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| **SCIENCE EDUCATION PLANNER: Butterflies** |
| **SCIENCE STRANDS:**Living WorldMaterial World | Physical World Plant Earth and Beyond | **MACRO TASK:** Become familiar with New Zealand’s butterflies, both native and introduced, and discover how students work as citizen scientists to tag and track monarch butterfly movements. | **LEVEL:** 1 2 3 4**YEAR:** 6–8**TEACHER:** Angela Schipper |
| **Nature of Science:** understanding, investigating, communicating and participating and contributing. |
| **STRANDS/AOs:** | * Recognise that there are life processes common to all living things and that these occur in different ways.
* Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced.
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| **KEY COMPETENCIES:** * Thinking – understanding New Zealand has both native and introduced butterflies, and they have similarities and differences in their life cycles.
* Language – using scientific language related to the butterfly life cycle; using vocabulary related to the monitoring and tagging of monarchs.
* Managing selves – working alone and together during activities and investigations.
* Relating to others – listening to others and sharing their scientific ideas and theories.
* Participating and contributing – becoming part of a national butterfly project and having the opportunity to lead the school in environmental initiatives.
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| **INTENDED LEARNING OUTCOMES:** The students will: |
| **Conceptual LOs** | **Procedural LOs** | **Nature of science** | **Technical LOs** |
| * Understand that New Zealand has both native and introduced butterflies.
* Understand that some native butterflies are rarely seen due to their habitats and/or human impacts.
* Understand that all butterflies go through metamorphosis but the process varies between species.
* Understand that tagging monarchs helps us learn more about their behaviour.
 | * Learn about native and introduced butterflies, their habitats and life cycles using Science Learning Hub resources.
* Observe life cycle similarities and differences by raising common butterfly species.
* Learn more about butterfly species in their area through transect walks.
* Take part in the national butterfly tagging project lead by the Monarch Butterfly NZ Trust.
 | * Understand that scientific knowledge is based upon evidence from observations of the natural world.
* Understand that citizen scientists contribute to investigations through observations and data collection.
* Understand that school students can be scientists provided they follow scientific procedures.
 | * View/gather information, discuss and record ideas.
* Investigate life cycles through hands-on activities and through the use of an interactive.
* Participate in the Monarch Butterfly NZ Trust transect and tagging programmes.
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| **MANAGEMENT/MATERIALS:****Resources:** [www.sciencelearn.org.nz/resources/503-butterflies](https://www.sciencelearn.org.nz/resources/503-butterflies), [www.monarch.org.nz/monarch](http://www.monarch.org.nz/monarch), <http://nzbutterfly.info>, [www.teara.govt.nz/en/butterflies-and-moths/4/1](http://www.teara.govt.nz/en/butterflies-and-moths/4/1)  |
| **ASSESSMENT ACTIVITY EXAMPLES:**Students draw and label the butterfly life cycle and compare this to the initial life cycle drawing. |

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| **SCIENCE: PLANNING FOR TEACHING AND LEARNING: Butterflies** |
| **MACRO TASK:** Become familiar with New Zealand’s butterflies, both native and introduced, and discover how students work as citizen scientists to tag and track monarch butterfly movements. |
| **Micro task** | **Resources** | **Planned****interactions** | **Intended learning****outcomes** | **Reflections** |
| **MESO TASK:** To find out what we already know about butterflies. |
| Discuss what students already know about butterflies and the butterfly life cycle. | * Paper to record ideas
 | * What butterflies do you recognise? Where do they go at night, in the winter? What are their life cycles?
* In pairs, students sketch the butterfly life cycle.
 | * Discover what knowledge students already have as well as any alternative conceptions.
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| Discuss what students would like to learn about butterfly science. | * Selection of library books on butterflies
* Paper to record questions/ideas
 | * Students look at books.
* What have you learned about New Zealand butterflies?
* Is there anything you would like to learn?
 | * Help students to see that, although there are numerous butterfly books, many feature overseas butterflies and may contain little actual science.
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| **MESO TASK:** To learn more about our native butterflies. |
| In some parts of New Zealand, our most common and most visual butterflies are the introduced white and the monarch.Almost all of the butterflies in New Zealand are native and most are endemic. | * [New Zealand butterfly families](https://www.sciencelearn.org.nz/embeds/94-new-zealand-butterfly-families) Slideshow
* [New Zealand native butterflies](https://www.sciencelearn.org.nz/embeds/56-new-zealand-native-butterflies) Slideshow
* Data projector/classroom computers/or printed and laminated colour slides from the slideshows
* Additional information and maps showing precise habitat locations [www.nzbutterfly.info](http://www.nzbutterfly.info/)
 | * How many butterflies can you name/have you seen?
* Do you think other parts of the country have the same types of butterflies as in our town/city?
* Use the New Zealand butterfly families Slideshow to show the butterflies we have in our country.

