



Overview

In “Voyage of Exploration”, students read about the marine diversity in New Zealand’s territorial waters and the process that NIWA scientists use to classify organisms.

Curriculum context

SCIENCE

NATURE OF SCIENCE

Understanding about science

Achievement objective(s)

L4: Students will appreciate that science is a way of explaining the world and that science knowledge changes over time.

L4: Students will identify ways in which scientists work together and provide evidence to support their ideas.

LIVING WORLD

Evolution

Achievement objective(s)

L4: Students will begin to group plants, animals, and other living things into science-based classifications.

L4: Students will explore how the groups of living things we have in the world have changed over long periods of time and appreciate that some living things in New Zealand are quite different from living things in other areas of the world.

Key ideas

- Living things can be grouped into classifications based on their characteristics.
- A classification system can be used to determine which group a living thing belongs to.
- Technological advances can help scientists to make new discoveries.
- Scientific knowledge is constantly evolving.

ENGLISH

READING

Ideas

Achievement objective(s)

L4: Students will show an increasing understanding of ideas within, across, and beyond texts.

Indicators

- Makes meaning of increasingly complex texts by identifying and understanding main and subsidiary ideas and the links between them.
- Makes connections by thinking about underlying ideas within and between texts from a range of contexts.
- Makes and supports inferences from texts with increasing independence.

The Literacy Learning Progressions

The literacy knowledge, skills, and attitudes that students need to draw on by the end of year 8 are described in *The Literacy Learning Progressions*.

MATHEMATICS

GEOMETRY AND MEASUREMENT

Shape

Achievement objective(s)

L4: Students will identify classes of two- and three-dimensional shapes by their geometric properties.

Key idea

- Classifying objects involves sorting them into groups based on common features.

Meeting the literacy challenges

The following strategies will support students as they engage with the information and ideas in the text. Once they understand what the article is about (“the story”), they will be able to explore the key science ideas outlined in the following pages.

The *Connected* series includes a range of texts that provide opportunities for students to locate, evaluate, integrate, and synthesise information and ideas.

It is expected that students will read across the range of texts in this *Connected* to develop their literacy skills and their understanding of the topic.

Text characteristics

- Technical information, connections across the text, and many examples and explanations
- Scientific vocabulary and terminology.

1. FINDING THE MAIN IDEAS

The focus of the article “Voyage of Exploration” is Linnaean taxonomy, the scientific system of classification. This is presented in four sections.

The sections contain:

- an account of a voyage of exploration to gather information about species in New Zealand waters
- a practical account of how scientific samples are collected, sorted, and classified
- an explanation of a Deep Towed Imaging System and how it is operated
- information about the Linnaean system of classification.

IDENTIFY aspects of the structure of the article that help students to navigate the article and locate the main ideas, for example, the title, headings, photographs, and pagination.

There is a range of competing information in this article. Have the students **SUMMARISE** the text, section by section, to identify the important points in each section and the connections between the sections.

MODEL ways that students can track information in order to make connections between the sections.

Section 4 page 6	Links to other sections
Linnaeus travelled the subarctic regions of his country and sent his students all over the world to collect specimens.	Section 1 – Scientists on the <i>Tangaroa</i> are collecting specimens from NZ waters.
Linnaeus developed a system of classifying living things, and he established a naming system for plants and animals.	Section 2 – Technicians on the <i>Tangaroa</i> sort the animals into groups; they register specimens in a database; the animals are properly identified by a taxonomist.

Have students complete a graphic organiser connecting the sections before refining their summaries.

2. USING TEXT AND DESIGN FEATURES FOR DEEPER UNDERSTANDING

ASK QUESTIONS to draw out the idea that articles often contain additional information that supports the main ideas.

How does the information on page 4 fit with the rest of the article?

Do we need to understand how the Deep Towed Imaging System works to understand about classifying living things? Why or why not?

How do the paragraph and photographs on page 4 add interest to this article?

3. DEALING WITH UNFAMILIAR VOCABULARY

IDENTIFY the scientific words that may challenge students. For example: “transmitting”, “brittle”, “retract”, “pectoral”, “sponges”, “fine-scale”, “taxonomist”, “organisms”, “winch operator”, “subarctic”.

