

ANIMALS & ECOSYSTEMS



**A facilitator's guide to animal adaptations and
needs**

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Legend

	Choice- gives an alternative method for activity structure
	Bright Idea- gives you tips on the set-up and logistics of the workshops.
	Culture Note – gives you an idea of varied cultural beliefs to be aware of when presenting this activity.

NOTE: The formatting in this workshop will let you know things to say, things to do, and things you can expect the students to say using the following formatting

Italicized print – guideline for scripting (statements or questions that you could say)

➤ Arrowed bullets, normal print – instructions for things that you could do (i.e., show an object)

Bold Print – responses that the students might give

A. Description of Workshop

Grade for Workshop/ Appropriate Age

This activity is designed for use in Grade 4-12 classrooms.

Overview of Workshop

Explore the needs of living things and understand how animals survive in their own specific habitats. Activities include creating a food web; test various adaptations animals have to keep warm in cold weather; and creating a “super animal” with adaptations to help it survive in its specific habitat.

Science Topics

- Habitats & Ecosystems
- Animal Adaptation

B. How to Run This Workshop

Physical Requirements

Activity 1: You will need a large classroom with a clear space big enough for all students to sit or stand in a circle.

Activity 2: You will need access to cold water or snow to fill buckets.

Materials and Set-Up

Introduction	Activity 1: Food web game	Activity 2: Animal Adaptations	Activity 3: Super Animals
Pictures of Water, Food, Shelter, Sun, Space	Food web tags (1 per student)	Clear Containers (1/group)	Ecosystem descriptions
	Ball of Yarn	Ice water (or snow, if available)	Worksheets (1/student)
		Plastic bags (sandwich bags) or wrap (2+ /group)	Super animal birth certificates (1/student)
		Wrapping materials - fake fur, cotton balls, foil, thermal sock (1 of each / group)	Pencils (1/student)
		Lard Mitt (1/group)	
		Balloons (1/group)	
		Straws (1/group)*	
		Paper towels (for clean-up)*	
		Optional Extension: Thermometers, Paper, Pencils, Water Bottles	

*Consumable items

Timing of Activity

Part of Workshop:	Suggested Timing:	Cumulative Timing:
General Introduction	10 min.	10 min.
Activity #1	10 min.	20 min.
Activity #2	30 min.	40 min.
Activity #3	15 min.	55 min.
Wrap-Up	10 min.	65 min.

C. Introduction to Topic

Object of the Introduction

- Introduce yourself and volunteers (they can each say something about where they're from and what they do)

What is a biologist?

A biologist is someone who studies living things.

Through dissecting words, you can learn what type of science a person does. Biology, bio=life, logy=study of

Today we are going to learn about living things.

What do I mean when I say something is living or alive?

Eats, grows, breathe.



CULTURE NOTE: Conceptually, Inuit cultures view 'living things' as anything with a life cycle. For example, the weather, the seasons, the rocks, the waterways are all included in this view. When you supply the answer you can say that biologists would say that living things are those that eat, grow, and breathe.'

After studying thousands of different living things, scientists have realized:

- All living things need food
- All living things grow and reproduce
- All living things give energy

Now that we know what a living thing is, can you give some names of living things?

Fish, birds, moss, whales, seals, bears etc

All living things, like seals, moss, birds, insects and even people have to have certain things in order to live that are found in their habitat (a habitat is where something lives).

What do you think these things are?

Food, water, shelter/protection, sun and space (not outerspace - room to move around).

WATER:

Where do plants and animals get water from?

Lakes, streams, rivers...

Also, water gets trapped on plants so animals that eat plants (herbivores) will get water from eating plants.

Where do animals get water in the winter when all the water is frozen?

Snow. Also, some animals hibernate so they don't need it.

FOOD:

What are the different categories of animals based on their diets?

Herbivores (plants only), Carnivores (meats only), Omnivores (both)

SHELTER/PROTECTION:

Why is shelter important?

Shelter is important for protection from weather and escaping or hiding from predators.

SUN:

Why do plants and animals need sun?

The sun provides plants and animals with heat and light and gives them energy to grow.

SPACE:

Why is space important?

It is important that plants and animals have enough space to grow (includes travelling to get food, raising young...). Larger animals need more space than smaller ones (i.e. 100 bears wouldn't fit into a classroom – but 100 insects would have enough space to survive in a classroom).



CHOICE: For younger students, you may want to teach them the song about the needs of living things (see I. Extension Activities).

Animals also need to be able to adapt to their habitat.

Animals have certain things on their bodies that allow them to live where they do.

