Why is it Important to Classify Living Things?

Strand: Life Systems
Topic: Diversity of Living Things
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The Context

Scientists organize our world in very particular ways. Microbiologists identify, describe and name numerous bacteria in order to better understand life. Geologists identify, describe and name rocks and minerals specific to certain regions. Fish biologists study and name fish in their various habitats (fish that live in rivers, lakes and oceans). All living things are organized into groups by scientists as they are identified. Living things organized into particular groups have common characteristics. Different scientists use various systems of classification to organize all living things into groups. Overall, the reason scientists classify living things is to understand the relationships between different organisms.

In this unit students, working in small groups, will identify the genus and species of several animals, investigate their characteristics, create a word key to classify their animals, and then prepare a science report for a press conference with a group of journalists. Each group will create a word key on posterboard to show the range of animals studied. The posterboard will also include illustrations.

The Purpose

In this unit students will learn:

♦ to classify everyday objects using a scheme of their choice;
♦ to classify living things;
♦ to use a word key to identify the scientific name of a living thing from its common name;
♦ to create a dichotomous word key;
♦ about vertebrates and invertebrates;
♦ to identify and classify living things in a sample of plant debris;
♦ to conduct a peer review of scientific findings.
The Support Tasks

1. Classifying objects 30 minutes
2. Classifying living things 30 minutes
3. Using and creating a word key 45 minutes
4. The animal kingdom: Vertebrates 45 minutes
5. The animal kingdom: Invertebrates 45 minutes
6. Exploring plant debris 60 minutes

The Big Task: Answering the Big Question

The Big Question students will answer is: Why is it important to classify living things? 3 x 45 minutes

The Evaluation

30 minutes

Unit Review

30 minutes

NOTE

As part of your introduction to this unit, write the Big Task (Answering the Big Question) on chart paper and post in a prominent location in the classroom. Tell students this is what they will be doing in this unit. Next tell students that before they can answer a Big Question, they must learn appropriate knowledge and skills. This is achieved through a series of Support Tasks. Post in a prominent location a list of the Support Tasks for this unit. Tell students that at the end of each Support Task you will ask them what they have learned and how it will help them be successful with answering the Big Question.

At this point ask students if they have any questions about classifying living things. Write these on chart paper headed “Emerging Questions” and post at the front of the classroom. Tell students that at the end of every Support Task you will add new questions to the list.
Emerging Questions

Answering the Big Question provides students with a focus for the unit. However, throughout the unit students should be asked if they have other, related questions; that is, emerging questions. These emerging questions should be recorded on chart paper at the front of the room. At the end of each Support Task all new emerging questions should be added to the chart paper. Asking questions throughout the unit models the way scientists engage in similar practices.

At the conclusion of the unit, refer students to the list of emerging questions and discuss the following points:

- The number of questions emerging from the Big Question;
- Themes present in the list of emerging questions;
- The type of scientist who might study each question;
- The potential for further research provided by emerging questions;
- The acceptability of not having immediate answers to all the questions;
- That scientists do not yet have answers to all the questions;
- Where to find answers to some of these questions.

At the beginning of this unit the Big Question may lead to the following emerging questions (sample questions from Grade 6 students):

- How long does it take for a species to evolve?
- What does classify mean?
- How do animals mutate?
- Are there kingdoms that scientists haven’t named yet?

During this unit Support Tasks may lead to the following emerging questions (sample questions from Grade 6 students):

- Do all living things have a purpose on Earth?
- Why do living things die?
- Why were living things put on Earth and not on other planets?
- How many species of living things are there on Earth?
- Why do they have so many names?
- Why do some animals have the same kingdom and phylum and others are different?
- Why are lobster and honeybee in the same kingdom?
- Why is the killer whale so confusing to put in groups?
Doing science involves making value judgements. Making these judgements is an ongoing process that will permeate this unit. Teachers should engage students in thoughtful discussion that will help them to make decisions that are important to them and eventually to society. They begin to think about the positive and negative effects of scientific developments on the environment and in other contexts.

Values are influenced by personal priorities. Students’ experiences at Grades 4 - 6 will be centred not only on themselves, their friends and family, but also on other children and adults.

**Teacher input**

Explain to students that doing science involves exploring and explaining. Tell students that when they decide about the worth or importance of scientific activity they are making a value judgement about its importance and its validity.

Tell students that a democratic society requires each of them to become an informed citizen who will use his or her value system when making decisions about the use of science in settings outside the school.

Explain to students that as they learn to recognize and discuss values, they will begin to compare how their own values are similar to or distinct from those of friends or others. Ask questions that will help students decide on the worth of their own experiments and those of scientists in the world outside school. Discuss how these views might impact their life both now and in the future. Recognize that students’ answers will reveal value judgements that become more complex and sophisticated with practice and experience.

At appropriate times throughout the unit, use the following questions as entry points to engage students in thinking about and discussing values as they relate to science and scientific activity.

**Worth of the scientific activity**
- Is the science worth knowing?
- Why is the research being conducted?
- How is the research being conducted?
- Are there alternatives?
- Who wants the research to take place?

**Validity of the science**
- Is the method appropriate?
- Is the evidence trustworthy?
- Does the evidence support the claim?
- Why do you trust these sources?
- Is there consensus regarding this knowledge claim within the scientific community?
- Is the report biased in any way?

**Impact of the scientific activity**
- Who or what will benefit from the results?
- Does it improve people’s lives in the community?
- Who or what will suffer from the results?
- Who or what will suffer as a result of doing the science?
- What are the environmental consequences of doing the science?
- What are the environmental consequences of using the science?

**Economic cost**
- How much will the science cost?
- Is this an appropriate use of the money?
Support Task 1: Classifying objects

**Teacher input**

Ask students to imagine going into a supermarket to do the shopping for the weekly groceries, only to find rows and rows of different foods all piled high on the shelves with no order to them at all. The sugar is next to the hamburger, boxes of cereal are next to the tinned tomatoes, and apples and bananas are at different places amongst piles of packet soup and loaves of bread. Would it be easy to buy what was on your shopping list? Suppose the store manager asked you to sort things out. What would you do? How would you arrange the groceries?

Probably every supermarket is arranged slightly differently. There are lots of efficient ways that the food can be grouped. Is one way right and the others wrong? What do they all have in common?

**Student activity**

Organize the class into small groups of four students. Give each group a bag containing a wide assortment of nuts, bolts, washers and nails. Tell each group that they must classify the contents of the bag; that is, sort the contents into groups. Students can create as many groups as they choose. They should give each group a name and provide a description for each group. The description should include a reason why they classified the objects in a particular way.

