



Task of a Trunk: An Adaptations Inquiry (Advanced 6-12)

At a glance

Students investigate the question of how elephants use their trunks most often through observation at the Zoo.

Time requirement

- 2 classroom sessions of 45 minutes each (one prior to the Zoo visit, and one after)
- 2 30 minute observations periods at Zoo

Group size and grades

Any number of small groups of 2 to 5 students

Grades 6-12

Materials

Stopwatches

Pencils

Data sheets

Results worksheets

Clipboards or stiff piece of cardboard

Goal

Through an inquiry investigation learn why animals have adaptations

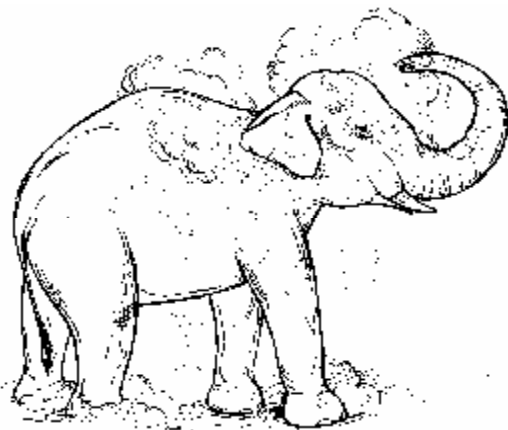
Objectives

1. Students will conduct an investigation using the scientific method
2. Students will be able to calculate averages and create a bar graph
3. Students will be able to interpret and discuss their findings
4. Students will understand how their findings could be useful in real world applications
5. Students will be able to define adaptation
6. Students will be able to describe why animals have adaptations and how they use them to survive.

Theme

The elephant uses its trunk as an adaptation in a variety of different ways to help it survive.

Elephants use their trunks to toss dirt and grass on their backs to keep biting insects away. Who knew that dirt could be used as a bug repellent!



Academic standards - Science

<p>Ohio Science Academic Content Standards (Grade: Indicators)</p>	<p>Life Sciences <i>Characteristics and Structure of Life</i> (7:1) <i>Evolutionary Theory</i> (7:8) <i>Diversity and Interdependence of Life</i> (10:14,15) (11:10) (12:7)</p> <p>Science and Technology <i>Abilities To Do Technological Design</i> (9:2,3)</p> <p>Scientific Inquiry <i>Doing Scientific Inquiry</i> (6:2) (7:3,4) (8:1,3,4) (9:5,6) (10:2,4) (11:1,2,3,5) (12:1,4,5)</p> <p>Scientific Ways of Knowing <i>Nature of Science</i> (6:1) (9:2) (10:3) (11:1,2) (12:4) <i>Scientific Theories</i> (10:6) <i>Ethical Practices</i> (6:2) <i>Science and Society</i> (6:3)</p>
<p>Kentucky Core Content— Science</p>	<p>Biological Science Unity and Diversity SC-(06-3.4.2) Biological Science SC-(06-3.5.1) (08-3.5.1) (HS-3.5.2)</p> <p>Unifying Concepts Interdependence SC-(HS-4.7.1)</p>
<p>Indiana Science Standards</p>	<p>The Nature of Science and Technology Scientific Inquiry (6.1.3) (7.1.4)</p> <p>Scientific Thinking Communication Skills (6.2.5,6,8) (8.2.8)</p> <p>The Living Environment Diversity of Life (6.4.3)</p> <p>Biology I Principles of Biology Evolution (B.1.34) Ecology (B.1.43,46)</p> <p>Environmental Science, Advanced Principles of Environmental Science Environmental Systems (Env. 1.4) Animal Genetics and The Environment Evolution (AS.4.14)</p>

Elephant Background

Each species is adapted to live in a specific habitat, where it lives and finds what it needs to survive—food, water, shelter, and space. The physical and behavioral characteristics that enable an animal or plant to survive in its particular habitat are called adaptations.

The elephant's most famous adaptation is certainly its trunk. A formidable body part, the trunk is comprised of more than 100,000 muscles and has one or two (depending on the species) fingerlike tips. It's how the elephant uses the trunk, its behavior, which truly makes it an indispensable adaptation. For example, this fifth limb has the ability to pick up a huge tree by its trunk or a twig the size of a pencil. The trunk acts as a snorkel to breathe through when under water and as a hose while bathing. The elephant also uses its trunk to bring food and water to its mouth, to trumpet to

communicate, to dust its back for protection from the sun, and to hold mother's tail for safety.



