



County Implementation Award Program (CIAP) Math and Science Lesson

Unit Title: Animal Adaptations
Lesson Title: Fabulous Swimming Feet
Author: Brenda Stracener
Grade Level: 1 st
Time Frame: 55 minutes
Targeted Standard(s): 1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use the parts to help them survive, grow, and meet their needs. 1.NBT.A.1 Count to 120, starting at any number less than 120. In this range, read and write numerals and represent several objects with a written numeral. 3.MD.C.5.B A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units. MP6 Attend to precision.
Short Description of Targeted Phenomenon: Share with students the video of a duck swimming from below. https://www.youtube.com/watch?v=VXrOdyRkoF4 Ask them to share what they notice and wonder. Students will discover how a duck foot is adapted with characteristics (larger surface area and webbed toes) to move from place to place in its habitat.
Three Dimensions of NGSS
Science & Engineering Practice/s (SEP): <i>Constructing Explanations and Designing Solutions</i> <i>Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.</i> <i>-Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1)</i>
Crosscutting Concept/s (CCC): Patterns: <i>Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.</i>
Structure and Function: <i>The shape and stability of structures of natural and designed objects are related to their function(s).</i>
Connection to Engineering, Technology, and Applications of Science: <i>Influence of Engineering,</i>

Technology, and Science on Society and the Natural World:

-Every human-made product is designed by applying some knowledge of the natural world and is built by using materials derived from the natural world.

Disciplinary Core Idea/s (DCI): LS1.A: Structure and Function: *All organisms have external parts.*

Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1)

LS1.D: Information Processing: *Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1)*

Language Supports:

anchor chart (duck foot/chicken foot), pair share before group discussion, counting strategy posters displayed on math strategy wall.

Materials Needed:

picture of duck foot, picture of chicken foot, water, plastic container, plastic fork, masking tape, template of duck footprint, template of chicken footprint, unit cubes

Objective(s): Students will be able to:

1. Compare the characteristics of the feet of birds that swim and do not swim.
2. Understand that the feet of swimming birds are characterized by webbing and/or larger surface area that moves water more efficiently than bird feet with smaller surface area.
3. Measure the foot (template) of a non-swimming and swimming bird with unit cubes to determine its area.
4. Compare the cubic measurement of the foot print and identify the foot with the larger number of cubic units (area).

How Math and Science concepts/skills/practices were integrated in this lesson:

Students will compare the characteristics of bird feet that allow some birds to swim. They will discover that birds who swim have feet with larger surface area that allow water to be pushed effectively to move the water while birds that do not swim have feet with less surface area and separated toes that do not push water effectively to move through water. The math connection in this lesson is both counting and comparing measurements. Students will be exposed to a future standard of finding area but will be using 1st Grade math standards to count cubic units, compare the measurements for larger number and to attend to precision.

Possible Challenges /Misconceptions:

Students will need to be careful and concise in placing unit cubes on the foot templates to obtain an accurate measurement of area. They will need to use a counting strategy (one by one, grouping, etc.) to be accurate in finding the total number of cubes for each foot template.

Formative Assessment:

Teacher observation of groups while comparing foot characteristics and while conducting area measurement of foot area with cubes.