**Teacher input**

Explain to students that arranging things in groups, so that the group members have something in common, is called classifying. It is what you do when you sort your stamp collection or your CD collection. How many different ways can you group CDs?
Relating this Support Task to the Big Task

At the conclusion of this Support Task ask students the following questions:

- What did you learn about classifying objects?
- What did you learn in this Support Task that will help you answer the Big Question?
- Do you have any new emerging questions about classifying living things?

Add all new questions to the ongoing list of emerging questions on the chart paper posted at the front of the classroom.

New vocabulary

classification

Resources required

<table>
<thead>
<tr>
<th>Stimulus materials:</th>
<th>picture of supermarket shelves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumable materials:</td>
<td>paper</td>
</tr>
</tbody>
</table>

Safety check

Discuss the hazards and risks involved in handling nuts, bolts and nails, and how these risks can be managed by acting sensibly and responsibly.
**Support Task 2: Classifying living things**

**Teacher input**

Tell students that the manager of the supermarket had to sort food into groups that made sense so that customers could easily and efficiently find what they wanted. Arranging food in a supermarket makes life simpler for the supermarket manager too. It is easier to identify gaps on the shelves.

Scientists must have a way of organizing all living things in the natural world. They have to arrange them into groups. Otherwise studying the diversity of millions of living things is too overwhelming. Grouping things helps scientists identify gaps in their research and they get an idea of what to investigate next.

In 1735 Carolus Linnaeus sorted all identified living things and developed a system of classifying and naming them. The name given to a living thing has two parts. The first part, the genus name, always starts with a capital letter. The second name, the species name, does not. The genus name is analogous to a person’s surname and the species name is analogous to their given name. Living things are usually classified into five main taxonomic groups: animals, plants, bacteria, protista, and fungi. Each of these groups contains levels of classification. For example, animals are first classified as vertebrates (with backbones) or invertebrates (without backbones).

**Student activity**

Divide students into six equal groups. Give each group a set of handouts (BLM “Kingdoms - pages 1-11”). Tell students that each page contains the name of a living thing, its kingdom, and in some cases several additional levels of classification. Tell students to first sort all living things into kingdoms. Ask students how many kingdoms there are and to name them. List these on chart paper. Confirm that these are the five main kingdoms scientists use to classify all living things (Animalia, Plantae, Monera, Fungi, Protista). This reference should remain visible to students throughout the unit.

Next tell students to look only at the living things in the kingdom animalia. Help students understand that each level of classification (reading from the top down) distinguishes animals in that group. Students need to carefully examine the levels of classification and make a list of true statements (e.g., dogs and humans are classified to be in the same kingdom, phylum and class. They are classified differently for order, family, genus, and species). Students can use the BLM “Kingdoms - page 12” to record their answers.
**LIVING THINGS**

### Bacteria
- Very small. Occur everywhere. Cause many diseases.

### Protista
- Microscopic organisms whose body consists of only one cell. Live in water or as parasites inside other organisms.

### Fungi
- Non-green, do not photosynthesize. Some are parasites and cause serious diseases of plants.

### Plants
- Bryophytes (mosses & liverworts): Have simple leaves or leaf-like form. Found mainly in damp places.
- Conifers (Gymnosperms): Large plants with cones for reproduction. Good at surviving in dry or cold climates. Most of them keep their leaves through the winter.
- Flowering plants (Angiosperms): Wide range of plants with flowers for reproduction. Range from small herbs to massive trees. Many of them drop their leaves in the winter.

### Animals
- Animals without backbones (invertebrates)
  - Coelenterates: Many-celled animals with tentacles and sting cells. Most of them live in the sea. Example: sea anemone.
  - Flatworms: Body elongated and flat. Some of them live in ponds and streams, but most are parasites causing diseases.
  - Roundworms: Body elongated and thread-like, round in cross-section. This group includes some harmful parasites.
  - Annelids: Body divided up by rings into a series of segments. Example: earthworm.
  - Molluscs: Have a soft body usually protected by a shell. In some the shell is greatly reduced.
  - Echinoderms: Have a tough spiny skin. Most of them are star-shaped. They all live in the sea.
  - Arthropods: Have a hard outside and jointed limbs. Divided into four groups mainly on the basis of the number of legs.
    - Crustaceans: Live mainly in the sea, but some on land. Examples: crab, woodlouse.
    - Arachnids: Spiders: 8 legs and 2 main body parts.
    - Insects: 3 main body parts and 6 legs. Adults have wings.

- Animals with backbones (vertebrates)
  - Fishes: Live in water. Have gills for breathing, scales on their skin, and fins for movement.
  - Amphibians: Have moist skin, without scales. Live on land but lay eggs in water. Have fish-like tadpole larvae which change into the adult.
  - Reptiles: Have dry waterproof skin with scales. Eggs have a leathery shell and are laid on land.
  - Birds: Have feathers. Eggs have hard shells. Wings for flying and a beak for feeding.
  - Mammals: Have hair. The young develop inside the mother and after birth are fed on her milk.
**Teaching the Unit**

**Teacher input**
Tell students that in order to remember the levels of classification for the kingdom animalia, they can learn the mnemonic “King Philip Can Only Find Green Socks.” Create a list on chart paper and post in a visible spot for reference throughout the unit.

Students could be asked to make up their own mnemonic.

**New vocabulary**
- kingdom, phylum, class, order, family, genus, species, mnemonic, animalia, plantae, protista, monera, fungi

**Relating this Support Task to the Big Task**
At the conclusion of this Support Task ask students the following questions:

- What did you learn about classifying living things into kingdoms and levels?

- What did you learn in this Support Task that will help you answer the Big Question?

- Do you have any new emerging questions about classifying living things?

Add all new questions to the ongoing list of emerging questions on the chart paper posted at the front of the classroom.

**Resources required**
- Stimulus materials: none required
- Tools: pencils

**Safety check**
Discuss the hazards and risks involved in working as a group and how these risks can be managed by the way students behave and treat one another.
Teaching the Unit

King † Kingdom
Philip † Phylum
Can † Class
Only † Order
Find † Family
Green † Genus
Socks † Species
Teaching the Unit

Support Task 3: Using and creating a word key

Teacher input

Ask students if they have ever seen a plant or an animal and wondered what it is. Explain that there are two ways to identify such things as plants, animals, rocks or minerals: (a) field guides containing descriptions and pictures, and (b) word keys. Show students an example of a field guide (e.g., National Audubon Society First Field Guide: Insects).

Scientists create and use word keys in order to classify living things. A key sometimes includes diagrams and uses descriptive characteristics to enable identification. Show the students an example of a dichotomous word key. Use the BLM “Sports key” as the example. Explain that each box contains one question and there are only two paths out of each box. Usually, one path is for the answer “yes” and one for the answer “no”.