The elephants on display at the Zoo are Asian elephants, which are found in the tropical region of Southeast Asia. They

live in grasslands, swamps, and forests. Asian elephants are the world's largest land mammal, weighing up to 11,000 pounds and eat leaves, grasses and fruits.

Giraffe Background

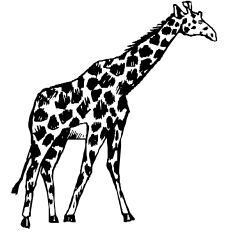
At 17 feet, the giraffe is the world's tallest animal. The giraffe's neck can be 6 feet long, the same length as its legs. This long neck, along with their 18 inch tongue, equips giraffes with the ability to eat leaves off the highest parts of the trees. The only other grazer that can reach these leaves is the elephant. Giraffes have excellent eyesight which they use to scan for predators on the African savanna and because of their height they can see further distances than other animals.

The Cincinnati Zoo currently houses Maasai Giraffes. This species of giraffe can easily be identified by their jagged spots. Each giraffe has its own unique markings much like human's

fingerprints. Be sure to look at the signs down by Giraffe Ridge to see how zookeepers use these unique spot patterns to identify the animals in the collection.

Vocabulary

Adaptation— A body part or behavior that helps an animal survive in its habitat



Hypothesis—A proposed explanation that predicts an outcome of an investigation

Activity

Getting ready

Copy the Data Sheets so that each group of students has one. Copy Results worksheets so that each individual student has one to be done back in class.

Optional: If you want the students to practice collecting data prior to the Zoo visit, either find a video of wild elephants or shoot a video of the elephants at the Zoo to use in the classroom.

Doing the activity

Classroom Session Prior to Zoo Visit

Ask students to think about when they eat cereal for breakfast. How do they pour the milk? Or pick up the spoon? We can eat and drink because we have special hands that have opposable thumbs. Thanks to our thumbs, we can hold a spoon or pick up a cup, which makes eating and drinking a bit easier.

Drop 3 pennies on the table or floor. Have students pick them up. Ask "why are we doing this? This seems like a pretty silly little task." Then drop the pennies again and have the students pick the pennies up without using their thumbs. (They can either tuck their thumb in or they can tape their thumbs to their fingers). Then ask again, "why are we doing this. What does teach us about opposable thumbs?"

Having thumbs for grasping is an example of an adaptation. An adaptation is a body part or behavior that helps an animal survive. A thumb is a body part, and how we use it to grasp the milk carton or a spoon is a behavior.

Animals don't have to pick up a milk carton or a spoon, but they do have to eat. How do they do it without hands and thumbs? Each animal has special

physical features and behaviors (adaptations) that help them to get food, drink water, and do other things.

Ask them how an elephant gets food and water. What adaptations does it have to help? A trunk! A trunk is very similar to our hands.

Make a list of all the different ways the students think an elephant might use its trunk. If you choose, you can have the students do some research on this topic. You might also want to show a video of elephant behavior.

Elephants use their trunks in many ways, but what do elephants use their trunks for most often: eating, drinking, bathing, dusting, or communicating?

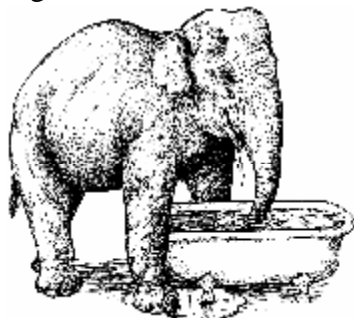
Explain to the students that scientists often conduct observational investigations to answer questions about animal behavior. Learning about animal behavior can help people care for captive animals and better protect those in the wild.

Break the class into pairs or small groups. Tell the students that they will be conducting an investigation and each group needs to create a hypothesis, in which they will predict the activity that the elephants will do with their trunks most often and give a little explanation as to why they think so. For example: The elephant will use its trunk for eating more than any other activity, *because* elephants must eat a lot and more often for their size.

Discuss as a class how they could answer the question by watching the elephants at the Zoo. They'll need to count how many times an elephant uses its trunk for each activity.

At-the-Zoo

Pass out the Data Sheets, clipboards, pencils, and stopwatches. Go over the instructions for how each group will collect data during the Zoo visit. Go to the Elephant Reserve exhibit. Note that the elephants and giraffes should be on exhibit outside if it's above 50°F. Otherwise, you can view them inside the building.



After completion of the elephant investigation, have the students apply their knowledge gained to conduct a similar investigation on giraffes.

