**Part 1: Learning outcomes plan**

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| **Main ideas:*** There are native and introduced butterflies that follow similar life cycles.
* Scientists track monarchs to learn more about their behaviour.
 | **Science strand:**Living World | **Level:** 1 2 3 4**Year:** 4**Teacher:** Angela Schipper |
| **Overarching learning outcomes:** * Become familiar with New Zealand’s butterflies.
* Discover how students work as citizen scientists to tag and track monarch butterfly movements.
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| **Conceptual learning outcomes**  | **Procedural learning outcomes**  | **Nature of science outcomes**  | **Technical learning outcomes**  |
| * New Zealand has native and introduced butterflies.
* Butterflies follow the same life cycle but there are differences between species.
* Butterfly tagging helps scientists learn more about monarch over-wintering habits.
 | * Learn about native and introduced butterflies, their habitats and life cycles.
* Take part in the MBNZT tagging project.
 | * Understand that scientific knowledge is based upon evidence from observations of the natural world.
* Citizen scientists contribute to investigations through observations and data collection.
 | * View/gather information, discuss and record ideas.
* Investigate life cycles through hands-on activities.
* Participate in the MBNZT tagging programme.
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| **Assessment:**Students draw and label a butterfly life cycle. * Compare this life cycle with their original drawings. Compare accuracy, labels and choice of butterfly.
* Is there increased accuracy of the metamorphosis process?
* Are students using more advanced vocabulary?
* Do students solely use the monarch butterfly or do they feature the white or a native butterfly?
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**Part 2: Lesson plan**

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| **Main idea:** To discover students’ prior knowledge and any alternative conceptions and to view their understanding of the butterfly life cycle. |
| **Subtasks** | **Resources/focal artefacts** | **Planned interactions** | **Key student outcomes** |
| **Meso tasks** | **Micro tasks** |
| **Day 1**Establish initial student knowledge regarding butterflies in general and life cycles in particular. | 1.1 Discover what they already know. |  | * What can you tell me about:
	+ butterflies you’ve seen
	+ male/female differences
	+ moths versus butterflies
	+ life cycles?
 | * Establish areas of knowledge and uncover alternative conceptions.
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| 1.2 Find out what they want to learn. | * A variety of butterfly books from the library
 | * Students look through the books and we compile a list of questions they would like to have answered through this week.
* Ask if the library books cover all their questions about butterflies.
 | * Establish student interests.
* Think more carefully about science resources and their content.
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| 1.3 Find out the depth of student understanding regarding butterfly life cycles. | * Paper, pens etc.
 | * In pairs, students draw and label the butterfly’s life cycle.
 | * Establish areas of knowledge, view labels in regard to accuracy, scientific vocabulary.
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| **Main idea:** Butterflies have life cycles. There are similarities and differences between species’ life cycles. |
| **Subtasks** | **Resources/focal artefacts** | **Planned interactions** | **Key student outcomes** |
| **Meso tasks** | **Micro tasks** |
| **Day 2**Extend knowledge of butterfly life cycles.Introduce/extend scientific vocabulary  | 2.1 Review metamorphosis. | * Monarch butterfly life cycle interactive on the SLH
* IWB
 | * Review students’ ideas from yesterday.
* Use the interactive with the students. Take note of the scientific language used. Ask a recorder to write the word along with a similar word the child have used in their drawings i.e. larva (caterpillar), pupa (chrysalis), eclosion (hatching), moult (shed), exoskeleton (shed), filaments (antennae).
 | * Students gain knowledge of the life cycle and begin to learn scientific vocabulary.
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| 2.2 Examine life cycle differences between species. | * Cruciferous (broccoli, rocket, etc.) and milkweed leaves with white and monarch eggs/larvae
* Hand lenses
 | * Do all butterflies go through the same life cycle process?
* Students use the hand lenses to look at the eggs. Students can see how the eggs darken before they hatch. Possibly see differences in shape between the species’ eggs/larvae.
 | * Students gain a visual understanding of similarities and differences between monarch and white butterfly eggs and larvae.
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| 2.3 View photos of the yellow admiral and white butterfly life cycles.  | * [www.nzbutterfly.info/resident/yellow-admiral/](http://www.nzbutterfly.info/resident/yellow-admiral/)
* [www.nzbutterfly.info/resident/white-butterfly/](http://www.nzbutterfly.info/resident/white-butterfly/)
* IWB
 | * Use photos from the nzButterfly.info website to view eggs, larvae and pupae.
* Discuss similarities and differences between their metamorphosis processes.
 | * Students gain an understanding of similarities and differences between the processes.
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| **Science Learning Hub resources for background teacher knowledge**[Monarch butterflies](http://www.sciencelearn.org.nz/resources/511-monarch-butterflies)[White butterflies](http://www.sciencelearn.org.nz/resources/696-white-butterflies)[Our elusive native butterflies](http://www.sciencelearn.org.nz/resources/505-our-elusive-native-butterflies)[New Zealand butterfly origins](http://www.sciencelearn.org.nz/resources/504-new-zealand-butterfly-origins)[Differences between butterflies and moths](http://www.sciencelearn.org.nz/resources/506-differences-between-butterflies-and-moths)[Butterfly defence mechanisms](http://www.sciencelearn.org.nz/resources/507-butterfly-defence-mechanisms)[Monarch butterfly life cycle](http://www.sciencelearn.org.nz/image_maps/48-monarch-butterfly-life-cycle) **-** interactive |
| **Main idea:** New Zealand has native butterflies. |
| **Subtasks** | **Resources/focal artefacts** | **Planned interactions** | **Key student outcomes** |
| **Meso tasks** | **Micro tasks** |
| **Day 3**Learn about New Zealand’s native butterflies.  | 3.1 Insects can be native.  | * Kiwi soft toy
* Photo of a Harris’s tussock
 | * What do these creatures have in common? (Both native and rarely seen in the wild.)
* What makes a butterfly native?
* How are they the same and different to monarchs and whites?
 | * We have native butterflies.
* Monarchs came to New Zealand on their own about 125-150 years ago. Whites were accidentally introduced.
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| 3.2 There are a number of native butterflies. | * Native butterfly PowerPoint
* IWB
* Copies of slides
* New Zealand butterflies poster
 | * View the PowerPoint, then view the poster to see their actual sizes.
* Hand out individual slides so students can review the information on their own.
* Look at the poster and concentrate on the differences in size between various species.
 | * Students become familiar with native butterflies, their habitat locations and their size relative to a monarch.
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| 3.3 There are native butterflies in the Waikato but they may be tricky to find due to size, habitat and scarcity of larval food plants. | * Butterfly location maps (I made the maps using information from [www.nzbutterfly.info](http://www.nzbutterfly.info)).
* Copies of [How big is this butterfly?](#big) (adapt as needed for other locations)
 | * Look at the location maps to view which butterflies we should be able to see in the Waikato. (Use [www.nzbutterfly.info/](http://www.nzbutterfly.info/) to adapt this activity to your own location.)
* Discuss if students do see these butterflies and work through reasons why they may not. (White and monarch are large, garden butterflies easily seen and we grow their larval food plants. Red and yellow admirals have stinging nettles as larval food plants – undesirable in gardens. Coppers’ larval food plant is muehlenbeckia, found in forests. Blues are small, low flying, possibly overlooked or mistaken for moths.)
* Give students the [How big is this butterfly?](#big) sheet so they can compare sizes.
 | * Students discover which butterflies are found locally.
* Students understand the roles habitat and size play in our ability to see some butterflies in the Waikato.
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| **Science Learning Hub resources for background teacher knowledge**[Our elusive native butterflies](http://www.sciencelearn.org.nz/resources/505-our-elusive-native-butterflies)[Monarch butterflies](http://www.sciencelearn.org.nz/resources/511-monarch-butterflies)[White butterflies](http://www.sciencelearn.org.nz/resources/696-white-butterflies)[New Zealand native butterflies PowerPoint](https://www.sciencelearn.org.nz/embeds/56-new-zealand-native-butterflies) (you can also print and laminate the slides for students to view and use)**New Zealand butterfly identification poster –** [www.monarch.org.nz/monarch/items-for-sale/butterfly-id-posters/](http://www.monarch.org.nz/monarch/items-for-sale/butterfly-id-posters/) |

