Science Unit: ***Animal Growth and Changes***

Lesson 1: ***Measuring Living Things***

School Year:	2012/2013
Developed for:	Hastings Elementary School, Vancouver School District
Developed by:	Linda Herbert (scientist); Natacha Corrie and Chris Donegan (teachers)
Grade level:	Presented to grade 2/3; appropriate for grades 1 – 7 with age appropriate modifications
Duration of lesson:	2 hours. The lesson can be shortened to 1 hour and 20 minutes by removing the work activity or by doing it as a class demonstration activity instead.
Notes:	Depending on student age, having additional classroom volunteers or parents to assist with each station would be helpful. Depending on available materials and the size of the class, one or two sets of each station can be set up. When this lesson was originally conducted two copies of each station were used.

Objectives

1. Practice taking and recording measurements and observations.
2. Discover some of the challenges associated with measuring living organisms.

Background Information

Making and recording accurate observations and measurements is an important part of the scientific process. Students will gain confidence in their ability to make accurate measurements and start to critically reflect on the different ways in which "the same" measurement can be taken; thereby realizing the importance of clearly explaining how/when/where specific measurements were taken. One example of this will occur when students measure the fish model at Station 1: the length of the fish could be correctly measured in a variety of ways:

- from nose to the very tip of the tail fin
- from nose to the base of the tail
- from nose to the fork of the tail

All methods can be considered correct but of course are not directly comparable to one another. Fisheries biologists measure length in different ways depending on the study being conducted and thus "length" can be reported as fork length (from nose to fork of tail), standard length (from nose to base of tail), etc.

Vocabulary

Millimeter:	A metric unit of measurement used for measuring length (or similar e.g. height, diameter etc.) and abbreviated mm.
Gram:	A metric unit of measurement used for measuring weight and abbreviated g.
Celsius:	A metric unit of temperature as well as a scale for temperature abbreviated C or °C. On the Celsius scale water boils at 100°C and freezes at 0°C.

Materials

- Paper towel tube (demo)
- Piece of string (demo)
- Measuring tapes (mm), 4 per station 1
- Eggs 4 per station 1 (contents blown out). If available use eggs of different sizes (chicken, goose, quail etc.)
- Ear thermometer
- Glass of warm (50-60°C) water 1 per station 3
- Ruler (demo)
- Measuring tape (demo)
- Rulers (mm) 4 per station 1
- 4 small (200g) blocks of wood of identical size: Two of a light wood such as cedar or balsam; two of a dense wood such as cherry or gumwood.
- Ear thermometer disposable tips (1 per student minimum)
- Student worksheets
- Length of elastic band (demo)
- Live worms (several for each group)
- Scale (g) 1 per station 2
- Items to weight – can use biological materials such as cleaned chicken bones, beef or pork ribs etc. or students can use school items such as erasers, pens, etc.
- Regular thermometers (2 per station 3 minimum)
- Pencils

In the Classroom

Introductory Discussion

1. Last week we learned how to think like a scientist using the Scientific Method (See introductory handout). Today we are going to focus on one of the steps in the scientific method, making and recording observations. If you want to conduct a good experiment with correct results you need to make sure you are making careful observations. Measurements are important because they help us describe the size of objects so that other people know exactly what we are talking about.

    - What are some measurements that we can use to describe the size of objects? Let's use people as an example. Last week we took one measurement, HEIGHT, what other measurements could we use to describe the size of a person? Ask students for suggestions (height, weight, length of arms or legs etc., width, girth/circumference).
    - Today we are going to focus on three types of measurements: length, weight and temperature
    - What tools can we use to measure length? What if we were measuring the length of this tube? Ask for suggestions (ruler, measuring tape, metre stick etc.).
    - What if we wanted to measure the distance around the tube? (ruler, measuring tape) What if we only had a hard ruler, what could we do? What if we had some string? (roll along tape, wrap with string).
    - Could we use this elastic to measure around the tube? Demonstrate. (no, it stretches).
    - What if we were going to measure a worm?
    - Before we start we need to remember that we need to treat living organisms with respect. What does that mean? Ask for responses. (Be gentle, remember their needs – worms do not like light; dry out easily; do not scare or harm the organism).
    - What tools could we use to measure a worm?
    - We all know what worms are like; do you think we can ask them to stay still while we measure them? (No)
    - What other problems might we have trying to measure a worm? Ask for suggestions.