Student activity

Tell the students that they are going to learn how to use a key to identify leaves. Divide the class into groups of four. Give each group a copy of the BLM “Word key for identifying leaves” (2 pages). Each student in a group picks one leaf but does not reveal their choice to the remainder of the group. Another member of the group uses the word key to identify the chosen leaf. At the end of the activity, ask the students to tell you how the word key for leaves helped them to identify each leaf. (The key uses a series of increasingly specific attributes.)
**Teaching the Unit**

**Teacher input**

Tell students that they will now create their own dichotomous word key. Divide the groups into pairs. Each pair will create a word key for the topic “Pets”. They need to have 3 levels of classification for pets (3 yes/no questions). Once designed, the key will be displayed on a large sheet of paper 20” x 16”.

Explain that they should first list all the pets to be classified and that each question in the word key must have only two answers (i.e., be dichotomous). They can use BLM “Creating a dichotomous word key” to plan their work. Some students may want to use a pre-printed key (BLM “A key to classify ……”). Impress upon students the importance of listing all the pets to be classified and listing characteristics before they begin to draw their key.

**Relating this Support Task to the Big Task**

At the conclusion of this Support Task ask students the following questions:

- What did you learn about using and creating dichotomous word keys?
- What did you learn in this Support Task that will help you answer the Big Question?
- Do you have any new emerging questions about classifying living things?

Add all new questions to the ongoing list of emerging questions on the chart paper posted at the front of the classroom.

**New vocabulary**

dichotomous, word key

**Resources required**

- **Stimulus materials:** A First Field Guide
- **Consumable materials:** BLM “Sports key”, BLM “Creating a dichotomous word key”, BLM “Word key for identifying leaves”, BLM “A key to classify ……”, 20” x 16” paper
- **Equipment:** pencils, markers

**Safety check**

Review the hazards and risks involved in working as a group and how these risks can be managed by the way students behave and treat one another.
Teaching the Unit

Support Task 4: The animal kingdom: Vertebrates

**Teacher input**

Show students a large colour photograph of a human and a large picture of a butterfly.

Tell students that all living things in the kingdom animalia are divided into two groups: vertebrates and invertebrates. Vertebrates are animals with a backbone or skeleton inside their body. Invertebrates are animals without a backbone or skeleton.

Vertebrates are classified into smaller groups. Each group has specific characteristics that allow for classification. All vertebrates are in the same phylum: chordata.

Produce sets of vertebrate pictures for use by students: Photocopy BLM “Examples of Vertebrates” onto thin card, cut out the images and place each set of cards in a ziploc bag. One set will be needed for each group of four students. Make a set of flash cards by enlarging and photocopying each image separately onto letter size card.

**Student activity**

Divide the class into groups of four. Give each group a set of vertebrate pictures and a copy of the BLM “Fact sheet: Vertebrates”. Tell students to use the fact sheet to help them sort the pictures into groups of vertebrates. Students can record their answers on the BLM.

Using flash cards identical to the pictures used by students, have students identify the vertebrate group for each example. In each case students should state which characteristics they used to choose the vertebrate group. Ask students how many groups of vertebrates they classified.
Relating this Support Task to the Big Task

At the conclusion of this Support Task ask students the following questions:

- What did you learn about classifying vertebrates?
- What did you learn in this Support Task that will help you answer the Big Question?
- Do you have any new emerging questions about classifying living things?

Add all new questions to the ongoing list of emerging questions on the chart paper posted at the front of the classroom.

New vocabulary
vertebrate, invertebrate

Resources required
Stimulus materials: large colour pictures of vertebrates and invertebrates
Tools: pencils, sets of vertebrate cards, flash cards

Safety check
Review the hazards and risks involved in working as a group and how these risks can be managed by the way students behave and treat one another.
Support Task 5: The animal kingdom: Invertebrates

Teacher input
Remind students that all living things in the kingdom animalia are divided into two groups: vertebrates and invertebrates. Ask students to describe the major difference between the two groups. (Vertebrates are animals with a backbone or skeleton inside their body, invertebrates are animals without a backbone or skeleton).

Tell the class that invertebrates are classified into numerous phyla (groups). Each phylum has specific characteristics that allow for this level of classification for every invertebrate.

Student activity
Divide the class into groups of four. Give each group a set of invertebrate pictures and a copy of the BLM “Fact sheet: Invertebrates”. Tell students to use the fact sheet to help them sort the pictures into groups of invertebrates. Students can record their answers on the BLM.

Using flash cards identical to the pictures used by students, have students identify the invertebrate group for each example. In each case students should state which characteristics they used to classify the invertebrate groups.

Teacher input
Produce sets of invertebrate pictures for use by students: Photocopy BLM “Examples of Invertebrates” onto thin card, cut out the images and place each set of cards in a ziploc bag. One set will be needed for each group of four students. Make a set of flash cards by enlarging and photocopying each image separately onto letter size card.
Relating this Support Task to the Big Task

At the conclusion of this Support Task ask students the following questions:

- What did you learn about classifying invertebrates?
- What did you learn in this Support Task that will help you answer the Big Question?
- Do you have any new emerging questions about classifying living things?

Add all new questions to the ongoing list of emerging questions on the chart paper posted at the front of the classroom.

New vocabulary
exoskeleton

Resources required
Stimulus materials: large colour pictures of invertebrates
Equipment: pencils, flash cards, sets of invertebrate cards

Safety check
Review the hazards and risks involved in working as a group and how these risks can be managed by the way students behave and treat one another.
Support Task 6: Exploring plant debris

**Teacher input**

Show students a bag of plant debris and then slowly tip it out onto a large sheet of newspaper or a plastic garbage bag. Ask students where they would expect to find plant debris. Ask students to tell you what they would expect to find in the pile.

Tell students they are going to examine a small sample of plant debris in order to find and classify the different types of animal and plant material. They will then use word keys to identify them. Remind students that the plant debris may contain living creatures and therefore great care should be taken when sorting and lifting individual items. Live animals should be treated gently and carefully and kept moist (using a spray bottle), as they will be taken back to the place where they were found. Demonstrate how to lift a small insect from the plant debris into a Petri dish using blunt tweezers.

Ensure students recognize that living things need to be handled very carefully. Discuss how to use tweezers and Petri dishes. Explain that you will be taking the animals and plants back to their original habitat as soon as possible.

**Student activity**

Working in pairs, students will identify the plant and animal matter in a pile of plant debris. Tell students to use blunt tweezers or a dampened paint brush to pick up anything that moves and transfer it to the Petri dish for examination with a magnifying glass. Students can sort the plant material into piles of leaves, bark, and dead grass.