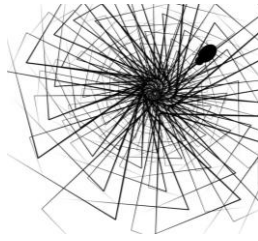
A seal is a good example of this:

- *Have smooth bodies*
- *Flippers for swimming*
- *Thick layer of fat for warmth*

Can you name adaptations other animals have to help them adapt to their habitats?

- **Polar bears: white fur, for camouflage & warmth**
- **Belugas: use their foreheads to bash the ice to breathe**
- **Some snakes: look like other poisonous snakes**

D. Activities



ACTIVITY #1: FOOD WEBS (10 min.)

Object of the Activity

- To demonstrate the relationship between different species in an ecosystem

Suggested Discussion and Instructions

- Give each student a species (or Sun/Water) name tag.
- Have them stand up and form a circle.

Points of discussion:

What are 2 of the most important things for life on earth?

Sun and water

Why do we need them?

Helps plants and other organisms grow.

Why do we need plants and other organisms?

To live, to get supplies, to eat.

What is a predator?

An organism that hunts and eats another organism.

What is prey?

An organism that is eaten.

Can someone give me some examples of predators/prey relationships (what eats what)?

Let students give ideas.

*What is the name for the special interdependent relationship between living things and what they eat? **Food web.***

The food web looks like a big spider web. Using the cards we've given out we're going to make a food web here.

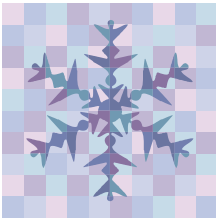
Method:

Part 1:

- Have group stand in a circle.
- Each person in circle wears a tag that identifies them as an organism or element in nature.
- The leader stands in the middle of the circle and begins the game by handing the end of the yarn to sun and then to water.
- Ask what needs water and sun to grow- hand a piece of string to all of the plants, etc. in the circle. Be sure they do not let go of their yarn.
- What eats plants? Continue making connections until everyone in the circle is holding onto a piece of the yarn and the middle of the circle looks like a big tangled web.

Part 2:

- Introduce disease. E.g. What if disease killed all of the voles? Who would be affected? Those directly affected drop their yarn.
- Observe the effects. What if disease affected the willow trees?
- Experiment with how the web is affected to get across the point that all living things depend on other living things and elements in order to survive.



ACTIVITY #2: ANIMAL ADAPTATIONS (30 min.)

Object of the Activity

- To explore the ways in which animals are adapted to cold weather.
- Explore the insulating effects of different materials.

Suggested Discussion and Instructions

How do you stay warm when you go outside?

Coats, hats, mitts, etc

Do animals wear coats and hats?

No.

Can you name some animals that you see outside in the winter?

Answers may vary.

How do these animals stay warm when it is cold outside?

Blubber (fat, like lard) and fur keep Arctic animals warm. Down feathers trap a layer of air next to the body to help keep birds warm. Some animals go south, or hibernate.

Materials that insulate to keep heat in or cold out are very important to keep us healthy and comfortable. A thermos will keep milk cold and fresh so that it is still safe to drink at lunch time. Fleece-lined slippers keep our toes cozy and warm when the floors are cool in winter. Maintaining appropriate temperatures in buildings is important and the energy to provide heat can be expensive. Heating and cooling buildings is one of the greatest uses of energy worldwide.

We are going to explore some different ways that animals insulate themselves to stay warm in the winter.

- Split the class into groups of 3-4 students each.
- Hand out a container of cold water/snow, and the insulation testing materials.



BRIGHT IDEA: While one volunteer is explaining the activity, have the other volunteer fill containers with cold water/snow. Make sure there is enough water/snow to cover an entire finger – preferably a whole hand.

- Walk through the activity with the students before they begin.
- Show a demonstration of how to test the insulation properties of air by putting a balloon over your finger and filling it with air with a straw.
- Explain to students that they will be testing each material by wrapping each finger with a different material, put your hand in a plastic bag, dip it in ice water/snow and see which material keeps your finger warmest (note: the blubber mitt covers an entire hand). As a group, they need to decide which materials were the best at keeping your finger/hand warm?
- Show a demonstration of how to test the insulation properties of air by placing a balloon on one finger without air in it. Then, insert the straw into the balloon (keep it on your finger) and blow some air into it. Test.



CHOICE: For older students, you may want to use more precision. Instead of using your finger, try filling a small water bottle with room-temperature water and placing a thermometer in the bottle. Pack plastic bags with insulating materials and place the bottle in the bags. Record the temperature of the bottle before placing it into the ice water/snow. Measure temperature changes every 5 minutes for 25-30 minutes. Repeat with different insulating materials. Each group could test a different material.



CHOICE: Ask students to find examples around their home of insulators we use every day to keep hot things hot and cold things cold. They can report back to their teacher the following day.