PROMPT students to locate meanings for unknown words and phrases by using the text or contextual clues.

Students can **IDENTIFY** and **RECORD** new vocabulary and compile their own glossaries, adding meanings in their own words.

IDENTIFY the terminology that is part of the Linnaean system of classifying living things. This includes “animal kingdom”, “Annelida phylum”, “class”, “order”, “family”, “genus”, “species name”, “Chordata phylum”.

Include the adjective “Linnaean”. Although this word is not in the text, this is an appropriate opportunity to introduce it.

RECYCLE the words “taxonomy” and “taxonomist” to embed them in the students’ vocabulary.

DISPLAY a chart or an Internet image of the Linnaean classification system so that students can see how this system names living things at many levels.

As an extension activity, some students could research the conventions for writing these names.

Exploring the science

The following activities and suggestions will support students to develop scientific understanding as they explore the concept of classification and how living things can be grouped.

Key ideas

- Living things can be grouped into classifications based on their characteristics.
- A classification system can be used to determine which group a living thing belongs to.

Begin by reading "Voyage of Exploration". The article describes some of the vast marine biodiversity in New Zealand waters. Show the students images of the *Tangaroa* on the NIWA website: www.niwa.co.nz/our-science/vessels

Activity 1: Comparing living things

Things that live in different parts of the world share similar characteristics, but they also have many differences. In this activity, students compare living things in New Zealand with living things from another part of the world.

Have the students find out facts about two living things from different parts of the world. The two living things could both be land based, ocean based, or a mixture.

Encourage the students to find out information about each living thing, relating to the following categories:

- diet
- habitat
- breeding/reproduction
- life cycle
- adaptations.

Using a Venn diagram, have the students compare the features of these two living things.

Activity 2: Classification

In this activity, students group things according to observable characteristics and justify their decisions. Then they explore the use of Carl Linnaeus's classification system.

Have the students collect a range of living or non-living things from their natural environment, for example, shells, leaves, worms, or insects.

Have the students reread page 6. Ask the students to group their living or non-living things according to characteristics that they can observe. Provide magnifying glasses or microscopes if possible.

Prompt the students' thinking by asking:

What features do you notice?

Are there differences on the front, back, or sides?

Does each item have a certain number of each feature (for example, lines, points)?

Do any of the items have a feature that is unique? Do any of the items have features in common?

Encourage students to visit one another's collections and to question or challenge why they have been grouped that way.

Refer students back to the section on page 6.

Further background information on Linnaeus's system of classification can be found at:

- www.sciencelearn.org.nz/Contexts/Hidden-Taonga/Science-Ideas-and-Concepts/Classification-system
- www.sciencelearn.org.nz/Contexts/Hidden-Taonga/Science-Ideas-and-Concepts/Naming-species

Have students choose two or three living things that they would like to compare. Students can research the full classification of each on the Internet, using the

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Linnaean system of classification, and then use this information to see what characteristics each has in common.

Activity 3: Discovering new species

Scientists are constantly discovering more about the species that inhabit our world. In this activity, students find out more about a recently discovered species and how it was discovered.

Have students choose a recently discovered species to research.

The following websites contain useful information:

- <http://species.asu.edu/index>
- <http://species.asu.edu/Top10>
- <http://tvnz.co.nz/national-news/scientists-find-new-species-in-kermadec-islands-4175019>
- www.nzherald.co.nz/world/news/article.cfm?c_id=2&objectid=10727793

Encourage students to use the scientific name of their chosen species as they do their research.

Ask the students the following questions:

- *What is the scientific name for your species?*
- *What is the common name for your species?*
- *Where was it discovered?*
- *How was it discovered?*
- *Did scientists use any form of technology to discover this species? If so, what?*
- *What other species is it related to?*
- *What are some interesting features of this new species?*

Students can then present their information to the class. Ask them to include a picture of the new species.

