

## Performance Standards Framework for Science –

### Unit Organizer:

(Approximate Time: 12 days)

### OVERVIEW:

Students will observe specimens from animal and plant groups. They create a "field guide" to compare and contrast different plants and animals. This field guide will include a page of information dedicated to each of the following: vertebrate, invertebrate, mammal, bird, reptile, amphibian, fish, vascular plant, and non-vascular plant. Students will then take with them to Cannon's Point a disposable camera, a magnifying glass, a small container for samples and the field guides they have created. Students will discuss similarities, differences, and characteristics of organisms they have photographed as a class and the reasons they have classified each into the groups they have chosen.

### STANDARDS ADDRESSED IN THIS UNIT

#### Content Standards:

#### **S5L1. Students will classify organisms into groups and relate how they determined the groups with how and why scientists use classification.**

- a. Demonstrate how animals are sorted into groups (vertebrate and invertebrate) and how vertebrates are sorted into groups (fish, amphibian, reptile, bird, and mammal).
- b. Demonstrate how plants are sorted into groups.

#### Habits of Mind:

#### **S5CS3. Students will use tools and instruments for observing, measuring, and manipulating objects in scientific activities.**

- c. Use computers, cameras and recording devices for capturing information.
- d. Identify and practice accepted safety procedures in manipulating science materials and equipment

#### Nature of Science:

#### **S5CS8. Students will understand important features of the process of scientific inquiry.**

Students will apply the following to inquiry learning practices:

- a. Scientific investigations may take many different forms, including observing what things are like or what is happening somewhere, collecting specimens for analysis, and doing experiments.
- b. Clear and active communication is an essential part of doing science. It enables scientists to inform others about their work, expose their ideas to criticism by other scientists, and stay informed about scientific discoveries around the world.
- c. Scientists use technology to increase their power to observe things and to measure and compare things accurately.
- d. Science involves many different kinds of work and engages men and women of all ages and backgrounds.

## **KNOWLEDGE:**

- Students will be able to identify both animals and plants
- Students will be able to distinguish vertebrates from invertebrates
- Students will understand what classifies a vertebrate as the following: mammals, reptiles, birds, fish, and amphibians
- Students will be able to group plants based on their characteristics as either vascular or non-vascular.

## **ENDURING UNDERSTANDINGS**

Students will understand that:

- Animals and plants are different.
- Vertebrates have a backbone; invertebrates do not have a backbone
- Vertebrates can be broken into subcategories (mammal, bird, reptile, fish, amphibian)
- The characteristics of vascular plants vs. the characteristics of non-vascular plants

## **ESSENTIAL QUESTIONS:**

### **OVERARCHING ESSENTIAL QUESTION**

How do we group plants? How do we group animals?

### **TOPICAL ESSENTIAL QUESTIONS**

E.Q.s:

1. How can we classify animals into groups?
2. What makes animals vertebrate or invertebrates?
3. What characteristics of a vertebrate tell us that animal is a fish?
4. What characteristics of a vertebrate tell us that animal is an amphibian?
5. What characteristics of a vertebrate tell us that animal is a reptile?
6. What characteristics of a vertebrate tell us that animal is a bird?
7. What characteristics of a vertebrate tell us that animal is a mammal?
8. How do we group vertebrates? What is the difference between a vertebrate and an invertebrate?
9. How do we classify plants into groups?
10. How do we group vascular and non-vascular plants?

## **CONCEPTS:**

Animals are classified into two groups: vertebrates and invertebrates.

Vertebrates can be classified further into subgroups: mammals, reptiles, fish, amphibians, and birds.

Plants are grouped into two groups: vascular and non-vascular.