Possible items: thermos, tea cosy for a teapot, insulated lunch bags and picnic totes, down-filled winter coats, fur-lined boots or gloves, foam tubes around hot water pipes, Styrofoam lining in the toilet tank, spray foam insulation on walls, etc.



ACTIVITY #3: SUPER ANIMALS (15 min.)

Object of the Activity

- To apply what they learned about needs of living things to create their own animal

Suggested Discussion and Instructions

An **ecosystem** is the interaction of living and non-living things that are in a delicate balance. Every living thing has a job to do in the ecosystem, and each living thing is divided into specific groups: Producers (green plants) and Consumers (predators and prey).

- Using the Ecosystem task cards introduce the different ecosystems with students and then pass the task cards around for students to look at.

Water: There are two main types of aquatic ecosystems: saltwater (oceans) and freshwater (ponds, rivers, lakes). Aquatic ecosystems usually support a wide variety of life forms, including micro-organisms; bottom-dwellers; free-floating and rooted plants; and fish, birds, reptiles and amphibians.

Desert: The animals which live in this arid biome are usually light-colored and use camouflage to blend into their surroundings, and possibly for protection against predators. Being more active at night and around dawn and dusk, allows them to escape the scorching heat. During the day they often lay in burrows or under rocks. Different species of life in the desert include jackrabbits (North America), kangaroo rats, owls, snakes, lizards and tortoises.

Forest: There are three main types of forests:

- **Temperate deciduous forests** are forests in cool, rainy areas; they have trees that lose their leaves in Fall and regrow them in Spring. Animals in this type of forest include beavers, bears, deer, fox, porcupine, rabbit, raccoon, and squirrels.
- A **taiga**, also called a boreal forest or northern coniferous forest, is a cold woodland or forest. Animals that live in this type of forest include fox, arctic hare, wolf, bears, lynx, moose, caribou, deer, snowy owl, and reindeer.
- **Rainforests** are very dense, warm, wet forests. Ridiculously huge numbers of animals live in rainforests, including microscopic animals, invertebrates (like insects and worms), fish, reptiles, amphibians, birds, and mammals. Some examples include alligator, anaconda, bat, apes, butterflies, crocodiles, boas, gorillas, toucans, leopards, and lizards.

Arctic: Arctic life forms have evolved unique physical adaptations that permit living in extreme environmental conditions. Walruses and seals have a thick layer of blubber that serves to insulate their cores from the cold water and winds. Certain fish species have an internal source of "antifreeze" that keeps their body temperature just above freezing. And because the air spaces that form between snowflakes trap heat, even small, non-hibernating animals such as mice can be active in and survive the bitter cold of winter. Algae are adapted to grow at low temperatures and can also grow in the lower-light conditions that exist under ice. As the most important primary producers of the Arctic, they directly and indirectly support a wide variety of marine life that includes zooplankton, fish, jellyfish, seals, walruses, and whales.

- Handout student worksheets and give time to draw their own super animal.
- Remind students that they can use adaptations they remember from the previous activity.
- If time allows, students can present super animals to the group discussing why it is suited to its ecosystem.
- If time allows, make each students a Super Animal Birth Certificate.

E. Wrap-Up

Suggested Discussion and Instructions

What were the 5 things that living things all need?

Food, water, shelter/protection, sun and space.

Which insulation materials worked best to keep you warm?

Let students share.

Did the layer of air help keep your finger warmer? Can you think of any animals that have a layer of air around their body?

Birds, animals with fur and feathers use it to trap in air close to their body for warmth.

What animals have a lot of fat on their body? What is the purpose of this fat (or blubber)?

Seals, polar bears.

Insulator is another name for a material that is a poor conductor of heat. Insulators slow down the transfer of heat from an object or place that is warm (like your hand) to an object or place that is cooler. Heat always moves from hot areas to cold areas in an attempt to even out the temperature between the two places. Insulation is used to keep hot things hot and cold things cold.

In order to reduce energy consumption, proper insulation is necessary to cut heating/cooling costs, while maintaining comfortable temperatures. Although covering a building in blubber would not be an effective way to insulate a building, trapping air in material, like birds do with their feathers, is a commonly-used strategy. Fiberglass, a material made from very fine fibers of glass, traps air in its fibres and is used to insulate buildings and homes.

What was your favourite activity today?

Do you think biology is fun?

Do you have any questions for me?

F. Restocking Notes

- DO NOT store blubber mitts in a warm area.
- Insulation materials may need to be replaced occasionally.
- Make sure you have enough worksheets for students photocopied.

G. Extension Activities

A. Needs of Living Things Song

The song is to the tune of 'Farmer in the Dell'.