- Let's try it. Have students briefly try measuring their worms and then discuss the problems they encountered as a class.

2. Introduce and describe the three stations.
   - Station 1: Measuring Length and Size: At this station students will practice using measuring tapes and rulers to measure a fish and an egg.
   - Station 2: Measuring Weight: At this station students will practice using a scale to measure the weight of different objects, including 2 different types of wood with the same dimensions.
   - Station 3: Measuring Temperature: Here students will practice taking and reading temperatures. They will measure their body temperature with the use of an ear thermometer and with the help of an adult
3. Description of science experiment/activity.
   - Students will move from station to station practicing a different type of measurement at each station: length, weight and temperature.
4. Processes of science that the students will focus on: Students will focus on making observations/measurements and recording their observations/measurements.
5. Safety Guidelines.
   - Be careful with the blown eggs, they are easy to break.
   - Living organisms must be treated with care and respect. Remind students that worms are sensitive to light and can dry out easily. They should be handled gently (with clean, slightly dampened hands) and only for a short period of time. As soon as observations are complete they should be returned to their container of moist soil.
   - Thermometers are made of glass and can break if they are dropped or roll onto the floor. Remind students to keep the antiroll guards on the thermometers (if available) or to place the thermometers into the cases in between uses.

Science Activity/Experiment

Activity Title: How do scientists measure living things?

Purpose of Activity: To gain experience measuring length, weight and temperature.

Methods and Instructions:
Set-up prior to experiment:
- If the worm activity is going to be done as a class, 12-24 worms will need to be collected in advance. Two to four worms can be placed in each of six separate containers with some moist soil. A clean yogurt container with holes punched in the lid works well. Each group of four will receive one container of worms to observe. The students can observe the worms in the container or gently pour the container out onto a tray or some newspaper.
- Arrange materials at each station. It is recommended that for a class of 24 students that there be two set ups of each station (i.e. two Station 1, two Station 2 etc. for a total of six stations).

Students will work in groups of 4 and move with their group from station to station.

1. See detailed instructions on worksheet.
2. Students will move from station to station completing the mini activities on their worksheets. It is helpful if there is one adult (scientist/teacher/classroom volunteer/parent) at each of the three stations to help guide younger students through the activities. One adult will be required for sure at Station 3 to assist in taking the ear temperatures of each student.

3. Students may discuss their methods and observations within their group but each student will record their measurements individually.

Closure Discussion

1. Discuss the measurements students made at each station as a class.
2. Discuss the different methods they used and the challenges and uncertainties they encountered.
3. Where did you measure the egg? Did everyone measure it in the same spot?
4. How did you measure the length of the fish? Discuss the different measurements made. What if we were going to measure how our fish grew over time, if different scientists were going to take the measurements, how could we ensure that all of the scientists were using the same length measurements?
5. Were you surprised by the results at Station 2? Hands up if you predicted that the weight of the two pieces of wood would be the same.
6. Is length alone a good measurement to describe the size of an object? Why or why not??
7. Discuss the variation in body temperature among the students.
8. Do you think it is easy to measure living organisms? What are some difficulties you encountered?
9. Discuss the temperature change of the water and relate it to exothermic animals such as insects (in preparation of next lesson). Temperature is important for all living things. People are able to control their body temperature (warm blooded or endothermic) but some animals, such as insects are not (cold blooded or exothermic). Insects' body temperatures depend on the temperature of the environment around them.