## **LANGUAGE:**

- Vertebrate
- Invertebrate
- Mammal
- Reptile
- Fish
- Bird
- Amphibian
- Vascular
- Non-vascular

**MISCONCEPTIONS**

**A snake is an invertebrate**

**Plants are not alive**

**All animals have a backbone**

**Bats are birds**

**PROPER CONCEPTIONS**

**A snake is a vertebrate**

**Plants are alive, even though they are different from animals and humans in many ways**

**Some animals have no backbone**

**Bats are mammals**

**EVIDENCE OF LEARNING:**

By the conclusion of this unit, students should be able to demonstrate the following competencies:

Goal: Grouping Animals and Plants.

Role: Taxonomist

Audience: Fifth grade students.

Situation: Students will be conducting research on the species of Cannon's Point.

**TASKS:**

The collection of the following tasks represents the level of depth, rigor and complexity expected of all physical science students to demonstrate evidence of learning

**Overreaching Task:** Creation of a field guide

Description: Students will create a field guide which is to include the following sections: vertebrate, invertebrate, mammal, reptile, amphibian, bird, fish, vascular plant, and non-vascular plant. This will include a description and example of each type of plant and animal, a list of distinguishing characteristics, and a photo example of each. This will be completed over the entire unit until the field trip. Each day, one more page should be completed. Information about defining characteristics will be given in class. At the end of each section, take the students to the library or computer lab, and have them find an animal/plant of interest to print a picture of for each group. When you return to the classroom, have students write about their personal animal stating how they knew it fit into the group that day.

Discussion, Suggestions for use: Students will bring the following to Cannon's Point: the field guide they have created to help in identifying real-life species, a magnifying glass to "get a closer look," a gallon sized zip-lock bag for small specimens, and a camera to collect data for review.

Possible Solution: Students may or may not see some of their field guide organisms. Encourage them to take pictures of whatever organisms they find to share with the class. Try to find at least one that fits into each group!

## DAY 1: Introduction to Animal Grouping: Grouping

EQ: How can we classify animals into groups?

Understandings:

We classify objects according to differences and similarities. Animals are likewise grouped accordingly.

- Activate this lesson by having the entire group of students remove one of each of their shoes. These shoes will be placed into a pile in the center of the room. Have the students group the shoes according to their similarities, without telling them how specifically to group them. When the students have “classified” their shoes, have them explain what groups of similarities they have created. Explain that this is similar to what scientists do with animals.
- When students have put their shoes back on, break them up into groups. Have several photos of different animals for each group. Have the students sort these photos into two groups to the best of their ability: animals with backbones and animals without backbones. When the students have had time to group their animals, have each group create a two-column list with the names of the animals with backbones on the left and without backbones on the right. This will be collected.
- Explain that this is one way that we can start to group animals.
- At the end of this lesson, have students create a “field guide” that will be filled in over the course of the unit. This field guide will need a page for each of the following:
  - Field guide title page
  - Invertebrates
  - Vertebrates
  - Fish
  - Amphibians
  - Mammals
  - Birds
  - Reptiles
  - Non-vascular plants
  - Vascular plants
- Students can design the title page of their field guide, if time permits.

Formative Assessment:

Ticket-out-the-door:

What is your favorite animal? Name an animal that might be “grouped” with this animal, and give two shared characteristics of your chosen animals.

## DAY 2: Introduction to Animal Grouping: Invertebrates

**EQ:** How do I know if an animal is an invertebrate?

### Understandings:

Scientists begin classifying animals into two groups: vertebrates and invertebrates. Invertebrates have no bones, no bony skeleton, or backbones. Invertebrates often have a hard external shell or an exoskeleton. Invertebrates usually live “in” their shells/exoskeletons. Some invertebrates have no shell or exoskeleton at all.

- Activate this lesson by handing out several pictures of different animals, including snails, crabs, reptiles, mammals, birds, fish, and amphibians. Make sure to include the animals with shells/exoskeletons. Divide the class into two groups, and have the students group these animals into only two different groups however they think best. Have a copy of the pictures for yourself. As you come to each animal, hold it up and discuss which group the students put that particular animal in and why.
- Explain that two groups scientists classify animals into are vertebrates and invertebrates. Vertebrates are animals with backbones, and invertebrates have no backbone. Invertebrates usually have a hard external shell, or an exoskeleton, but not always (i.e. octopus, jellyfish, slug, etc).
- As a hands-on activity, have the students create an origami clam shell. Students should be broken into small groups for this activity. Every student can create their own clam shell, and being in groups will allow students to support each other in understanding directions.