SPACE

We all need space to grow
From Maple tree to crow
Hi ho I'm glad to know
We all need space to grow

FOOD

Good food is what we need
Both animal or seed
Hi ho I'm glad to know
Good food is what we need

WATER

Water helps things grow
It comes as rain or snow
Hi ho I'm glad to know
That water helps things grow



CHOICE: Use EITHER Shelter OR Protection.

SHELTER

A shelter is a place
That gives a safe place
Hi ho I'm glad to know
A shelter is a place

SUN

The sun is big and bright
It gives us warmth and light
Hi ho I'm glad to know
The sun is big and bright

PROTECTION

Protection is a way
That keeps us safe today
Hi ho I'm glad to know
Protection is a way

B. Survival Game

What you Need:

Round One (Pre-Evolution):

- Calculator
- Mouths/Stomachs (used to contain the foodstuffs): various sized plastic cups/containers
- Mouth Parts (used to pick-up the foodstuffs): Magnets, plastic forks/spoons, clothespins
- Foodstuffs:
 - marshmallows (both large and small)
 - marshmallows with red spots (both large and small) – poisonous
 - many pieces of metal attracted by magnets
 - a few pieces of metal NOT attracted by magnets
 - thread spools
 - anything else that you can think of (try to make some of them hard to pick up, and make some of them easy to pick up – with the mouthparts that you give them)

Set-up:

1. Best if done outside on the grass.
2. Establish a foraging arena by marking off a specified area with caution tape or something like that.
3. Spread out the food within this area, making some small groupings of like foodstuffs. This is to mimic something like the berries on a bush.
4. Try to mix it up well, so that there aren't a lot of similar types of foodstuffs in any one area that a certain species is capable of foraging for. Keep in mind some non-magnetic species can pick up the foodstuffs that the magnets can pick up. The idea here is that some species adapt to eat things that others more commonly eat.
5. Give each participant a stomach – make sure there is a good variety.
6. Give each participant a mouth-part – make sure there is good variety.
7. If you have a large enough group, you may want to make several of the students be the same 'species', as opposed to everyone being completely different.

Activity:

Explain to the students that they are all a variety of species, living in the same area (marked off by tape). Each of you are going to be put into your ecosystem and need to forage for food.

1. Allow the participants to spend enough time in the foraging arena such that not much food is left (an alternate would be a specific amount of time, which would be exactly the same in the second. round). Do not wait until all of the food is eaten, especially if you have any of it hidden.
2. Have everyone count the number of pieces eaten (each type of foodstuff).
3. Calculate the average number of pieces that all participants ate.
4. All those that ate at least the average, survived. Those that ate less than the

average did not survive. Try to see if any one species died off (highly variable outcomes). Explain that if $\frac{3}{4}$ of a single type die, reproductive effects start to play a role, etc, and that particular species will likely go extinct.

What were the variety of mouths and stomachs the different species had? What was easy/difficult for each of you?

5. At this point, explain that if anyone ate a marshmallow with red spots on it, or any other red foodstuff, they died. This is because they are poisonous.
6. Explain how evolution works, survival of the fittest, etc.

This is how this works in the wild. Some food is poisonous to a species. The members of the species who eat that food will die. The ones who do not, either through learning, or chance, will live and reproduce; creating more of the species of will not eat the poisonous food.

Round Two:

Set-up:

1. This round is basically, the same as Round One.

As time passes in our ecosystem, what do you think is going to change?

- **More poisonous food, since no one can eat it.**
- **Less of the food that everyone could eat, etc.**

2. Either add the new foodstuffs to the already set-up area, or have two areas set-up – one for round one, the other for round two (depends on available space and on available foodstuffs).
3. Difference being the different foodstuffs, the different sized baggies (stomachs), and the different mouth-parts.

Activity:

1. This part is basically the same as Round One.
2. Explain that an evolutionary process has occurred in response to the foraging episode that they just underwent.
3. This time some species can eat the poisonous marshmallows (you choose which ones can eat the poisonous food).

Wrap Up: What's Happening:

The idea behind this exercise is to see how different species are better or worse at foraging for the variety of foodstuffs that are available. They will also experience an evolutionary process whereby the foraging species are changing to be better foragers, but that the food source is also changing in response to being foraged.

Some organisms adapt to be able to eat poisonous foods. Some end up with modified physical make-up to eat other foods, etc.

C. Extra Resources

Ecosystems

<http://library.thinkquest.org/11353/ecosystems.htm>

The World's Biomes

<http://www.ucmp.berkeley.edu/glossary/gloss5/biome/>

Biomes and Ecosystems

<http://www.windows.ucar.edu/tour/link=/earth/ecosystems.html>

Teacher's Domain: Arctic Ecosystem

<http://www.teachersdomain.org/resource/ipy07.sci.life.eco.arcticecosys/>

Enchanted Learning: Biomes and Habitats

<http://www.enchantedlearning.com/biomes/>