Once students have sorted the plant debris they can identify the leaves and small animals using word keys (BLM “Word key for identifying leaves”, BLM “Word key for identifying tiny animals” and BLM “Tiny animals in leaf litter”).
**Teaching the Unit**

**Teacher input**

Tell students that if they find an animal or some plant material that cannot be identified using the keys provided they could sketch it and make notes based on what they can observe. At a later time they can refer to field guides or more extensive word keys to identify the animal or plant material.

Add all new questions to the ongoing list of emerging questions on the chart paper posted at the front of the classroom.

**New vocabulary**

plant debris

**Relating this Support Task to the Big Task**

At the conclusion of this Support Task ask students the following questions:

- What did you learn about plant debris?
- What did you learn in this Support Task that will help you answer the Big Question?
- Do you have any new emerging questions about classifying living things?

**Resources required**

- **Stimulus materials:** none required
- **Consumable materials:** bags of plant debris, newspaper, plastic garbage bags, surgical gloves, BLM “Word key for identifying leaves”, BLM “Word key for identifying tiny animals”, BLM “Tiny animals in leaf litter”, magnifying glasses, blunt tweezers, Petri dishes, paint brushes, spray bottles
- **Equipment:**

**Safety check**

Discuss the hazards and risks involved in using tweezers, Petri dishes and plant debris, and how taking care and using the correct procedures can manage these risks.
The Big Task - answering the Big Question: Why is it important to classify living things?

Teacher input

Tell students that each one of them is going to use what they have learned in Support Tasks 1 - 6 to answer the following Big Question: Why is it important to classify living things?

Tell students to imagine they are scientists who have been invited to a science press conference to announce the results of their research. Each scientist will be asked to describe his or her research findings. Tell students they will work together in order to prepare a group presentation. The journalists attending the press conference will write a report in the “science news” section of the newspaper or provide a television report announcing the new animals that have been classified.

- Develop a key with their group.
- Peer-review the scientific findings of another group and have their own key peer-reviewed using BLM “Peer-reviewing scientific research”.
- Prepare a group presentation of their findings to be presented as a live telecast.

Student activity

Divide the class into groups of 4 or 5 students. Give each group a copy of BLMs “What scientists do”, “The common names of some animals”, “My research report” and “Peer-reviewing scientific research”. Assign one list of animals to each group of students. Students will then be responsible for completing the following tasks:

- Identify which group of scientists they are by using the BLMs “The common names of some animals” and “What scientists do”.

- Choose an animal and independently complete the research required from the BLM “My research report”. In all future discussions they should refer to themselves by their correct title (e.g., malacologists, entomologists, ichthyologists). Now they know which First Field Guides to select from the front of the class to help them in their research.

- Tell students they are now to prepare a group presentation. The group is to create a word key on posterboard showing the range of animals studied and how they are classified. They can mount their drawings on to the posterboard. (Note the drawing should be in colour on a piece of paper 12 cm x 15 cm).

The word key must be able to be used by other scientists (class members). The word key should begin with the common characteristics of the animals (e.g., belong to the same kingdom) and then describe more specific characteristics so that the last stage of the key allows someone else to identify each animal (see Support Task 3: Using and creating a word key). The key must show a minimum of three levels of classification (3 yes/no questions).
Display the word keys on posterboard around the classroom and provide students with time to try the keys from the different groups. Ensure that each group is provided with the peer-review evaluation BLM before beginning their word key and research report. This way students know what the evaluation criteria will be. At this stage students can use the peer-review page to evaluate other group word keys.

Student activity

Below is a suggested script that students could follow or at least begin with to prepare their presentations:

- “We are [type of scientist]. We study [name of animal].”

Each student in the group will then:

- state the name of the animal they studied;
- show a picture of the animal;
- give its scientific name (genus and species);
- use their own words to describe the characteristics of the animal;
- describe how they classified the animal.

Each student in the group must end his or her presentation by completing the following sentence:

“As you can see, it is important to classify living things because ….”

New vocabulary

peer-review

Resources required

Stimulus materials: BLM “Peer-reviewing scientific research”
Consumable materials: posterboard, BLM “The common names of some animals”,
BLM “My research report”, BLM “What scientists do”, 12 cm x 15 cm paper
Equipment:
National Audubon Society First Field Guides, all published by Scholastic:

Safety check

Review the hazards and risks involved in working as a group and how these risks can be managed by the way students behave and treat one another.
Teaching the Unit

Evaluating the Final Product

Teacher input

Tell students that in science it is important that the results of research are reviewed by peers (examined by other scientists) in order to validate the work. Results are also published in journals and the popular press so that as many people as possible can learn about the results. Sometimes other scientists repeat the research to see if they get the same result.

Did the pictures of the animals in the research reports accurately reflect their appearance?

Were the common names of the animals included in the poster?

Were both the genus and the species of each animal included in the poster?

Did the word key allow successful classification of the animals?

Was the word key dichotomous?

Additional comments?

Working in groups, have students peer-review the poster of another group showing the animals studied and the word key developed to classify those animals. Use the following questions:
Student activity

Each group should write a summary of its evaluation and return this with the illustrations and the poster to the group that made them. The BLM “Peer-reviewing scientific research” can be used by students to write their report. Each group then reviews the evaluation of its illustrations and word key and makes a short presentation to the class commenting on:

- the quality of the illustrations;
- the success of the word key;
- how the group could improve the word key.

Students’ group presentations are reviewed by other scientist groups in the class. Each group should use their word key poster in the presentation.

New vocabulary

none

Resources required

Stimulus materials: completed posters and research reports
Consumable materials: BLM “Peer-reviewing scientific research”
Equipment: pencils

Safety check

Review the hazards and risks involved in working as a group and how these risks can be managed by the way students behave and respect one another.
Teaching the Unit

Unit Review

**Teacher input**

Explain to students that it is important to think about how they can improve their ability to conduct scientific activity and that they can do this by discussing the following questions:

- What did you learn about science?
- What did you learn about “doing” science?
- What did you enjoy most?
- What did you find easy?
- What did you find challenging?
- What did you get better at?
- How did you help each other?

**Student activity**

Students should discuss the questions in groups. When finished each group should provide a summary of their discussion to the class. Upon completion of all group summaries, the class can agree on a statement of improvement for their next science unit.
Teacher input

As a conclusion to this unit of work refer students to the list of emerging questions generated by them throughout the unit. Discuss with students the following:

- The number of questions emerging from the Big Question;
- Themes present in the list of emerging questions;
- The type of scientist who might study each question;
- The potential for further research provided by emerging questions;
- The acceptability of not having immediate answers to all the questions;
- That scientists do not yet have answers to all the questions;
- Where to find answers to some of these questions.