Classroom Session After Zoo Visit

Have students combine their data with other classmates' on their Results worksheets. Then each student should calculate the average number of times an elephant used its trunk for each activity over all the observation periods and create a bar graph to illustrate the results.

Repeat for giraffes.

The students should consider their results and answer the questions on the worksheet.

Wrap-up

Discuss students' answers from the Think and Apply and The Big Picture sections on their results sheet.

Assessment

Collect the completed Results worksheets.

Unsatisfactory—Did not complete the worksheet and/or put forth little effort.

Satisfactory—Completed the worksheet.

Excellent—Completed the worksheet and provided thoughtful answers.

Extension

Have students develop their own testable questions and design and conduct investigations about adaptations of wildlife in their backyards, animals in the classroom, or their own pets at home.

Resources

Books

Asian Elephant. Louise Spilsbury. 2006.
Elephants (True Books). Melissa Stewart. 2002.
Eyewitness: Elephant. Ian Redmond. 2000.
Little Elephant's Trunk. Hazel Lincoln. 2006.

Internet

"Maasai Giraffe" <http://www.cincinnati-zoo.org/animals/mammals/maasaigiraffe.html>

Video/DVDs

Corwin's Quest - Episode 7: The Elephant's Trunk. Discovery Channel. 2007.

How Does an Elephant Use its Trunk Most Often? - Data Sheet

Names _____

Background

Each species is adapted to live in a specific habitat, where it lives and finds what it needs to survive—food, water, shelter, and space. The physical and behavioral characteristics that enable an animal or plant to survive in its particular habitat are called adaptations. While physical and behavioral adaptations usually develop through gradual processes over many generations, behavioral adaptations can also be learned and occur within a single generation.

The elephant's most famous adaptation is certainly its trunk. Go to the sign located by the Elephant Bath area where visitors can sit down and view the elephants and read about the elephant's amazing trunk. Write down at least 3 interesting facts about an elephant's trunk.

1. _____
2. _____
3. _____



Asian Elephant's Wild Habitat Vs. Captive Habitat

Cincinnati Zoo currently houses Asian elephants. Wild Asian elephants are found in the tropical region of Southeast Asia where they live in grasslands, swamps, and forests. Asian elephants need plenty of space to roam around because they are always on the search for food. They can eat up to 250 pounds and drink up to 40 gallons of water in a single day. That would be like you eating 1,000 quarter-pound cheeseburgers and drinking 123 Super Size beverages. Elephants are the world's largest herbivores. In the wild and in captivity they will eat grasses, leaves, and fruit.

Look at the elephant exhibit here at the zoo. List at least three ways this elephant yard is different from the habitat of a wild elephant?

1. _____
2. _____
3. _____

List at least three ways the elephant yard is similar to a wild elephant's habitat?

1. _____
2. _____
3. _____

Extension: (To be done back in class)

Now that you know more about the habitat of elephants and what zoos do to try and mimic that habitat; write a story about some of the experiences a captive elephant might have if it escaped into the wild. To conserve paper you can write your story on the back of this investigation packet. Be scientific but also be creative in this fun writing activity.

Investigation:

You have learned plenty about an elephant's trunk but do you know what an elephant uses its trunk for most often? Complete the following investigation to answer the question:

How Does an Elephant Use its Trunk Most Often?

Before You Begin the Investigation:

1. Assign one group member to be the Timer, one to be the Writer, and the rest will be watchers.
 2. Pick one elephant to observe for 10 minutes.
 3. Make a hypothesis (an *explanation* of what you think the outcome of the investigation will be). Do you think the elephant you picked will spend more time using its trunk for eating, drinking, bathing, dusting, communicating, or another activity (please describe what that other activity may be). In order for it to be a true hypothesis you must provide an explanation of what you think the outcome of your investigation will be. Remember your hypothesis may be incorrect and that is ok. If scientists knew all the answers there would be nothing to investigate.
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Doing the Investigation:

1. When the Timer says start, the Watchers should observe the elephant and tell the Writer each time it uses its trunk for one of these activities:

Eating – The elephant uses its trunk to pick up grass/hay/food and puts it in its mouth.

Drinking – The elephant uses its trunk to suck up water, and sprays it in its mouth.

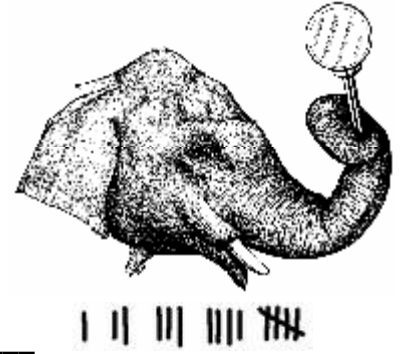
Bathing – The elephant uses its trunk to spray water on itself.