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| **Main idea:** Citizen scientists tag monarch butterflies for research. Students supply tag information to the Monarch Butterfly New Zealand Trust. |
| **Subtasks** | **Resources/focal artefacts** | **Planned interactions** | **Key student outcomes** |
| **Meso tasks** | **Micro tasks** |
| **Day 4**Learn about the research being done by the MBNZT and how students act as citizen scientists to help.  | 4.1 Monarch butterflies migrate to warmer places to over-winter. | * Google image/ map of monarch migration in North America
* IWB
 | * Do you see butterflies during the winter?
* Discuss monarch migration in North America. Does the same thing happen in New Zealand? (Monarchs do migrate to warmer areas usually along the coast.)
 | * Students think about why butterflies are summer insects and about their over-wintering habits.
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| 4.2 The Monarch Butterfly New Zealand Trust is interested in tagging and tracking butterfly migration. | * MBNZT tags and/or photocopies to pass around
* Photos of tagged butterflies
* IWB
 | * Discuss MBNZT work. The group tracks monarchs to learn more about over-wintering habits. The goal is to protect these habitats from development. They also track butterflies to monitor species numbers for conservation. This information is given to scientists for research purposes.
 | * Students learn about the goals of the MBNZT.
* Students learn that citizen scientists participate in actual scientific research by gathering data for scientists.
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| 4.3 The MBNZT gathers and publishes tagging information | * As above
 | * Hand out tags so children can see the information printed on them.
* Log on to the MBNZT website to see how to register a tagged butterfly and what other information the Trust likes to collect about the released butterfly.
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| 4.4 Practise tagging. | * Small sticky dots
* Toothpicks
* Pieces of paper to represent butterflies
 | * Look at photo of tagged butterflies to see where the tag placed (see tagging activity).
* Students fold the square of paper and use toothpick to roll a sticky dot onto the ‘wing’.
 | * Students practise tagging skills and learn correct placement procedures.
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| 4.5 Butterfly gardens and future research. |  | * What next for the class? How will students use their butterfly knowledge to help the MBNZT? What role will they play to inform others of their efforts to conserve and nurture butterflies?
 | * Students decide if and how they will help with the tagging.
* Students consider how they can develop gardens within school grounds as butterfly habitats.
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| **Science Learning Hub articles for background teacher knowledge**[Citizen scientists](http://www.sciencelearn.org.nz/resources/512-citizen-scientists)[Jacqui Knight](http://www.sciencelearn.org.nz/resources/698-jacqui-knight)**Teaching activity –** [Tagging monarch butterflies for science](http://www.sciencelearn.org.nz/resources/700-tagging-monarch-butterflies-for-science)**To order tags and to register a tagged butterfly –** [www.monarch.org.nz](http://www.monarch.org.nz) |

**How big is this butterfly?**

Draw a butterfly outline in each box. The butterfly should fill up the entire box. This shows the difference in sizes between the butterflies that live in the Waikato.

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| monarch | red or yellow admiral | white | copper | blue |