Resources required

Stimulus materials: none
Consumable materials: paper
Equipment: pencils

Safety check

Discuss with students whether they used hazard recognition, risk identification, and risk management when answering the Big Question: Why is it important to classify living things?
## New Vocabulary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>animalia</td>
<td>one of the five main kingdoms; about 800,000 species have been identified in this kingdom</td>
</tr>
<tr>
<td>class</td>
<td>a grouping of organisms; the next major level of classification below phylum</td>
</tr>
<tr>
<td>classification</td>
<td>the grouping of similar organisms based on specific characteristics</td>
</tr>
<tr>
<td>dichotomous</td>
<td>branching into two</td>
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<td>exoskeleton</td>
<td>the hard external structure that supports and protects the bodies of many invertebrates such as insects and shellfish</td>
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<td>a category used in the classification of living things that consists of one or more related genera of organisms</td>
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<td>one of the five main kingdoms; fungi have the special role of recycling dead organic matter into useful nutrients</td>
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<td>invertebrate</td>
<td>lacking a backbone or spinal column (e.g., crab, spider, clam, sea star, sand dollar)</td>
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## Summary of Resources

<table>
<thead>
<tr>
<th>Support Task</th>
<th>Stimulus materials</th>
<th>Consumable materials</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>picture of supermarket shelves</td>
<td>paper</td>
<td>pencils, washers of various diameters; nuts, bolts &amp; nails of various sizes &amp; materials</td>
</tr>
<tr>
<td>2</td>
<td>none required</td>
<td>BLM “Kingdoms – pages 1-11”, BLM “Kingdoms – page 12”, chart paper</td>
<td>pencils</td>
</tr>
<tr>
<td>3</td>
<td>First Field Guide</td>
<td>BLM “Sports key”, BLM “Creating a dichotomous word key”, BLM “Word key for identifying leaves”, BLM “A key to classify . . . . . .”, 20” x 16” paper</td>
<td>pencils, markers</td>
</tr>
<tr>
<td>6</td>
<td>none required</td>
<td>bags of plant debris, newspaper, plastic garbage bags, surgical gloves, BLM “Word key for identifying leaves”, BLM “Word key for identifying tiny animals”, BLM “Tiny animals in leaf litter”</td>
<td>magnifying glasses, blunt tweezers, Petri dishes, paint brushes, spray bottles</td>
</tr>
<tr>
<td>Evaluating the Final Product</td>
<td>completed posters and research reports</td>
<td>BLM “Peer-reviewing scientific research”</td>
<td>pencils</td>
</tr>
<tr>
<td>Unit Review</td>
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MOE Expectations

Overview

- The study of living things in Grade 6 focuses on the use of classification systems as ways of learning about the great diversity of species and as ways of organizing the study of species. Particular attention is given to the classification of organisms in the animal kingdom. Classifying animals not only will enable students to learn about many different types of animals, from mammals to microscopic organisms, but will help them to observe and describe similarities and differences among species more precisely. To acquire first-hand experience in studying the diversity of living things, students will examine and classify organisms in a specific habitat – a pond, for example.

Overall expectations

- demonstrate an understanding of ways in which classification systems are used to understand the diversity of living things and the interrelationships among living things
- investigate classification systems and some of the processes of life common to all animals (e.g., growth, reproduction, movement, response, and adaptation)
- describe ways in which classification systems can be used in everyday life

Specific expectations: Understanding basic concepts

- explain why formal classification systems are usually based on structural characteristics (e.g., type of skeleton, circulatory system, reproductive system) rather than on physical appearance or behavioural characteristics
- recognize that the essential difference between cold- and warm-blooded animals lies in different means of regulating body temperature
- identify and describe the characteristics of vertebrates, and use these characteristics to classify vertebrates as mammals, birds, amphibians, reptiles, and fish (the five main classes)
- identify and describe the characteristics of invertebrates, and classify invertebrates into phyla (e.g., sponges, worms, molluscs, arthropods)
- compare the characteristics of vertebrates and invertebrates
- compare the characteristics of different kinds of arthropods (e.g., crustaceans such as crayfish, shrimp; insects such as grasshoppers, butterflies, mealworms)
- describe microscopic living things using appropriate tools to assist them with their observations (e.g., nets and microscopes for pond study)
- describe ways in which micro-organisms meet their basic needs (e.g., for food, water, air, movement)
**MOE Expectations**

### Specific expectations: Developing skills of inquiry, design, & communication

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>BT</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- formulate questions about and identify the needs of different types of animals, and explore possible answers to these questions and ways of meeting these needs (e.g., design an experiment to study whether certain insects will grow larger if given large quantities of food)
- plan investigations for some of these answers and solutions, identifying variables that need to be held constant to ensure a fair test and identifying criteria for assessing solutions
- use appropriate vocabulary, including correct science and technology terminology, in describing their investigations and observations (e.g., use terms such as organism, species, structure, and kingdom in describing classification of animals)
- compile data gathered through investigation in order to record and present results, using charts, tables, labelled graphs, and scatter plots produced by hand or with a computer (e.g., make an inventory of animals found in a specific location)
- communicate the procedures and results of investigations for specific purposes and to specific audiences, using media works, oral presentations, written notes and descriptions, charts, graphs, and drawings (e.g., create a clearly labelled chart of organisms observed and identified during a pond study)

### Specific expectations: Relating science and technology to the world outside the school

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</table>

- identify various kinds of classification systems that are based on specific criteria and used to organize information (e.g., in a telephone system, numbers are classified according to country code, area code, telephone number, extension number)
- identify inherited characteristics (e.g., eye colour, hair colour) and learned or behavioural characteristics (e.g., habits of cleanliness)
- explain why characteristics related to physical appearance (e.g., size, shape, colour, texture) or behaviour are not suitable attributes for classifying living things
- identify various kinds of plant or animal organisms in a given plot using commercially produced biological or classification keys (e.g., organisms observed in a pond study, in the school yard, in wildlife centres)
- describe specific characteristics or adaptations that enable each group of vertebrates to live in its particular habitat (e.g., fish in water) and explain the importance of maintaining that habitat for the survival of the species
- compare similarities and differences between fossils and animals of the present
Links to Other Subjects

Language
  Writing
  • communicate ideas and information for a variety of purposes (to inform, to persuade, to explain) and to specific audiences
  • organize information using well-linked paragraphs
  • use a variety of appropriate sentence types and structures
  • revise and edit work in collaboration with others
  • use and spell correctly appropriate grade-level vocabulary
  • use correctly the conventions specified for this grade level