Show the New Zealand native butterflies Slideshow to learn more about the individual butterfly habitats and locations. | * Students will understand that we have native butterflies (just like we have native birds).
* Students will begin to see how habitat, camouflage and other characteristics influence how often we may see a native butterfly and why students may not be familiar with them.
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| To understand why we commonly see some butterfly species but not others. | * [Our elusive native butterflies](https://www.sciencelearn.org.nz/resources/505-our-elusive-native-butterflies) article for guided or individual reading
* Copies of the activity sheet [Questions about our elusive native butterflies](#elusive)
 | * Students discuss these questions, drawing upon the experiences of those who have lived in or visited other parts of New Zealand or other countries.
	+ Which butterflies have you seen?
	+ Why do you think we don’t see some butterfly species around school/home?
* Students read the article to find out why some of our native butterflies are not often seen.
 | * Students will understand that we don’t see many of our native butterflies due to the nature of the butterflies themselves and/or as a result of human impact.
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| **MESO TASK:** To learn more about butterfly life cycles. |
| Build on students’ prior understanding of the monarch’s life cycle. | * [Monarch butterflies](https://www.sciencelearn.org.nz/resources/511-monarch-butterflies) article
* [Monarch butterfly life cycle](https://www.sciencelearn.org.nz/image_maps/48-monarch-butterfly-life-cycle)
* Data projector
* Library books about monarchs
* Actual monarch egg/larvae/pupae specimens
 | * Review what students already know through previous observations. Highlight/record any scientific language they use.
* Use the Monarch butterfly life cycle interactive. View and discuss the images.
* Compare and contrast the language found in the books and in the interactive. Discuss why there might be discrepancies.
* If live specimens are available, observe the life cycle in the classroom.
 | * Students will gain a fuller understanding of the monarch life cycle and begin to use more specific and scientifically accurate vocabulary.
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| Examine the white butterfly’s life cycle to compare/contrast it with that of the monarch. | * [White butterflies](https://www.sciencelearn.org.nz/resources/696-white-butterflies) article
* [White butterfly life cycle](https://www.sciencelearn.org.nz/resources/701-white-butterfly-life-cycle) activity
* Actual white egg/larvae/pupae specimens
 | * Discuss whether students have seen white butterfly eggs or caterpillars in their gardens.
* Discuss whether the life cycle is the same as that of the more commonly observed monarch.
* Use the white butterfly article and activity to learn more about and observe how this life cycle is similar to but different from that of the monarch.
 | * Student will understand that, although metamorphosis follows a similar pattern, there is variation in larval food sources, the amount of time it takes to move from one stage to another, and egg, larvae and pupae characteristics.
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| Examine other butterfly life cycles to compare/contrast them with that of the monarch. | * More information about native butterfly life cycles [www.nzbutterfly.info](http://www.nzbutterfly.info)
* Red admiral’s life cycle [www.teara.govt.nz/en/butterflies-and-moths/4/1](http://www.teara.govt.nz/en/butterflies-and-moths/4/1)
 | * View photos/life cycles of other New Zealand butterflies or students can use information from the NZButterfly website to make their own native butterfly life cycle Slideshow presentations.
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| **MESO TASK:** To learn how some butterflies defend themselves with toxicity. |
| Explore the defence mechanisms some butterflies use to protect themselves. | * [Butterfly defence mechanisms](https://www.sciencelearn.org.nz/resources/507-butterfly-defence-mechanisms) article as a whole class discussion or individual/small group use
* Swan plant, images of stinging nettle
* Copies of the activity sheet [Questions about butterfly defence mechanisms](#mechanisms)
 | * This article can be used as a reading activity.
* Alternatively, the questions from the activity sheet can be the basis of a whole class discussion, using the article as a resource.
 | * Students will understand that some butterflies use the toxins from their larval food plants as a means of protection.
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| **MESO TASK:** To become actively involved in butterfly research by acting as citizen scientists.  |
| Learn how everyday people become citizen scientists.Citizen scientists collect data for research scientists to analyse. School students become actual scientists if they follow scientific procedures. | * [Citizen scientists](https://www.sciencelearn.org.nz/resources/512-citizen-scientists) article
* [Jacqui Knight](https://www.sciencelearn.org.nz/resources/698-jacqui-knight) article
* Learn more about the Monarch Butterfly New Zealand Trust (MBNZT)