Lesson Opening (10 minutes)	
<p>Teacher Actions (10 minutes) Engaging Phenomenon Show video clip of duck swimming underwater: https://youtu.be/VXrOdyRkoF4 Ask students: (Allow a few minutes for discussion with an elbow partner before whole class discussion.)</p> <ol style="list-style-type: none"> 1. What animal is this? 2. What is it doing? 3. Do you think other birds can swim like this too? 	<p>Student Actions Watch video clip. Active participation in discussing and sharing out ideas for teacher questions.</p>
Lesson Introduction (5 minutes)	
<p>Teacher Actions Show students worksheet with 7 different types of bird feet. http://www.fernbank.edu/Birding/bird_feet.htm Have students compare (study pictures for similarities and differences). Ask: <i>Why do you think that different birds have different foot characteristics? How do the different characteristics help the bird survive in its habitat?</i> Say: <i>Today we are going to study the characteristics of two different types of birds, a duck and a chicken. We will compare them to see how they are the same and different. Which bird has the most fabulous swimming feet? Let's find out.</i></p>	<p>Student Actions Study pictures of 7 different bird feet. Study and identify similarities and differences of different bird feet. Share observation of similarities and differences (in small groups of 2-3 and whole class discussion.) Share reasoning for benefits of different foot characteristics (in small groups of 2-3 and in whole class discussion).</p>
Body of Lesson (30 minutes)	
<p>Teacher Actions Show the class a picture of a duck's foot and a chicken's foot. Ask students what they notice/see. Record student observations on a two-column anchor chart (one column for duck feet and another column for chicken feet). Hold up a plastic fork. <i>Which foot does this fork look like?</i> Put students in groups of three to four. Give each group a plastic container of water and a plastic fork. Have students test moving the fork through the water. Ask each group, would this type of foot be good for swimming? What happened to the water? (openings in the fork did not move the water) Ask which bird is a better swimmer, a duck or a</p>	<p>Student Actions Observe characteristics of duck and chicken feet based on a picture. Experiment using the plastic fork through water to decide if it would make a good swimming foot. Add masking tape to the fork to mimic the characteristics of duck feet. Students experiment using the adapted fork (with masking tape) to</p>

<p>chicken? (duck) Ask, how could we make our plastic fork be more like the duck foot? (close the open spaces in the fork)</p> <p>Give each group a large piece of masking tape to wrap around the fork and have them test the fork in the water again.</p> <p>Ask the group, what happened with the water after you added masking tape? (the fork was able to move the water.)</p> <p>Say, let's do some measuring to compare our two types of bird feet. Pass out a chicken footprint template, duck footprint template and unifix cubes to each group. Tell students that they are going to measure the area of the different bird feet by placing unifix cubes side by side inside the footprint lines. Remind them they should only count cubes that fit all the way inside the footprint line. After groups measure the two footprints, discuss their findings (lab sheet)</p>	<p>move water. They discuss their findings and record their observations on their lab sheet.</p> <p>Use unit cubes to measure the area of the duck and chicken footprint templates. They count the total cubes for each footprint and compare the results. Students identify which footprint has a larger cubic measure (area).</p>
<p>Lesson Closure (10 minutes)</p>	
<p>Teacher Actions</p> <p>Whole class discussion -- Review group findings (larger surface area of foot led to more water movement)</p> <p>Ask:</p> <ol style="list-style-type: none"> 1. Which type of foot (duck or chicken) moved the water best? 2. Which footprint had the largest number? 3. What could this mean? 	<p>Student Actions</p> <p>Students discuss their findings and their ideas how the larger surface area helps a duck moved more efficiently through the water than a chicken.</p>
<p>Summative Assessment: lab sheet</p>	
<p>Other Teaching Resources:</p> <p>Bird Feet Information Sheet from Ferndale Science Center: http://www.fernbank.edu/Birding/bird_feet.htm</p> <p>Follow-up Read Aloud: What If You Had Animal Feet? (Sandra Markle) page 14-15 Duck Billed Platypus Duck and Chicken footprint templates are from www.printabletreats.com (for educational use only)</p>	
<p>Lab Safety: none</p>	
<p>Extensions (if any): To connect back to the Performance Expectation, have students design a solution to a human problem connected to the learning done in this lesson, such as developing a tool to help people swim farther/more easily. (Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to</p>	



protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.)



