science Learning Hub web page.)

Although the science articles are written for teachers, consider how you might use them with older/more capable students. Consider printing a portion of an article for use as a reading activity. Cut and paste the information into Word, changing the font and font size if appropriate. Create a couple of simple questions to answer or remove content vocabulary to create a cloze activity.

If using the video clips, preview them first. The videos often contain sophisticated language, so use your judgement about whether to play the entire video. With younger students, consider playing a portion of the video – starting times for these are included in the planner. An alternative is to use the transcript as a guide and provide your own simplified voiceover. In some cases, the video images themselves are more useful than the audio and may simply require a few words from you to emphasise what is happening on screen.

Pause the videos as needed to discuss a concept. If using an interactive whiteboard, use annotation tools to direct attention to or label a concept shown in the video. For example, circle the tūī’s beak and the surrounding flowers and discuss why the beak needs to be longer in order to obtain nectar from native flowers.

**Use of artefacts**

An artefact is a physical thing that students can handle. Consider establishing a botany table. Use it to hold appropriate library books, readers, digital tablets with related apps, colour images, seeds, flowers or other objects of interest to this unit. Encourage students to bring their own artefacts to provide a learning link between home and school.

**Adapting the unit plan**

This planner is in Word. Edit it to include additional learning outcomes, planned interactions, student activities or resources.

**Part 2: Lesson plan**

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| **Main idea:** | Flowering plants reproduce via pollination and use animals or the wind to get pollen from one flower to another. |

| **Subtasks** | | **Resources/focal artefacts** | **Planned interactions** | **Key student outcomes** |
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| **Meso tasks** | **Micro tasks** |
| 1. Introduce key terms:   * reproduction * anther * stigma * pollination | 1.1 Establish that most living things reproduce via a male and a female. | * Image of a baby or kitten sourced from the internet. | * Introduce the term ‘reproduction’. Show the image of a baby or kitten and discuss how each began with a female and a male (mother and father). * Continue with other living organisms: male and female birds come together and lay an egg, etc. | * Students are introduced to specific scientific content vocabulary. * Students are aware the term ‘reproduction’ means making a new organism. * In general, most living things require a male and a female to reproduce. |
| 1.2 Plants reproduce by seeds. | * Image > [From kōwhai flower to fruit](https://www.sciencelearn.org.nz/images/81-from-kowhai-flower-to-fruit) | * Ask how plants reproduce (via seeds). * Show image to students and get students’ ideas on the process from flower to seed. | * Students are aware that most plants produce and grow from seeds. |
| 1.3 The anther contains pollen – a male part of reproduction.  The stigma receives the pollen and is a female part of the flower. | * Image > [Flax flower with pollen](https://www.sciencelearn.org.nz/images/71-flax-flower-with-pollen) * Image > [Cutaway kōwhai](https://www.sciencelearn.org.nz/images/72-cutaway-kowhai) | * Show the flax flower image. Point out the pollen on the end of the anther. * Show the kōwhai image. * Briefly discuss that flowers have male and female parts. | * Students know that flowers have male features that produce pollen and female features that receive the pollen and produce seeds. |
| 1.4 Pollination involves the transfer of pollen grains from the anther to the female part of the plant. | * Image > [Flax flower with pollen](https://www.sciencelearn.org.nz/images/71-flax-flower-with-pollen) * Image > [Cutaway kōwhai](https://www.sciencelearn.org.nz/images/72-cutaway-kowhai) | * Explain that, just as a male and female cat come together to make kittens, pollen has to go from the anther to the stigma. | * Students learn that the term ‘pollination’ means the transfer (movement) of pollen and that this step is essential for flowers to make seeds. |

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| **Meso tasks** | **Micro tasks** |
| 2. Plants cannot move so they use pollinators (animals or the wind) to get male and female parts to each other – the pollen to the stigma. | 2.1 Establish that flowering plants need help with pollination. | **Teacher reference:**   * Article> [Methods of pollination](https://www.sciencelearn.org.nz/resources/102-methods-of-pollination) | * Discuss how animals or humans come together to make new animal or human babies. * Ask students how they think male and female plant parts come together. | * Students learn that flowering plants cannot move so they need help with reproduction. |
| 2.2 Insects and birds help to pollinate flowers in New Zealand. | * Image > [Honey bee on a flower](https://www.sciencelearn.org.nz/images/83-honey-bee-on-flower) * Image > [Tūī on flax flowers](https://www.sciencelearn.org.nz/images/74-tui-on-flax-flowers) * Video > [Bird pollination in New Zealand](https://www.sciencelearn.org.nz/videos/26-bird-pollination-in-new-zealand) | * View images and discuss the role of insects and birds. * If appropriate, watch the video. Consider watching without sound and explain what is happening: 0:38–0:54 shows insect pollination. 1:20–1:50 and 2:10–2:30 show bird pollination. | * Students learn that insects and birds transfer pollen from one flower to another. |
| 2.3 Wind is a means of pollination for some plants. | * Image > [Maize (sweet corn) flowers](https://www.sciencelearn.org.nz/images/96-maize-sweet-corn-flowers) | * View the image and discuss how wind helps to spread pollen. * Emphasise that wind-blown pollen can land anywhere. Plants that rely on wind pollination need to produce lots of pollen so some lands on the stigma (female part) of another plant. (so corn should be planted in groups rather than single rows). * Plants using wind do not need to have colourful or scented flowers to attract pollinators. * Ask if wind-blown pollen of one plant species can pollinate another wind-blown species i.e. can corn pollinate grass? (No. just as two cats create a kitten, pollen usually only works with a plant of its own type.) | * Students learn that the wind blows pollen from one flower to another. * These types of plants (like grasses and maize) do not need flowers to attract insects or birds. |