[www.monarch.org.nz](http://www.monarch.org.nz)  | * Coloured ribbons/markers while on a bushwalk usually mark transects of some sort – possibly for monitoring, tracking or trapping. Ask if students have walked transects to gather information. What did they do with it?
* Discuss the article on Citizen scientists.
* Ask why the scientists don’t collect all of the data by themselves.
* Refer to the article on Jacqui Knight and her role as a citizen scientist. Students can see that much of her interest in butterflies came from a child’s question.
* Discuss the Monarch Butterfly NZ Trust.
* Alternatively, older students can read all 3 articles, and individually or in groups, explain how the articles are related.
* Discuss Jacqui’s quote: “*People are doing heaps for kauri, kiwi and kākāpō but nothing for endemic butterfly species, yet insects are crucial to the ecosystem.*”
 | Students will understand:* that citizen scientists help out real scientists in many ways
* the MBNZT works to help scientists answer questions about monarch butterfly habits and habitats
* even school students can be real scientists.
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| Collect butterfly data for the Monarch Butterfly NZ Trust. This can be done in two ways – through collection of transect data or by tagging monarchs to help with research about over-wintering habits. | * [Establishing butterfly transects](https://www.sciencelearn.org.nz/resources/699-establishing-butterfly-transects)
* [Tagging monarch butterflies for science](https://www.sciencelearn.org.nz/resources/700-tagging-monarch-butterflies-for-science)
* Learn more about MBNZT, order tags, register data [www.monarch.org.nz/monarch/projects](http://www.monarch.org.nz/monarch/projects)
 | * Refer to the activity Establishing butterfly transects to learn how to set up a transect and why they are valuable for data collection
* Refer to the activity Tagging monarch butterflies for science to learn how to tag a butterfly and register the tag with the MBNZT.
 | Students will:* understand more about transects and their value as monitoring tools
* learn about observing versus merely looking
* understand the relationship between releasing and recovering tagged butterflies
* appreciate that citizen scientists work in partnership with scientists to answer real-world questions.
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| Consider establishing butterfly gardens/habitats around the school. | * MBNZT certified butterfly garden [www.monarch.org.nz/monarch/projects/certified-butterfly-gardenhabitats](http://www.monarch.org.nz/monarch/projects/certified-butterfly-gardenhabitats)
* PDF on butterfly gardening [www.monarch.org.nz/monarch/projects/butterfly-gardening](http://www.monarch.org.nz/monarch/projects/butterfly-gardening)
 | * Discuss the possibility of establishing butterfly gardens around school.
* Discuss consultation, funding, on-going maintenance issues etc.
* Look into the MBNZT’s certified butterfly garden initiative.
 | Students will:* discuss the possibility of establishing butterfly gardens around the school
* research what steps they need to take in order to establish the gardens.
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| **MESO TASK:** Evaluation |
| Students draw a butterfly life cycle. | * Paper, drawing materials
 | * Students draw a butterfly life cycle including written descriptions of each section of the cycle using scientific vocabulary.
* Compare with initial life cycle drawings. Do they still focus on the better known monarch butterfly or branch out into native or white butterfly life cycles. Compare use of scientific vocabulary.
 | Students will:* demonstrate their increased understanding of butterfly life cycles
* demonstrate widening knowledge of native butterflies
* demonstrate their increased understanding of scientific vocabulary.
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**Questions about our elusive native butterflies**

Why is it uncommon to see some of our native butterflies? Read the article [Our elusive native butterflies](https://www.sciencelearn.org.nz/resources/505-our-elusive-native-butterflies)to answer the following questions.

What does the word ‘elusive’ mean?

Why does the author refer to native butterflies as elusive?

In what way are butterflies similar to kiwis?

Give two reasons why it is usually easier for most of us to see monarch and white butterflies rather than native butterflies.

Many of our native butterflies have colourful upper wings but camouflaged hind wings. (Look at the photo of the yellow admiral butterfly as an example.) Why do you think they have both colour and camouflage?

Use the information about wing size to draw an appropriately sized butterfly. For example, the monarch wings should be 110 mm across. Would this make a difference to how visible the butterfly is?

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| Monarch butterfly | Tussock butterfly | Copper butterfly |

**Questions about butterfly defence mechanisms**

Read the article [Butterfly defence mechanisms](https://www.sciencelearn.org.nz/resources/507-butterfly-defence-mechanisms) to answer the following questions.

1. Butterflies are referred to as the exhibitionists of the insect world. What is an exhibitionist?

Name another insect or animal that is the opposite of an exhibitionist.

1. How is aposematic colouration similar to a high-visibility vest?
2. Sketch the process by which a monarch butterfly obtains its chemical toxicity. There are four stages.
3. What are the two ways that a red admiral larva protects itself?
4. Swan plants are toxic yet they are still allowed in the classroom. What two reasons are given for allowing this?
5. The article ironically infers that it might be safer to use white butterfly larvae to teach about the butterfly’s life cycle.

What does the author mean?

Do you agree with the statement?