Name _____ # _____

Fabulous Feet

Lab Sheet

1. What attributes did you notice on the bird feet pictures? How are they the same and how are they different?

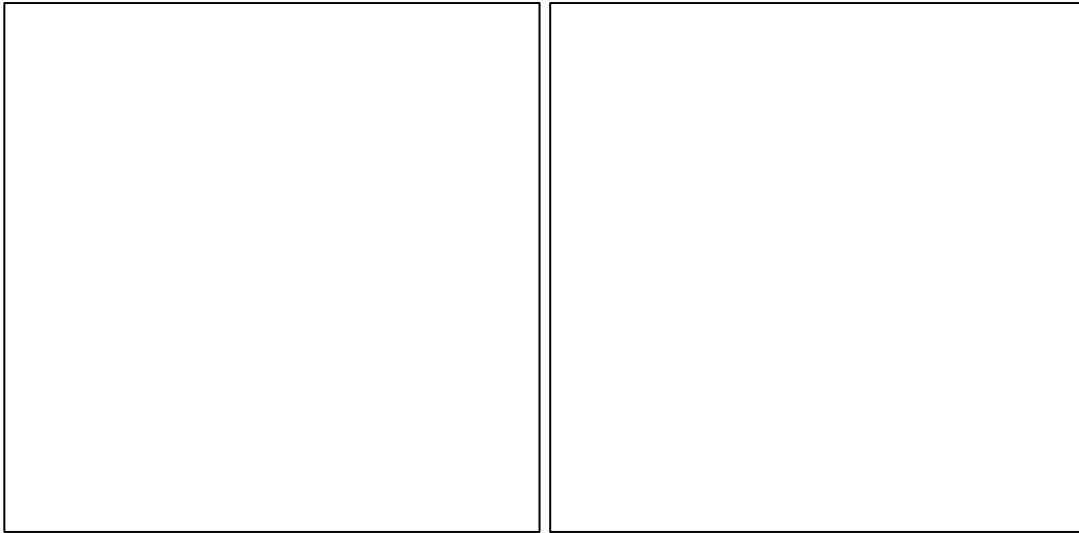
2. What happened when you moved the fork through the water? _____

3. What happened after you added tape to the fork? _____

4. Which type of bird foot would move more water (a chicken or a duck)? _____

5. How are the fork and the bird foot related? What do you notice? _____

6. Measure the two footprints with unifix cubes. Draw a picture and write the number of cubes you need to cover each footprint. Only count the cubes that fit all the way inside the footprint.



Chicken Footprint

_____ cubes

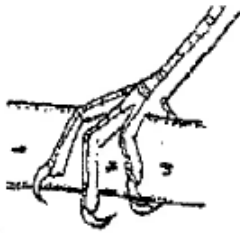
Duck Footprint

_____ cubes

7. Which footprint is covered by a larger number of cubes? _____

Fernbank Science Center
156 Heaton Park Dr.
Atlanta, GA. 30307

Info. sheet



SONG BIRDS or PERCHING BIRDS (warblers, thrushes, wrens, etc.) have independent, flexible toes, with one pointing backwards, ideal for grasping perches. **Why don't perching birds fall out of trees when they sleep?** When perching birds sit, a tendon on the backside of the ankle automatically flexes locking their toes around the branch. With feet locked, sleeping birds don't fall. As the bird stands up its feet release.



WOODPECKERS have two toes pointing forwards and two backwards; for climbing up, down, and sideways on tree trunks.



WATER BIRDS such as ducks have webbing between their toes for swimming. **GULLS** also have feet similar to these so they don't sink while walking in the soft sand or mud near the water's edge.



WADING BIRDS. The long toes of herons, which spreads the bird's weight over a large surface area, facilitates walking on soft surfaces near the water's edge (where wading birds like to eat).



RAPTORS such as hawks, eagles, and owls use large claws (called talons) to capture, kill, and carry prey with their feet.



Pheasants and chickens use their strong feet to scratch the dirt and leaf litter to uncover seeds and insects.



Strong-legged **flightless birds**, like the cassowary, protect themselves by kicking with their powerful feet and sharp claws.



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