Catch My Drift

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CONNECTED
SCIENCE • TECHNOLOGY • MATHEMATICS
2012 LEVEL 4

Overview

In "Catch My Drift", students learn about phytoplankton, the key producers in the ocean. Phytoplankton play a similar role to land plants, producing the carbohydrates and oxygen that marine consumers depend on. Phytoplankton also play an important role in the carbon cycle.

Curriculum context

SCIENCE

NATURE OF SCIENCE

Investigating in science

Achievement objective(s)

L4: Students will build on prior experiences, working together to share and examine their own and others' knowledge.

L4: Students will ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.

LIVING WORLD

Ecology

Achievement objective(s)

L4: Students will explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced.

Life Processes

Achievement objective(s)

L4: Students will recognise that there are life processes common to all living things and that these occur in different ways.

Key ideas

- Scientists ask questions when they are completing an investigation and use simple models to help explore complicated ideas. They use the skill of observation to gather information about what they are investigating.
- All living things have adaptations that help them to survive in their habitat.
- Living things can change their behaviour in response to a change in their environment.
- All living things have links in a food web. A food web begins with primary producers, and energy is transferred from one living thing to another through the web.
- Photosynthesis is a process in which plants make chemical energy from carbon dioxide, water, and light energy from the Sun. This energy is then transferred through food webs.

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*.

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

- Abstract ideas and concepts (photosynthesis and the carbon cycle) and lengthy sections of explanatory text
- A diagram that clarifies and elaborates on the text and requires interpretation
- Subject-specific vocabulary.

1. FINDING THE MAIN IDEAS

"Catch My Drift" explains what phytoplankton are and their important role in the carbon cycle.

The main information and ideas in the text include:

- Phytoplankton are the main producers in the oceans.
- Dinoflagellates and diatoms are two types of phytoplankton.
- Phytoplankton make their own food through photosynthesis. They have specific features that allow them to stay near the surface where there is sunlight.
- Phytoplankton play an important role in the carbon cycle.

2. DEALING WITH ABSTRACT IDEAS

Students will have little experience of the organisms and processes described in this text. Allow them to examine and discuss the microscopic images on pages 8–10 and the photographs on page 11.

Remind students that **ASKING QUESTIONS** as they read will help their understanding. **PROMPT** them to keep their questions in mind or record them in a notebook or a graphic organiser and to pause at the end of each double-page spread to reflect on what they have read.

What questions stayed in your mind after reading pages 8 and 9?

Which of your questions did the text answer?

Model **ASKING QUESTIONS** and **REFLECTING** .

I'm amazed at how many different shapes these diatoms can be. They look as if they're all different sizes too, although they all have only one cell. I wonder if they live in groups of the same kind or if lots of different phytoplankton float around together?

I'm thinking that red tide must be what happens along the coast in summer when the shellfish become toxic.

Suggest that students use this process of describing, wondering, and hypothesising as a way to make sense of unfamiliar information.

ASK QUESTIONS to prompt the students to clarify or summarise information.

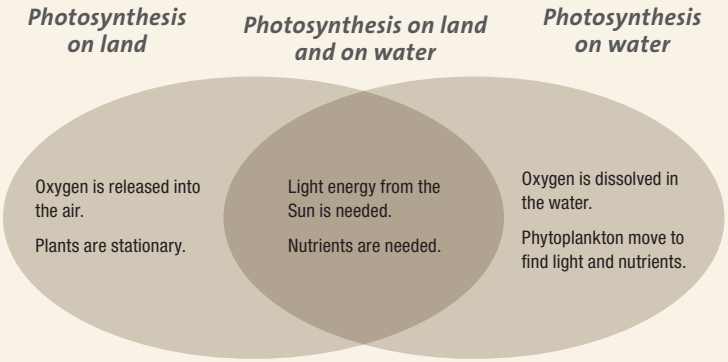
Phytoplankton are sometimes called "the plants of the sea". Why do you think this is? How are phytoplankton different from land plants?

How do scientists find these tiny diatoms?

Look at the images on page 10. What are they?

Before reading the section with the heading "A Light Meal", briefly summarise what the students already know about photosynthesis. This will prompt them to make connections between their existing knowledge and the new information.

After the reading, they can co-construct a Venn diagram comparing photosynthesis on land and on water.



3. INTERPRETING DIAGRAMS TO CLARIFY THE TEXT

The carbon cycle diagram

The diagram on pages 12–13 illustrates the carbon cycle.

This is a complex diagram. Have the students read the text before interpreting the diagram.

EXPLAIN that the diagram shows the continuous recycling of carbon – this is called the carbon cycle. Have the students read the explanatory text on the bottom of page 12.

Allow time for students to absorb the visual information in the diagram before **PROMPTING** them to interpret it in a shared reading context. Where appropriate, use think–pair–share to encourage students to collaborate.

ASK QUESTIONS to focus and guide their interpretation.

What do the arrows signify?

Are there any words that you don't understand? How can you use the diagram to work out what they might mean? For example, what does fossil fuel extraction mean?

4. DEALING WITH UNFAMILIAR VOCABULARY

IDENTIFY the challenging vocabulary, particularly the long words that recur throughout the article, for example, "phytoplankton", "dinoflagellates", "diatoms", and "photosynthesis".

Read these words aloud and reuse them when appropriate. **PROMPT** the students to use them in discussion so that they can pronounce and remember them.

Students can **IDENTIFY** and **RECORD** the scientific vocabulary that is new to them and compile their own glossaries. Prompt them to find definitions in the text or to use the contexts to predict meanings before checking them in a dictionary.

Exploring the science

The following activities and suggestions are designed as a guide for supporting students to develop scientific understanding as they explore the concepts of adaptations, food webs, and the transfer of energy within and between these.