MINISTRY OF EDUCATION RESOURCES

- Building Science Concepts: Book 7: *The Bush: Classifying Forest Plants*
- *Making Better Sense of the Living World*, pages 22–42
- www.sciencelearn.org.nz/Contexts/Life-in-the-Sea
- www.sciencelearn.org.nz/Contexts/Hidden-Taonga/Science-Ideas-and-Concepts/Classification-system
- www.sciencelearn.org.nz/Contexts/Hidden-Taonga/Science-Ideas-and-Concepts/Naming-species

FURTHER RESOURCES

- www.niwa.co.nz/our-science/vessels

Exploring the mathematics

In “Voyage of Exploration”, students read about Linnaean classification. Classification in mathematics involves deciding whether objects (for example, numbers or shapes) share certain features, making them distinct from other objects.

Key idea

- Classifying objects involves sorting them into groups based on common features.

Activity 1: Shape-shifting

Give pairs of students an assortment of geometric shapes. Include pictures of regular and irregular polygons (triangles, quadrilaterals, pentagons), two-dimensional closed curves, and three-dimensional shapes (prisms and cylinders, pyramids and cones, regular polyhedra, spheres).

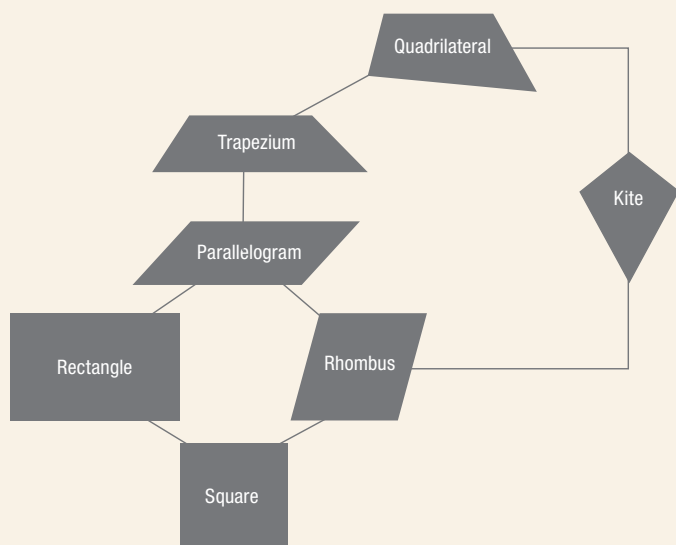
Tell the students to organise their shapes into groups. Tell them to compare their arrangements with those made by another pair, discussing any differences.

As a class, see whether there is consensus on how the shapes should be grouped.

Activity 2: Developing a system

Give pairs of students sets of quadrilaterals (square, rectangle, trapezium, rhombus, kite, quadrilateral with all sides different). Check whether the students know the names of each shape.

Give the students the diagram below and have them work in pairs to identify properties of each shape.



Properties:

Does the figure have:

- four sides?
- a pair of parallel sides?
- two pairs of parallel sides?
- four equal angles?
- four equal sides?
- diagonals that meet at right angles?

Which additional property does a kite have?

Answers:

Quadrilateral – a

Trapezium – a, b

Parallelogram – a, c

Rectangle – a, c, d

Rhombus – a, c, e, f

Square – a, c, d, e, f

Kite – a, f

As well as having diagonals that meet at right angles, a kite has two pairs of adjacent sides that are equal.

Activity 3: Properties of polygons

In this activity, students explore properties of polygons. Give the students the following statements and have them verify whether they are correct.

- If the opposite angles of a quadrilateral are equal, then the opposite sides are equal.
- If one of the angles in a parallelogram is a right angle, the parallelogram must be a rectangle.
- If the diagonals of a parallelogram are the same length, the parallelogram must be a rectangle.
- If a polygon has three equal angles, it will have three equal sides.
- If you draw lines from one vertex to every other vertex, the number of triangles you make is two less than the number of sides.

MINISTRY OF EDUCATION RESOURCES

- Exploration of cyclic quadrilaterals: www.nzmaths.co.nz/resource/quadrilaterals?parent_node=
- Figure It Out, *Geometry: Book One*, Level 4, Quad Queries, page 1
- <http://nzmaths.co.nz/resource/quad-queries>