Reading
  • read independently, selecting appropriate reading strategies
  • decide on a specific purpose for reading, and select the material that they need from a variety of appropriate sources
  • understand the appropriate grade-level vocabulary and language structures
  • summarize and explain the main ideas in information materials
  • plan and carry out a research project

Oral and Visual Communication
  • make reports, describe and explain a course of action, and follow instructions
  • ask and answer questions to obtain and clarify information
  • communicate a main idea about a topic and describe a sequence of events
  • express and respond to a range of ideas and opinions concisely, clearly, and appropriately
  • contribute and work constructively in groups
  • use appropriate grade-level conventions of oral language

Mathematics
  Data Management
  • systematically collect, organize, and analyze data
  • interpret and present data using mathematical terms
  • evaluate and make conclusions about data from the analysis

The Arts
  Visual Arts
  • produce 2D and 3D works of art that communicate ideas (thoughts, feelings, experiences) for specific purposes and audiences using a variety of tools, materials, and techniques
  • solve artistic problems using the elements of design and at least one of the principles of design specific for this grade
  • identify strengths and areas for improvement in their own work and that of others

Drama
  • demonstrate understanding of ways of sustaining the appropriate voice or character
  • speak or write in role for different purposes
  • recognize when it is necessary to sustain concentration in drama
  • describe the skills needed to perform in public.
<table>
<thead>
<tr>
<th>Title</th>
<th>Used In…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdoms – pages 1-11</td>
<td>Support Task 2 on page 8</td>
</tr>
<tr>
<td>Kingdoms – page 12</td>
<td>Support Task 2 on page 8</td>
</tr>
<tr>
<td>Sports key</td>
<td>Support Task 3 on page 12</td>
</tr>
<tr>
<td>Word key for identifying leaves (2 pages)</td>
<td>Support Task 3 on page 12 and Support Task 6 on page 18</td>
</tr>
<tr>
<td>Creating a dichotomous word key</td>
<td>Support Task 3 on page 13</td>
</tr>
<tr>
<td>A key to classify ……</td>
<td>Support Task 3 on page 13</td>
</tr>
<tr>
<td>Examples of Vertebrates (3 pages)</td>
<td>Support Task 4 on page 14</td>
</tr>
<tr>
<td>Fact sheet: Vertebrates</td>
<td>Support Task 4 on page 14</td>
</tr>
<tr>
<td>Fact sheet: Vertebrates – Teacher answer sheet</td>
<td>Support Task 4 on page 14</td>
</tr>
<tr>
<td>New vocabulary</td>
<td>Support Task 4 on page 14</td>
</tr>
<tr>
<td>Examples of Invertebrates (3 pages)</td>
<td>Support Task 5 on page 16</td>
</tr>
<tr>
<td>Fact sheet: Invertebrates</td>
<td>Support Task 5 on page 16</td>
</tr>
<tr>
<td>Fact sheet: Invertebrates – Teacher answer sheet</td>
<td>Support Task 5 on page 16</td>
</tr>
<tr>
<td>Word key for identifying tiny animals</td>
<td>Support Task 6 on page 18</td>
</tr>
<tr>
<td>Tiny animals in leaf litter</td>
<td>Support Task 6 on page 18</td>
</tr>
<tr>
<td>The common names of some animals</td>
<td>The Big Task on page 20</td>
</tr>
<tr>
<td>My research report (2 pages)</td>
<td>The Big Task on page 20</td>
</tr>
<tr>
<td>What scientists do</td>
<td>The Big Task on page 20</td>
</tr>
<tr>
<td>Peer-reviewing scientific research (2 pages)</td>
<td>The Big Task on page 20 and Evaluating the Final Product on page 23</td>
</tr>
</tbody>
</table>
Human

Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Primate
Family: Hominidae
Genus: Homo
Species: sapiens
Dog

Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Carnivora
Family: Canidae
Genus: Canis
Species: familiaris
Gorilla

Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Primate
Family: Pongidae
Genus: Gorilla
Species: gorilla
Honeybee

Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Hymenoptera
Family: Apidae
Genus: Apis
Species: mellifera
American Lobster

Kingdom: Animalia
Phylum: Arthropoda
Class: Crustacea
Order: Decapoda
Family: Homaridae
Genus: Homarus
Species: americanus
Atlantic Calico Scallop

Kingdom: Animalia
Phylum: Mollusca
Class: Bivalvia
Order: Ostreoida
Family: Pectinidae
Genus: Argopecten
Species: gibbus
Queen Conch

Kingdom: Animalia
Phylum: Mollusca
Class: Gastropoda
Order: Neotaenioglossa
Family: Strombidae
Genus: Strombus
Species: gigas
Algae

Kingdom: Protista

Phylum:

Class:

Order:

Family:

Genus:

Species:
Kingdoms – page 9

Bacteria

Kingdom: Monera

Phylum:

Class:

Order:

Family:

Genus:

Species:
Kingdom: Fungi
Phylum:
Class:
Order:
Family:
Genus:
Species:
Daisy

Kingdom: Plantae

Phylum:

Class:

Order:

Family:

Genus:

Species:
Look carefully at the living things in the kingdom Animalia, paying attention to their levels of classification.

In the space below make a list of true statements.

Examples:
• All the animals are in the same kingdom.
• Dogs and humans are classified to be in the same kingdom, phylum and class.
• Dogs and humans are classified differently for order, family, genus and species.

True statements:
Sports Key

Used to determine between:
baseball
golf
volleyball
soccer
hockey

Is it a ball sport?

yes

Do you use an object to hit the ball?

yes

Is it a team sport?

no

Do you use your hands?

yes

volleyball

no

soccer

hockey

no

baseball
golf
Word key for identifying leaves (1)

Leaf is divided into separate leaflets

Leaflets are like needles

- Yes: Pine
- No: Horse Chestnut

Leaf has deep V-shaped notches

- Yes: Sycamore
- No: Edge of leaf is smooth or nearly so

Edge of leaf is smooth or nearly so

- Yes: Beech
- No: Edge of leaf has rounded fingers

Edge of leaf has rounded fingers

- Yes: Oak
- No: Birch
Word key for identifying leaves (2)

<table>
<thead>
<tr>
<th>Illustration 1</th>
<th>Illustration 2</th>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="White Oak" /></td>
<td><img src="image2" alt="Sycamore" /></td>
<td>White Oak</td>
</tr>
<tr>
<td><img src="image3" alt="American Beech" /></td>
<td><img src="image4" alt="White Pine" /></td>
<td>American Beech</td>
</tr>
<tr>
<td><img src="image5" alt="White Birch" /></td>
<td><img src="image6" alt="Horse Chestnut" /></td>
<td>White Birch</td>
</tr>
<tr>
<td><img src="image7" alt="A single leaf divided into leaflets" /></td>
<td><img src="image8" alt="Four separate leaves on a twig" /></td>
<td>A single leaf divided into leaflets</td>
</tr>
</tbody>
</table>
Creating a dichotomous word key

Scientists create and use dichotomous word keys to identify living things in order to classify them. A key always includes descriptive words to enable identification and sometimes includes diagrams.

