NIGHT HIKE

ENDURING UNDERSTANDING

Humans are not physically adapted for life in the total dark. We must use all of our senses when exploring in the dark.

STATE STANDARDS

F.8.7 Understand that an organism's behavior evolves through adaptation to its environment

ASSESSMENT

Why are humans able to see better in the light than in the dark? Name two animals that have adapted to be active at night. How have these animals adapted?

CLASS ACTIVITIES

- Hiking at night
- "The Brightest Light"
- Colors and light experiment
- Wintergreen Lifesavers
- Bat and Moth game
- Using your nose

MATERIALS NEEDED

- Flashlight (s)
- First aid kit
- Night Hike Bag:
  - Candle
  - Matches
  - Crayons
  - Scrap paper
  - WintOgreen lifesavers
  - Blindfolds
  - Smell kit
  - Quartz Rocks

PROCEDURES

I. Set-up

The Night Hike class has basically no set-up. The materials needed for the different activities are in the Night Hike bag. Once you know what activities you would like to do, where you are going, just grab a bag and go.

II. Introduction

When people think of being outside at night, in the woods, they usually think of darkness and scary creatures in the shadows. During this evening activity, students will have an opportunity to explore human and animal adaptations related to nighttime situations. Students will hike through the woods, participate in experiments and play games.

III. Hiking at Night

Before heading away from the lodge area, discuss the student's feelings about hiking in the dark. Address concerns and review safety precautions. Students will need to follow the teacher at all times, no pushing, and take it slow. When the group stops, everyone will gather together. While hiking, students should be encouraged to remain quiet. An adult should be at the back of the group to ensure no one gets separated.

IV. Night Games

Bat and Moth game

During this game, students will learn about how bats locate food, using echolocation. Ask the students if they know how bats find food. They use echolocation. When a bat sends out a sound from their nose or mouth and once it hits an object, for example a moth, the echo comes back to the bat. From this echo, a bat can tell the size, shape, and texture of the object.

To play Bat and Moth:

Ask students to form a circle. Pick two students to be the players. The rest of the circle is the "forest" and must keep the bat and moth safe (they are the boundaries). If the bat and moth get close to the circle, the students should put up their hands and touch the bat or moth's shoulders so that they know to turn. If it is not completely dark, blindfold the bat.

This game is similar to Marco Polo. The bat sends out a noise, "Bat", and the sound hits the moth and comes back to the bat (the moth says, "Moth"). The goal is for the bat to catch the moth. Once the bat catches the moth. The moth can become the bat and a new moth is needed. The previous bat joins the circle. More than one moth can play at a time or the moth can be blindfolded also. When the game is over, discuss why the game was played. Do the students have a better understanding of echolocation?

Bat and Moth Option 2: Have three or four students designated as bats and the rest as moths. All will have to make some sort of sound (clicking noise, hand clapping, or finger snapping). Have the moths scatter over the playing area. The blindfolded bats will make the sound and then the moths return the sound to simulate the sonar effect. After each click, the moths can take ONE step. The bats can move freely and try to close in on the moths for capture. Touching a moth completes the capture.

Owl and Mice: (Be sure to have a large open space for this game) Discuss how owls use sound in locating prey. Have two students designated as owls. They stand facing each other on opposite sides of the playing field. All other students are mice and will try to sneak past the owls that are blindfolded. When an owl hears a mouse, the owl flashes its light on the sound. If the flashlight beam hits the mouse, they have been caught for supper. Discuss with students the impact of noises from different ground cover (i.e. dry leaves versus hard-packed trail.)

Owls – Owls localize sound in an amazing but fairly simple manner. Of all land animals, owls are the best at locating a moving target in three-dimensional space. While a human is as good as an owl at identifying the source of a sound in one plane – say to the right or left while standing on the ground – owls are far better at localizing sounds that come from above or below. This superior ability is based on the asymmetrical positions of the owl's outer ears. A person can tell if a sound comes from the right, left, or straight ahead because a sound from the left will strike the left ear first, and the brain interprets this as direction. Owls can do the same thing but can also localize sound from above or below their heads because one ear is relatively higher on the head than the other. Sound from above will thus strike the one ear first and sounds from below will strike the other ear first. The brain compares the difference and interprets the source of the sound as above or below the owl through a process called triangulation.

V. Test your Eyesight

1. Color

This activity works best if there is very little or no light present. Give each student a small paper square and a crayon. Ask the students to take a minute to write what color crayon they have on the piece of paper. Then collect the crayons. The students should hold onto their piece of paper or put it in their pocket until you have light to read it with. Once you return to the Lodge area, ask students to pull out their pieces of paper and see how they did. (Their guess will be written in the color of the crayon.)

Why? In the dark, colors are nearly impossible for humans to see. Humans have two types of cells in our eyes called rods and cones. Rods are light sensitive cells that help with seeing light and cones allow for seeing color. We have more cone (color) cells then rod (light) cells. This allows for us to see colors well but to also have very poor night vision. Diurnal (active during the day) birds are the only other type of animal that can see color as well as humans. We know this because many bird species choose a mate by the bright coloration of the males. Night active birds like owls, have mostly rod cells in their eyes, making their eyes excellent for seeing in low-light levels.

2. The Brightest Match

The students will now see the brightest match in the world. Everyone should stand in a circle and cover one eye with their hand. (Tell them to cover it so that absolutely no light will get in.) Students should leave their other eye open. Explain that you are going to light a candle and you want them to stare at he flame until you blow it out (10 to 15 seconds). Light the candle. After you blow it out, have students open and close each eye, switching from side to side. Ask students to describe any differences between what they see with their eye that was covered and with their uncovered eye.