<http://www.origami-instructions.com/origami-clam-shell.html>

- Point out to the students that invertebrates usually live “in” their shell or exoskeleton.
- To wrap up class, students should fill out a page for invertebrates in their “field guides” that were created in the previous lesson. Have them write down a definition/description in their own words of an invertebrate. Students should choose an example animal for this section in their field guide. They should write down the name of this animal and gather a picture to place beside the name. The final piece of this lesson is for students to include a reflection piece in their field guides. They will reflect on why the animal they have chosen fits into this specific group.

**Formative Assessment:**

**Ticket-out-the-door:**

How would life be different if you were an invertebrate? Write one paragraph.

### DAY 3: Introduction to Animal Grouping: Vertebrates

EQ: How do I know if an animal is a vertebrate?

**Understandings:** Invertebrates are animals that have no backbones. Animals that are in the vertebrate group will have a backbone. Humans are vertebrates, and snakes are also vertebrates. This is a common misconception, so it should be brought up in this lesson.

- To activate this lesson, create a list on the board of your students' favorite animals. Go through this list and see if there are any invertebrates. Have the students identify these, if any are present. Next, talk about the vertebrates that are listed. Point out to the students that all of these animals have a backbone and an endoskeleton.
- Hands-on activity: Students be broken into small groups to create backbones out of household items. The materials and procedure for this activity are as follows:

#### Materials per group:

- 8 spools
- 10 large buttons
- 1 large pipe cleaner

#### Procedure:

1. Gather all the material you will need for this project.
2. Start by twisting one end of the pipe cleaner.
3. Now thread the other end of the pipe cleaner through a hole in the button.
4. Now slide the button down the pipe cleaner so the button rests on the twist and does not fall off.
5. Now slide the spool down the pipe cleaner and continue by alternating with the buttons and the spools until the pipe cleaner is full.
6. Now twist the end so that nothing falls off and the spools and buttons remain in place.

When students have finished creating their backbones, explain that there are five major types of vertebrates: fish, amphibians, mammals, reptiles, and birds. Each of these will be looked at more in-depth over the next five days. Students should fill out the next page in their field guides: Vertebrates. This page should include a general definition/description of vertebrates, an example and picture of a vertebrate, and a reflection piece for why this animal fits into this distinct group.

**Formative Assessment:**

**Ticket-out-the-door:**

Describe the difference between a vertebrate and an invertebrate. Which group do humans belong to?

#### Day 4: Grouping Vertebrates: Fish

EQ: What characteristics make a vertebrate a fish?

#### Understandings:

Students will understand that fish are a subgroup of vertebrates. The characteristics that define a fish are the following: vertebrates, live in water, cold-blooded, scales, lay eggs, and get oxygen through gills.

- Activate this lesson by reading *Fish Tales* by Nat Segaloff and Paul A. Erickson.
- Students will be broken into small groups to create fish models. The instructions can be found at the following website: <http://www.kinderart.com/recycle/piefish.shtml>
- When students have finished making their fish, they will write a story as a group that must include the major characteristics of fish: vertebrate, lives in water, cold-blooded, scales, lays eggs, and gets oxygen through gills. Students will write the story and highlight these characteristics. These stories should be displayed somewhere around the room or in the hall with their fish creations.
- Students should complete the next page in their field guides for homework: fish. This should include a definition/description of fish, and example and picture, and a brief reflection on why this organism fits into this group.

#### Formative Assessment:

Ticket-out-the-door:

Name three major differences between humans and fish.



## Day 5: Grouping Vertebrates: Amphibians

EQ: What characteristics make a vertebrate an amphibian?