Your task is to create a dichotomous word key that allows classification of pets. Remember that in a dichotomous word key each question must have only two answers.

To create your own dichotomous word key:
- List all the pets to be classified.
- Write the questions to be included in the word key. Remember that each question must have only two answers.
- Plan the shape of the key on rough paper before beginning work on the 20” x 16” paper.
A key to classify . . . . . . .
Examples of Vertebrates (1)

<table>
<thead>
<tr>
<th>Great Blue Heron</th>
<th>Atlantic Cod</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savannah Sparrow</td>
<td>Chinook Salmon</td>
</tr>
<tr>
<td>Snowy Owl</td>
<td>Winter Flounder</td>
</tr>
</tbody>
</table>
Examples of Vertebrates (2)

Bullfrog

American Alligator

Red-spotted Newt

Red-bellied Turtle

Spotted Salamander

Eastern Diamondback
Examples of Vertebrates (3)

Human

Killer Whale

Colorado Chipmunk
**Fact sheet: Vertebrates**

**Specific characteristics:**
- Most give birth to live young
- Babies fed on mother’s milk
- Hair or fur on body

**Examples:**
- 
- 
- 

**Specific characteristics:**
- Lay hard-shelled eggs
- Feathers
- Wings for flying
- Beak for feeding

**Examples:**
- 
- 
- 

**Specific characteristics:**
- Hatch from hard-shelled eggs
- Dry, waterproof skin with scales
- Most lay eggs on land

**Examples:**
- 
- 
- 

**Specific characteristics:**
- Hatch from soft-shelled eggs laid in water or wet places
- Moist skin without scales
- Able to live on land or in water

**Examples:**
- 
- 
- 

**Specific characteristics:**
- Most hatch from soft-shelled eggs laid in water
- Scales on skin
- Gills for breathing
- Live in water

**Examples:**
- 
- 
- 

---

Names: ____________________________  ____________________________

______________________________  ____________________________

Date: ____________________________
Fact sheet: Vertebrates

Teacher answer sheet

Specific characteristics:
- Most give birth to live young
- Babies fed on mother’s milk
- Hair or fur on body

Examples:
- human
- chipmunk
- whale

Specific characteristics:
- Lay hard-shelled eggs
- Feathers
- Wings for flying
- Beak for feeding

Examples:
- sparrow
- heron
- owl

Specific characteristics:
- Hatch from hard-shelled eggs
- Dry, waterproof skin with scales
- Most lay eggs on land

Examples:
- alligator
- turtle
- snake

Specific characteristics:
- Hatch from soft-shelled eggs laid in water or wet places
- Moist skin without scales
- Able to live on land or in water

Examples:
- salamander
- newt
- frog

Specific characteristics:
- Most hatch from soft-shelled eggs laid in water
- Scales on skin
- Gills for breathing
- Live in water

Examples:
- salmon
- cod
- flounder
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Examples of Invertebrates (1)

Butterfly  Crab

Shrimp  Spider

Snail  Clam
Examples of Invertebrates (2)

- Sea Slug
- Octopus
- Sand dollar
- Sea urchin
- Sea star
- Sea cucumber
Examples of Invertebrates (3)

- Sea anemone
- Coral
- Jellyfish
- Sea pen
Fact sheet: Invertebrates

Specific characteristics:  Examples:
• Tough, spiny skin  
• Star shape or star pattern on body  
• All live in the sea

Specific characteristics:  Examples:
• Soft body, usually protected by a shell  
• Live in both fresh and salt water  
• Prominent foot

Specific characteristics:  Examples:
• Animals with radial symmetry  
• Tentacles that sting

Specific characteristics:  Examples:
• Jointed limbs  
• Exoskeleton  
• Segmented body
## Fact sheet: Invertebrates

### Teacher answer sheet

<table>
<thead>
<tr>
<th>Specific characteristics</th>
<th>Examples:</th>
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</thead>
<tbody>
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<td>sand dollar, sea urchin, sea cucumber, sea star</td>
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<tr>
<td><strong>Tentacles that sting</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific characteristics</th>
<th>Examples:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Jointed limbs</strong></td>
<td>crab, shrimp, spider, butterfly</td>
</tr>
<tr>
<td><strong>Exoskeleton</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Segmented body</strong></td>
<td></td>
</tr>
</tbody>
</table>
Word key for identifying tiny animals

Start
How many pairs of legs?

- more than four
  - Do all its legs have joints?
    - yes
      - How many pairs of legs on each segment?
        - two
          - millipede
        - one
          - butterfly or moth larva
        - five or fewer
          - sawfly larva
        - six or more
          - harvestman
      - no
        - How many pairs in all?
          - fewer than 14
            - woodlouse
          - more than 15
            - centipede
  - four
    - Is its body divided into 2 parts?
      - yes
        - spider
      - no
        - How many pairs of prolegs?
          - two
          - butterfly or moth larva
          - five or fewer
          - sawfly larva
          - six or more
          - harvestman
        - one
          - mite
      - Is its like a caterpillar?
        - yes
          - cockchafer larva
        - no
          - lacewing larva or might be aphid

- three
  - Is it over 2 cm long?
    - yes
      - Does it have curved mouth-parts in front of its head?
        - yes
          - earwig nymph
        - no
          - lacewing larva or might be aphid
    - no
      - Does it have a narrow waist?
        - yes
          - ladybird larva or might be aphid
        - no
          - Does its abdomen have two tails?
            - yes
              - wireworm or click beetle larva
            - no
          - Does its abdomen have curved mouth-parts in front of its head?
            - yes
              - earwig nymph
            - no
              - lacewing larva or might be aphid

Are there pincers on its abdomen?

- yes
  - lacewing larva or might be aphid
- no
  - Are the mouth-parts a long spike?
    - yes
      - lacewing larva or might be aphid
    - no
      - Does it have curved mouth-parts in front of its head?
        - yes
          - earwig nymph
        - no
          - lacewing larva or might be aphid

Does it have curved mouth-parts in front of its head?

- yes
  - earwig nymph
- no
  - Is its abdomen blue-grey?
    - yes
      - lacewing larva or might be aphid
    - no
      - With honey-dew tubes?
        - yes
          - lacewing larva or might be aphid
        - no
          - Does it have a narrow waist?
            - yes
              - ladybird larva or might be aphid
            - no
              - Does its abdomen have two tails?
                - yes
                  - wireworm or click beetle larva
                - no
                  - Does its abdomen have curved mouth-parts in front of its head?
                    - yes
                      - earwig nymph
                    - no
                      - lacewing larva or might be aphid

Are its legs longer than four times its body length?