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| **Meso tasks** | **Micro tasks** |
| 3. Flowering plants attract pollinators. | 3.1 Flowers use a number of different ways to attract insects. | * Article > [Methods of pollination](https://www.sciencelearn.org.nz/resources/102-methods-of-pollination) * Image > [Iris landing stage](https://www.sciencelearn.org.nz/images/75-iris-landing-stage) | * View the image and discuss how flowers attract insects through colour, with guiding marks, through petal shape and with scent. | * Students list some of the ways in which flowers attract insects. |
| 3.2 Flowering plants use a number of ways to attract birds. | * Article > [Methods of pollination](https://www.sciencelearn.org.nz/resources/102-methods-of-pollination) * Image > [Tūī on flax flowers](https://www.sciencelearn.org.nz/images/74-tui-on-flax-flowers) | * View the image and discuss how flowering plants attract birds with easily seen large, colourful flowers and strong branches to hold the birds’ weight. | * Students list some of the ways in which flowers attract birds. |
| 3.3 Flowers often have special shapes to encourage pollen transfer. | * Image > [Honey bee on a flower](https://www.sciencelearn.org.nz/images/83-honey-bee-on-flower) * Image > [Tūī on flax flowers](https://www.sciencelearn.org.nz/images/74-tui-on-flax-flowers) * Video > [Bird pollination in New Zealand](https://www.sciencelearn.org.nz/videos/26-bird-pollination-in-new-zealand) * Thin paintbrush | * View the images. Point out how the flower shape or the arrangement of the stigma encourages the insects or birds to brush past the pollen/anther. * Watch the video from 1:17 onwards to learn how the birds’ beaks and tongues are shaped to gain the nectar and encourage pollination. * Discuss the meaning of the term ‘robust’. * Use the paintbrush to model a tūī’s tongue. | * Students learn how flowering plants encourage insect and bird pollination. |

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| **Meso tasks** | **Micro tasks** |
| 4. Insects and birds receive rewards of food from the plants | 4.1 Insects and birds are rewarded with food in the form of nectar or pollen. | * Video > [Plant pollination](https://www.sciencelearn.org.nz/videos/25-plant-pollination) | * View the video clip. With younger students, begin at 1:16 for excellent images of insects collecting nectar and pollen. * Discuss why insects and birds visit flowers and how this aids pollination. | * Students learn that insects and birds receive food rewards when visiting flowers. * Pollen from the plant brushes on their bodies and the animals transfer the pollen when they move to another flower. |
| 5. Student activity: Pollination role plays. | 5.1 Students make puppets to model the ways in which animals and wind pollinate plants. | * Refer to the list of materials needed in [Pollination role-plays](https://www.sciencelearn.org.nz/resources/107-pollination-role-plays) | * Students make finger puppets and model how insects and birds visit flowers, receive a food reward and transfer pollen. * Students model how wind spreads pollen. * Upon completion, discuss how the class used models (the artificial flowers, cornflour ‘pollen’, finger puppet animals and the fruit ‘nectar’) to represent pollination, pollinators and rewards. Why would scientists use a model instead of the real thing? (Because it would be too hard to have real insects and birds pollinating flowers in the classroom. These models demonstrate how the process might happen in real life.) | * Students recognise some of the characteristics flowers use to attract insects or birds. * Students identify a reward pollinators might receive from a flower. * Students identify one plant that uses wind as a pollinator. * Students begin to identify how and why students use models. |
| 5.2 Students use the Pollination methods student handout to record their ideas on the three pollination methods. | * Student handout Pollination methods (found at the end of [Pollination role-plays](https://www.sciencelearn.org.nz/resources/107-pollination-role-plays). | * Students use the images, word bank and knowledge they’ve gained to explain insect, bird and wind-assisted pollination.   Encourage students to use specific science content vocabulary where possible. | * Use this handout sheet as one means of student assessment regarding the process of pollination and use of scientific vocabulary. |

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| --- | --- | --- | --- | --- |
| **Meso tasks** | **Micro tasks** |
| 6. Student extension activity:  Cross-pollination paper mosaic art activity | 6.1 Students work in pairs to demonstrate that pollination only occurs between plants of the same species. | * Article > [Methods of pollination](https://www.sciencelearn.org.nz/resources/102-methods-of-pollination) * Coloured paper, scissors, glue, dye, crayons, images of flowers and insects.   MYS_UNT_Pollination_ChildsArtwork1  MYS_UNT_Pollination_ChildsArtwork2 | * Discuss how humans can only have human babies; cats can only have kittens etc. Plants can only reproduce with their own species. * Students work in pairs to create paper mosaic flowers that are nearly identical (same species). The flowers show the petals and a very basic representation of the anther and stigma/ovary reproductive features. * Students make paper mosaic insects for pollination. * They design a background for their flowers and insects using crayon and dye. | * Students recognise that pollination only occurs between plants of the same species. * Students demonstrate their understanding of how plants attract insects to encourage pollination. * Students demonstrate an understanding of the reproductive organs on a flower. |
| 6.2 Students verbally describe or write about the features of their flowers and how they attract pollinators, the basic function of the flower parts and why the flowers need to be the same species. | * Video or audio recording device (such as an iPad) if the students are using verbal explanation. * Writing materials if the students are recording their ideas on paper. | * Ask students to describe their artwork. They should explain:   + why the flowers are similar (same species)   + the ways by which the flowers attract pollinators (e.g. colour, landing stripes)   + how the pollen is transferred (their representation of the stigma/ovary reproductive features). | * This activity can be used as an assessment for the unit or as a means of sharing their science knowledge with others. |