### Understandings:

Amphibians are another subgroup of vertebrates. The defining characteristics for these animals are as follows: vertebrates, cold-blooded, soft, moist skin, live in water after hatching from eggs ---use gills to breathe, and as adults they live on land and use lungs to breathe.

- Activate this lesson by playing this animation of a frog's life cycle video: <http://www.youtube.com/watch?v=7NhA9SHunKs>
- Have the students try to recreate the frog's life cycle on the board with drawings. There should be a stage where the frog is in egg form, then move to tadpole, a more mature tadpole with legs and arms, and a frog that has moved to the land. Discuss how the tadpole begins its life in the water, using gills to breathe once it has hatched from the egg. The tadpole must undergo change (metamorphosis) as it grows and matures. This is where we see the tadpole gaining legs and starting to see its tail shrink. Once the tadpole matures, it eventually moves to the land, no longer using gills to breathe, but instead using lungs to breathe. When frogs are mature, their skin will secrete mucus to keep it moist and, like fishes, these creatures are cold-blooded. A frog is just one example of what we call amphibians.
- Hands-on activity for students: <http://www.dltk-kids.com/animals/mfroglifecycle.htm>  
Students will create this life cycle of a frog model to help them remember amphibian characteristics.
- Show the following video: <http://www.youtube.com/watch?v=ti0HDtRY8u4>  
This video contains a catchy song to help kids remember there is a change in the life of an amphibian, and it also shows some different types of amphibians to help them choose one for their amphibian pages in the field guides we have been creating.
- If time permits, students can fill out their amphibians page of the field guides in class. If not, students should do this for homework. This page should include the following: a definition/description of amphibians, and example and picture of an amphibian, and a reflection on why this animal is considered an amphibian.

### Formative Assessment:

#### Ticket-out-the-door:

Do amphibians begin life on land and finish it in the water, or is it the other way around? Give one example of an amphibian.

## Day 6: Grouping Vertebrates: Reptiles

EQ: What characteristics make a vertebrate a reptile?

### Understandings:

Students will understand that reptiles are a subgroup of vertebrates. They are identified by the following characteristics: vertebrates, have scales, cold-blooded, lay eggs, and do not feed their young.

- Activate this lesson by showing the following video:  
<http://www.youtube.com/watch?v=oBz00-Go3gg>
- List the characteristics of reptiles on the board. In small groups, have the students come up with a poem or rap about reptiles using the characteristics listed. Each group should be given a poster board, a pair of scissors, and markers. Students will turn the poster into the shape of a reptile, write their poem or rap on the reptile, and decorate. These would be great projects to display.
- When students have completed their posters, have them present them to the class.
- If time permits, students may fill out their reptile page in the field guides we have been creating. If not, these should be done for homework. This page should include the definition/description of a reptile, an example and picture, and a brief reflection on why this animal fits into the category of reptiles.

### Formative Assessment:

#### Ticket-out-the-door:

What is the scariest (or coolest) reptile you can think of? How do you know this animal is a reptile?

## Day 7: Grouping Vertebrates: Birds

EQ: What characteristics make a vertebrate a bird?

### Understandings:

Students will understand that birds are vertebrates. The characteristics that define a bird are the following: vertebrate, have feathers, lay hard-shell eggs, and they are warm-blooded.

- Activate this lesson by showing this video: <http://www.youtube.com/watch?v=T5m4NnbPksc>
- As a hands-on activity, students will create bird masks. This link has instructions and a list of materials needed as well: [http://www.freekidscrafts.com/paper\\_plate\\_bird\\_mask-e519.html](http://www.freekidscrafts.com/paper_plate_bird_mask-e519.html)
- These masks will have feathers on them to help students remember that these are a vital component of bird classification. This might be a good place to talk about the difference between a bird and a bat because, although bats fit some bird characteristics, bats are actually mammals.
- Students should complete the birds page in their field guides today. It should include the following: a definition/description of birds, an example and photo, and a brief reflection on why this particular animal was chosen and how it fits the bird group.