- yes
  - harvestman
- no
  - Are its legs longer than four times its body length?
    - yes
      - cockchafer larva
    - no
      - lacewing larva or might be aphid

Are its legs longer than four times its body length?

- yes
  - cockchafer larva
- no
  - Are its legs longer than four times its body length?
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Is it like a caterpillar?

- yes
  - earwig nymph
- no
  - Are its legs longer than four times its body length?
    - yes
      - earwig nymph
    - no
      - lacewing larva or might be aphid
Tiny animals in leaf litter

a  wire worm
b  centipede
c  mayfly larva
d,e,f  spiders
g  moth or butterfly larva
h  woodlouse
i,j,k  thrips
l,m,n  mites
o  sawfly larva
p  cockroach
q  plant bug
r  rove beetle
s  worker ant
t  cockchafer beetle larva
u  rove beetle larva
v  millipede
w  ground beetle
x  earwig
y  millipede
The common names of some animals

**Group 1**
**Common names**
Small milkweed bug
Scarlet-and-green leafhopper
Japanese beetle
Sweetheart underwing
Black-and-yellow garden spider

**Group 2**
**Common names**
Green darner
Harlequin cabbage bug
Elephant stag beetle
Locust borer
Anise swallowtail
Deer tick

**Group 3**
**Common names**
Red-spotted toad
Pine barrens treefrog
Mountain treefrog
Long-toed salamander
Spotted salamander
Eastern newt

**Group 4**
**Common names**
Sea lamprey
Atlantic stingray
Brook trout
Western mosquitofish
Foureye butterflyfish
Queen parrotfish

**Group 5**
**Common names**
Atlantic winged oyster
Atlantic calico scallop
Red abalone
Purple-ringed top shell
Lewis’s moon snail
Northern red chiton

**Group 6**
**Common names**
Daisy brittle star
Spiny sun star
Hermissenda nudibranch
California stichopus
Purple sea urchin
My research report

1. The common name of the animal I studied is ____________________.

2. It belongs to the kingdom ____________________.

3. It belongs to the genus ____________________.

4. It belongs to the species ____________________.

5. The specific name given to scientists who study my animal is:
   ____________________.

6. Some characteristics of the animal I studied that I find interesting are listed below:

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

7. Some facts about the animal I studied that will allow me to classify it for the word key are listed below:

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

continued...
8. **Describe the habitat of the animal you studied:**

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

9. **Complete the following sentence:**

   It is important for scientists to classify living things because:

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

   ______________________________________________________

10. **On a separate page (12 cm x 15 cm) draw the animal you studied. Make your drawing as realistic as possible, showing as much detail as you can. Use colour to show some of the animal’s characteristics. (Another person should be able to use your drawing to identify the animal.)**
### What scientists do

<table>
<thead>
<tr>
<th>Type of Scientist</th>
<th>What they do</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Anthropologists</td>
<td>study existing and past human cultures</td>
</tr>
<tr>
<td>2 Archeologists</td>
<td>study artifacts and ruins from past civilizations</td>
</tr>
<tr>
<td>3 Agricultural Scientists</td>
<td>study farm crops and animals, and develop ways of improving their quantity and quality</td>
</tr>
<tr>
<td>4 Astronomers</td>
<td>study planets, stars, and the universe</td>
</tr>
<tr>
<td>5 Astrophysicists</td>
<td>study the physics of stellar phenomena</td>
</tr>
<tr>
<td>6 Biologists</td>
<td>study living systems</td>
</tr>
<tr>
<td>7 Biomedical Scientists</td>
<td>study laboratory investigations on human samples necessary for the diagnosis and prevention of disease</td>
</tr>
<tr>
<td>8 Botanists</td>
<td>study plants</td>
</tr>
<tr>
<td>9 Chemists</td>
<td>study the structure, properties and interaction of matter</td>
</tr>
<tr>
<td>10 Computer Scientists</td>
<td>study the design of computers, computational processes, information transfers, and transformations</td>
</tr>
<tr>
<td>11 Ecologists</td>
<td>study the relationship between living organisms and their environment</td>
</tr>
<tr>
<td>12 Entomologists</td>
<td>study insects</td>
</tr>
<tr>
<td>13 Environmental Chemists</td>
<td>study how substances react to affect the environment</td>
</tr>
<tr>
<td>14 Ethologists</td>
<td>study animal behaviour</td>
</tr>
<tr>
<td>15 Food Scientists</td>
<td>study the food processing industry and work towards meeting consumer demand for food products that are healthy, safe, tasty, and convenient</td>
</tr>
<tr>
<td>16 Geneticists</td>
<td>study cellular DNA to identify abnormalities in genes</td>
</tr>
<tr>
<td>17 Geologists</td>
<td>study the earth and the processes that shape the earth</td>
</tr>
<tr>
<td>18 Herpetologists</td>
<td>study reptiles and amphibians</td>
</tr>
<tr>
<td>19 Ichthyologists</td>
<td>study fish</td>
</tr>
<tr>
<td>20 Malacologists</td>
<td>study mollusks, like snails and clams</td>
</tr>
<tr>
<td>21 Mammalogists</td>
<td>study mammals</td>
</tr>
<tr>
<td>22 Marine Biologists</td>
<td>study life in oceans</td>
</tr>
<tr>
<td>23 Meteorologists</td>
<td>study the weather</td>
</tr>
<tr>
<td>24 Nematologists</td>
<td>study roundworms</td>
</tr>
<tr>
<td>25 Oceanographers</td>
<td>study the ocean</td>
</tr>
<tr>
<td>26 Paleontologists</td>
<td>study fossils and ancient life on earth</td>
</tr>
<tr>
<td>27 Physicists</td>
<td>study the fundamental structure of matter and energy</td>
</tr>
</tbody>
</table>
Peer-reviewing scientific research

1. Did the drawings of the animals in the research reports accurately reflect their appearance? □ yes □ no

Comments: ________________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________

2. Were the common names of the animals included on the word key poster? □ yes □ no

Comments: ________________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________

continued...
3. Were the genus and species of each animal included on the word key poster?  
   yes ☐ no ☐
   Comments: ________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________

4. Was it easy to understand and use the word key poster?  
   yes ☐ no ☐
   Comments: ________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________

5. Was the word key poster dichotomous?  
   yes ☐ no ☐
   Comments: ________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________

6. Helpful hints for the scientists to think about:
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________