Dusting – The elephant uses its trunk to throw dirt or hay on its back.

Communicating – The elephant uses its trunk to touch another elephant, or to make noise.

Other – The elephant uses its trunk in some other way.

- Each time the elephant uses its trunk, the Writer makes a tally mark in the box describing that trunk activity to keep track of how many times it does each activity.
- The Timer should let everyone know when 10 minutes is up and they can stop collecting data.



If you are using a watch write down the start and stop times.

Start time: _____ Stop time: _____

	Eating	Drinking	Bathing	Dusting	Communicating	Other
Number of times						

- Bring this data sheet back to school with you.

Investigation #2 Giraffes

How Does a Giraffe Use its Neck Most Often? - Data Sheet

There is another animal here at the zoo that has a long adaptation. Giraffes are the tallest land mammals on earth and can reach heights up to 17 feet. The giraffe's neck can be up to 6 feet long, the same length as its legs. This long neck equips giraffes with the ability to eat leaves off the highest parts of the trees. The only other grazer that can reach these leaves is an elephant. Giraffes also have excellent eyesight which they use to scan for predators on the African savanna.

The Cincinnati Zoo currently houses Maasai Giraffes. This species of giraffe can easily be identified by looking at their jagged spots. Each individual has its own unique markings much like human's fingerprints. Be sure to look at the signs down by Giraffe Ridge to see how zookeepers use these unique spot patterns to identify the animals in the collection.

Why do you think a giraffe evolved to have such a long neck?

Much like what you did with your elephant investigation you will need to find a way to determine what a giraffe uses its neck for most often. Construct another chart and write down some possible behaviors you may see a giraffe do with its neck in order to answer this question. The behaviors may be different than the elephant's. Be sure to provide a place for "other" in case you see a behavior you did not predict. If you can not think of any behaviors to look for, take 5 minutes and observe the giraffes before tallying any information and read the signs located at the giraffe viewing area. There are plenty of facts about what giraffes use their elevated heights for.

Write a hypothesis for what a giraffe uses its neck for most often.

Use the sign located in front of the lookout area and identify the giraffe you are observing.

Name of Giraffe _____

Giraffe Chart

In-School Activity

Here is your chance to see what your classmates came up with.

How Does an Elephant Use its Trunk Most Often? - Results

Name _____

1. Fill in the chart with the number of times each group's elephant did each activity.
2. Calculate the average number of times an elephant did each activity.

To calculate an average, add up the total number of times all elephants did an activity, and divide that total by the number of elephants observed. Show your work.

Number of times	Eating	Drinking	Bathing	Dusting	Communicating	Other
Group #1						
Group #2						
Group #3						
Group #4						
Group #5						
Average						

3. Create a bar graph. Draw a bar above each measurement category that goes as high as the amount recorded.



Think and Apply

1. Looking at your results, how does an elephant use its trunk most often?
2. Was your hypothesis correct?
3. If data collected doesn't match up with everyone's data, does that make your data wrong? Why or why not?
4. Why do you think an elephant has evolved to have such a long trunk? In other words, why is having a long trunk a good thing for an elephant?
5. What other questions do you have about elephants that you could investigate?

How Does a Giraffe Use its Neck Most Often? - Results

Name _____

- Fill in the chart with the number of times each group's giraffe did each activity. Add more columns as needed.
- Calculate the average number of times a giraffe did each activity.

To calculate an average, add up the total number of times all giraffes did an activity, and divide that total by the number of giraffes observed. Show your work.

Number of times						
Group #1						
Group #2						
Group #3						
Group #4						
Group #5						
Average						

6. Create a bar graph. Draw a bar above each measurement category that goes as high as the amount recorded.



Think and Apply

5. Looking at your results, how does a giraffe use its neck most often?
6. Was your hypothesis correct?
7. Why do you think a giraffe has evolved to have such a long neck? In other words, why is having a long neck a good thing for a giraffe?
8. What other questions do you have about giraffes that you could investigate?

The Big Picture

1. Why do you think it is important to understand why animals have adaptations?
2. Why do you think animals have different adaptations and how do you think these adaptations help them to survive in their habitats?

Things to consider in your answer:

- *availability and competition for food
- *the role humans play in the Earth's ecosystem
- *the food chain
- *the future for all animals in a changing world