### Formative Assessment:

#### Ticket-out-the-door:

What is one thing birds have that no other animal group has?

## Day 8: Grouping Vertebrates: Mammals

EQ: What are the characteristics that classify a vertebrate as a mammal?

### Understandings:

Students will understand that mammals are vertebrates. The characteristics that define a mammal are the following: hair or fur, warm-blooded, and they usually give birth to live young who feed off of milk from the mother.

- Activate this lesson by showing this YouTube video about mammals:  
[http://www.youtube.com/watch?v=cU4Bo\\_rF\\_R0](http://www.youtube.com/watch?v=cU4Bo_rF_R0)
- Students will participate in an in-class scavenger hunt today. Here is a link with the resources and directions needed for this activity:  
[http://www.superteacherworksheets.com/animals/mammal-scav-hunt\\_MAMMA.pdf](http://www.superteacherworksheets.com/animals/mammal-scav-hunt_MAMMA.pdf)
- Have the students fill out their mammals page in their field guides as the summarizing activity. They will need to have a description/definition of mammals, an example and picture, and a brief reflection on why they chose this animal as one that fits into the mammals category.
- Give each student a copy of the animal characteristics to take home from this website for review:  
[http://www.sheppardsoftware.com/content/animals/kidscorner/classification/kc\\_classification\\_main.htm](http://www.sheppardsoftware.com/content/animals/kidscorner/classification/kc_classification_main.htm)

### Formative Assessment:

#### Ticket-out-the-door:

Are you a mammal? What characteristics do you have or not have that mammals have?

## Day 9: Introduction to Plant Grouping: Vascular and Non-Vascular

EQ: How are plants grouped?

### Understandings:

Students will understand that plants are grouped into different categories. Two major categories are vascular and non-vascular.

- Activate this lesson by having the students go outside into a designated area, equipped with a plastic bag and plastic gloves. Tell the students to collect different types of plants that they see into their bags. Students should be given about 5 minutes to collect these things.
- Bring the students back into the classroom and discuss this PowerPoint:  
<http://www.cascience.org/csta/pdf/conferencehandouts/WhitelyVascularNonvascularPlants.ppt>
- Have the students split into groups and sort the plants given to their group using the characteristics in the PowerPoint. Teacher should check each group's work.

### Formative Assessment:

#### Ticket-out-the-door:

Write definitions for vascular plant and non-vascular plant in your own words. Draw a picture to illustrate your definitions.

## Day 10: Plant Grouping: Vascular vs. Non-Vascular

**EQ:** How are vascular and non-vascular plants structurally different?

**Understandings:**

Students will understand that vascular and non-vascular plants are structurally different, even at the microscopic level.

- Begin today's lesson by demonstrating proper use of a microscope. Make sure students understand that the slides we are putting in the microscopes are made of glass and can shatter/cut them. Here is a good video to use for general lab safety:  
<http://www.youtube.com/watch?v=tsAHt0FiwNM>
- Proceed to examine plant samples as follows:

### Step 1

Have students take bits of the plants they gathered and sorted yesterday and make their own slides to examine under the microscopes. They should keep in mind the characteristics of vascular and non-vascular plants.

### Step 2

Place the plant samples on microscope slides. Examine the slides under the microscope. Look for distinguishing characteristics of vascular and non-vascular plants.

### Step 3

Write a list of the differences between the cells of vascular and non-vascular plants. Keep in mind that vascular plants have tubes that transport water between various parts of the plant; non-vascular plants do not.

### Step 4

Examine the plants. Remember the differences between the size and physical appearance of vascular and non-vascular plants.

### Step 5

Look at the plants and plant samples you have taken. Vascular plants tend to be tall, leafy plants. Non-vascular plants have no roots, stems or leaves.

### Step 6

Compare the plant samples and determine which type of plant they came from.