Key ideas

- All living things have adaptations that help them to survive in their habitat.
- Living things can change their behaviour in response to a change in their environment.
- All living things are links in a food web. A food web begins with primary producers, and energy is transferred from one living thing to another through the web.
- Photosynthesis is a process in which plants make chemical energy from carbon dioxide, water, and light energy from the Sun. This energy is then transferred through food webs.
- Scientists ask questions when they are completing an investigation and use simple models to help explore complicated ideas. They use the skill of observation to gather information about what they are investigating.

Begin by reading "Catch My Drift". The article describes the relationships between some of New Zealand's marine biodiversity and the roles that photosynthesis and the carbon cycle have within these relationships. To find out more about plankton and to see images of it, visit: www.teara.govt.nz/en/plankton

Activity 1: *Adaptations*

In this activity, students learn about different adaptations. A simple experiment is used to model adaptations.

Explore the students' prior knowledge about adaptations. As a class or in groups, complete the first two sections of a KWL chart (What I know, What I want to know, What I have learned). Identify any misconceptions about adaptations. Some further information relating to marine life can be found at: www.sciencelearn.org.nz/Contexts/Life-in-the-Sea/Science-Ideas-and-Concepts/Adaptations-of-marine-organisms

Refer students back to the text and read the third paragraph on page 10, starting with: "The deeper you go in oceans, the darker it gets."

Ask the students:

Can you identify the adaptations of diatoms that are mentioned?

What types of adaptations are these? Structural or behavioural?

Give groups of students an ice-cream container filled with water and a small piece of modelling clay. Ask them to roll it into a ball and observe what happens when they place it into the water. Have students record their observations.

Challenge students to find a way to manipulate the same piece of modelling clay into a shape that will float. As they experiment, encourage students to record their observations. Compare their results with the example of how diatoms stay near the surface. Ask the students:

What type of adaptation are we modelling? (structural)

Students might like to experiment with the salinity of the water to see what effect this has.

For more experiments and ideas about buoyancy, refer to Building Science Concepts: Book 38: *Understanding Buoyancy.*

Complete the "What I have learned" section of the KWL chart and discuss.

Activity 2: *Understanding photosynthesis*

In this activity, students gain a deeper understanding of how food webs work in a marine environment. Students then complete an experiment in which they see how photosynthesis works.

Introduce students to the video of Associate Professor Stephen Wing from the University of Otago talking about food webs: www.sciencelearn.org.nz/Contexts/Life-in-the-Sea/Sci-Media/Video/Understanding-food-webs

Students can then explore a marine ecosystem interactive on the Science Learning Hub website, which explains how living things are linked in a marine food web. See: www.sciencelearn.org.nz/Contexts/Life-in-the-Sea/Sci-Media/Animations-and-Interactives/Marine-ecosystem

Students should now have a greater understanding of the concept that energy flows through an ecosystem by feeding. The feeding relationships can be illustrated using a food web.

Students need to understand that energy enters the food web by plants carrying out photosynthesis. Ask the students:

- to identify the first step in all food webs (plants and phytoplankton)
- to explain how the plants and phytoplankton get their energy.

In this experiment, students use bean plants to explore how photosynthesis works.

Organise students into three groups and give each group three potted bean plants with several leaves. Alternatively, grow the bean plants from seeds as a class. Try to have each of the plants approximately the same size.

Each group will now place their bean plants in a slightly different environment. For example:

- on a window sill in full sunlight
- away from windows but on a table in the classroom
- in a dark cupboard.

Arrange for the groups to water their plants with exactly the same amount of water.

Over the next few days, have the students make observations by looking at the bean plants.

Record these and discuss what is happening.

To develop the students' understanding of fair tests, discuss the procedure they followed in the investigation. What was the same? What did they change? What effect do these have on the possible growth of the plant?

Discuss what a fair test is and get the groups to plan their own test for a different variable that may affect the growth of the bean plants.

Activity 3: *Discover diatoms*

Scientists use observation to find out more about the world. They ask questions and investigate to discover new information. In this experiment, students practise the skill of observation as they study diatoms.

The surface mud of a pond, ditch, or lagoon will almost always hold some diatoms. They can be made to emerge by filling a jar with water and mud, wrapping it in black paper, and letting sunlight fall on the surface of the water. Within a day, the diatoms will come to the top in a scum.

Set up the experiment in a sunny place in the classroom or outside. Once the diatoms have come to the surface, carefully extract a small sample to look at under a microscope.

Use the following questions to help the students enhance their observation skills:

What shapes can you see?

What is the size of one diatom compared with another?

What can you see inside each diatom?

Do diatoms cluster together or are they spread out?

Sketch one or two diatoms – try to keep their sizes relative to each other.

What questions do you have about diatoms? Is there anything more you would like to find out?

MINISTRY OF EDUCATION RESOURCES

- Building Science Concepts: Book 38: *Understanding Buoyancy*
- Building Science Concepts: Book 22: *Tidal Communities: Interdependence and the Effects of Change*
- *Making Better Sense of the Living World*, pages 109–117
- www.sciencelearn.org.nz/Contexts/Life-in-the-Sea/Science-Ideas-and-Concepts/Adaptations-of-marine-organisms
- www.sciencelearn.org.nz/Contexts/Life-in-the-Sea/Sci-Media/Video/Understanding-food-webs
- www.sciencelearn.org.nz/Contexts/Life-in-the-Sea/Sci-Media/Animations-and-Interactives/Marine-ecosystem
- www.sciencelearn.org.nz/Contexts/Life-in-the-Sea/NZ-Research/Life-in-the-Sea

FURTHER RESOURCES

- www.teara.govt.nz/en/plankton

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