Scientist Name:_____

Date:_____

HOW DO SCIENTISTS MEASURE LIVING THINGS?

How long is a worm?

Scientists often have to measure living organisms. Today we are going to measure the length of a worm.

What tools can you use to measure a worm?

_____

_____

What problems can you have when trying to measure a worm?

_____

_____

_____

_____

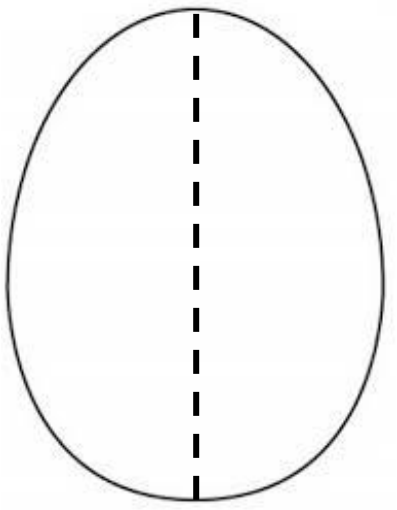
_____

How long is your worm? _____mm

Station 1: Measuring length and size

How many different ways can you measure an egg?

Draw on the diagram below to show how you measured the egg.



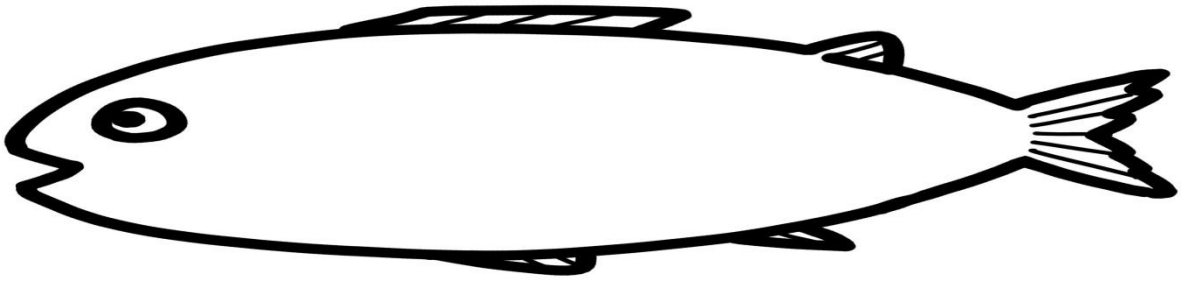
Label your measurements

_____mm

How can you measure the length of this fish?

Draw a line on the fish diagram to show how you measured the fish.

Fish number: _____ This fish is _____mm long



Scientist Name:_____

Date:_____

Station 2 Measuring weight

Compare the two pieces of wood, do not pick them up yet! Record their measurements.

Piece ____ Length = _____mm Width = _____mm Height = _____mm

Piece ____ Length = _____mm Width = _____mm Height = _____mm

Are they the same size? **YES** or **NO**

HYPOTHESIS (circle one)

I think the two pieces will: **weigh the same** or **not weigh the same**

Piece _____ Weight = _____g Piece _____ Weight = _____g

Practice using the scale by weighing some other objects:

OBJECT	**WEIGHT**
Pencil	g

Station 3: Measuring temperature

What is the temperature of the classroom? _____°C

What is the body temperature of each scientist in your group

SCIENTIST'S NAME	TEMPERATURE
	°C
	°C
	°C
	°C

Does everyone have the same temperature? _____

Are you warmer or colder than the classroom? _____

At the start of our lesson the water in the glass was _____°C, what is the temperature now? _____°C.

Insects lose heat just like the glass of water. If you were an insect how could you keep your body temperature warm on a cold day?

_____

_____

Scientist Name:_____

Date:_____

CONCLUSIONS

Do you think it is easy to measure living organisms? Why or why not?

_____

_____

Is length alone a good measurement to describe the size of an object? Why or why not?

_____

_____