- Teacher should take up the list of differences written by the students during this examination as formative assessment for this day. Students will fill out the final two pages of their field guides today: vascular plants and non-vascular plants. They should write a definition/description, give an example and picture, and write a brief reflection of why this plant fits for each. Tomorrow is the big field trip!

**Formative Assessment:**

**Ticket-out-the-door:**

Draw a picture of a vascular plant cell and a picture of a nonvascular plant cell like the ones you saw under the microscope. What was one thing that really stood out that was different to you?

## **Day 11: Cannon's Point**

### **Understandings:**

**Students will understand that there are many different plants and animals in the real world. Scientists collect and study these plants and animals and group them according to their findings. Today students act as such.**

- **Students should be briefed on safety procedures before they arrive at Cannon's Point. They will need to be dressed appropriately, being covered and wearing bug spray. They also must have their permission slips in by now.**
  
- **Each student should be equipped with a disposable camera with his/her name on it, a big plastic Ziploc bag labeled with his/her name, plastic gloves, his/her field guide, and a magnifying glass. They are to find samples/take pictures of as many plants and animals as possible. (only take samples of small plants) As you pass different wildlife/plant life, discuss a few examples and the habitats. Encourage students to use their field guides to discuss and examine the wildlife/ plant life!**
  
- **Bring the students back to the classroom safely. Collect all of the samples and cameras to use in the next class.**

**Day 12: Bringing it all together**

**EQ: How are plants and animals grouped?**

- **Teacher will need to have the camera films developed and sorted per student. Students will go through their photos and samples and discriminate between the different plant and animal groups to see which each belongs to. This should be done individually.**
- **Before students leave, they should turn in their completed field guides. These are going to be used as summative assessment and will be graded according to the rubric that follows. Any extra time in class this day will be used to finish these up for students who have not yet completed them, or to continue examining samples for students who have.**



FIELD GUIDE RUBRIC

<p>CONTENT Description of plant/ animal (5pts)</p>	<p>5 points: A maximum of one section is missing from the entire field guide. Every page includes all information given in class about each organism and its distinguishing characteristics.</p> <p>4: Two – three sections are missing from the field guide, but all relevant information from class about each present organism’s defining characteristics is displayed.</p> <p>3: More than three sections are missing from the field guide. Most of the relevant information from class is present pertaining to distinguishing characteristics.</p> <p>2: More than three sections are missing from the field guide. Student gives little information from class discussion of distinguishing characteristics in their field guide.</p> <p>1: More than three sections are missing from the field guide. No information on distinguishing characteristics or description of organism can be found.</p> <p>0: Student failed to write a description for any organisms.</p>
<p>Example and photo of plant/ animal (5 pts.)</p>	<p>5: Student has a photo of each organism in the field guide. Maximum of one photo missing.</p> <p>4: Two to three photos are missing</p> <p>3: Four to five photos are missing</p> <p>2: Six to seven photos are missing</p> <p>1: Eight photos are missing</p> <p>0: All photos are missing</p>

<p>Student reflection on plant/animal (10 pts)</p>	<p>9-10: Student gives detailed answers using the characteristics discussed as evidence for their organism fitting the group chosen. No more than one reflection is missing from the field guide.</p> <p>7-8: Student gives detailed answers using the characteristics discussed as evidence for their organism fitting the group chosen, but 2-3 reflections are missing.</p> <p>5-6: Student has somewhat detailed answers with reasoning pertaining to organism characteristics that have been discussed. Student may have a few missing reflections, or the reasoning might not match up entirely with those of the chosen group.</p> <p>3-4: Some reasoning has been given for most organisms, but the reflections do not connect well with the characteristics in each group. Many reflections are missing, but some connect well.</p> <p>1-2: Little to no reasoning is given for why organisms were selected for each group. Several reflections are missing from the entire field guide.</p> <p>0: Student did not reflect at all.</p>
<p>Extra Credit (2 pts.)</p>	<p>Field guide was decorated creatively.</p>

TOTAL POINTS: \_\_\_\_\_ / 20