Why? Human eyes produce a chemical called rhodopsin in low-light situations in order to improve our night vision. When the students used their eye that was covered, things should have appeared clearer and brighter than when they used the eye that looked at the flame. Rhodopsin makes seeing in the dark much clearer that when you have been in the dark for five minutes your vision is 1000 times better then when you first went into the dark. When your eyes are exposed to light, the rhodopsin that has been produced is instantly destroyed, making our night vision poor again.

3. WintOgreen Lifesavers

Gather in a circle so everyone can see each other. Pass out one lifesaver to every student. Tell them on the count of three to put the lifesaver in their mouth and chomp on it with their mouths open (be careful of your tongue). While this is happening, students should look around the circle at other people's mouths. "1, 2, 3." The lifesavers should make bright sparks in everyone's mouths.

Why? The creation of light by friction is called triboluminescense (try-bo-loom-in-es-cents). The phenomenon is not fully understood, but appears to be caused by the separation and reunification of

electrical charges. Some researchers believe that scratching or hitting materials together provides an input of energy that excites electrons within the materials. When the electrons fall from their excited state, a flash of light is produced. When sugar is broken, they tend to spilt along planes with positive charges on one side and negative charges on the other side. The charges want to get back to each other so they leap across the gap, back and forth. While these electrons are jumping across the gap, they come in contact with nitrogen in the air. This causes the nitrogen to emit tiny blue-white bolts of light at the same wavelength as natural lightning.

The candy has both sugar and wintergreen, when crushed an additional wavelength is emitted. Wintergreen is a florescent, not a triboluminescent. When the sugar crystals in the candy break, they release a small amount of ultraviolet energy. This energy causes the molecules in the wintergreen oil of the lifesavers and the oil to glow, or fluoresce.

Moon Rocks

You can see a similar effect when you strike two pieces of quartz together. You can try this version with students as well: Tell the students the story of how you came across the mysterious moon rocks. "Old man Krejcarek was the first settler on the land and as he was exploring this property, he came across a deposit of very peculiar rocks. They were all uniform in size and had some strange properties, one being that these rocks glowed. Hit the rocks together to show the kids how they spark. Krecjarek believed that these rocks were from a meteor that had hit the moon so he collected as many as he could. Another strange thing about these rocks is they are edible! Whenever he had visitors, he shared small pieces of the rocks with them and it was tradition for everyone to wait until it was very dark to eat the rocks. Krejcarek collected so many rocks there is still a huge stockpile left today and one of the special things you get to do at sixth grade camp is eat one of the moon rocks. I'll share the rocks with you but you'll need to do something special: Everyone face into the circle or face a partner and look at the person across from you. When you get your moon rock wait until everyone has their rock, when I say okay put the rock in your mouth and chew with your mouth wide open."

After students have chewed the lifesavers and figured out what they are, you can tell them why they spark see section above on <u>why</u> (if you want or you can keep them guessing).

The Uncompahgre Ute Indians from Central Colorado are one of the first documented groups of people in the world credited with the application of triboluminescence involving the use of quartz crystals to generate light. The Ute constructed special ceremonial rattles made from buffalo rawhide which they filled with clear quartz crystals collected from the mountains of Colorado and Utah. When the rattles were shaken at night during ceremonies, the friction and mechanical stress of the quartz crystals impacting together produced flashes of light visible through the translucent buffalo hide.

4. Eyeshine

At the end of the hike, you can use a flashlight to try and catch the eyeshine of different animals. Eyeshine is the ability of the tapetum (part of the retina) to reflect light. Light enters the eye and strikes the rods, then bounces off of the tapetum and hits the rods again (collecting twice as much light.) Therefore, the eyeshine is generally stronger in nocturnal animals than in diurnal ones. Following is a chart of eyeshine color and additional information.

Animal	*Color of Eyeshine*	*Description*
Barred Owl	red	strong
Black-crowned night heron	red	close set
Bullfrog	green	opalescent
Cat	red	strong
Coyotes & Dogs	white	fiery
Fox	white	bright
Great Horned Owl	red	medium strength

Opossum	orange	dull
Porcupine	deep red	N/A
Raccoon	yellow	right
Screech Owl	red	weak
Skunk	amber	N/A
Whippoorwill	white	dull
White Tailed Deer	greenish, silver-white	strong

VI. Using your Nose

The scent kit is made up of different bottles of "smells". Have students stand in a circle. Explain that they will be passing around one bottle at a time and smelling what is inside. Take your time. Do not drop or spill the contents of the bottles. Do not say what you think the substance in the bottle is until everyone has had a chance to smell it. See if the students' sense of smell gets better as they try the different smells or worse.

VII. Conclusion

Going outside at night can be a scary yet exciting thing to do. We are forced to use our other senses more than if we hiked during daylight.

Now let's talk about some of the adaptations that nocturnal animals have.

Discuss what the students learned. You may also want to discuss urban sprawl and the effects of light pollution.

SAFETY

During the Night Hike, several safety precautions should be taken. First, notify the Health Aide that you will be out on the hike. Have one adult in each Night Hike group, bring a two-way radio and ask the Health Aide or someone else that will be in the Lodge to have another radio on.

The group should walk slowly. Students should be warned to walk carefully and that there is no pushing. Stay on the trails while hiking at night. The adults should take flashlights from the Ehlert Lodge office. If you want to take the hike without any flashlight use, please bring one with you in case of emergency (just tuck it away in a backpack or something). At least one adult from each group needs to bring a First-aid kit (located in the Ehlert Lodge office).

ADDITIONAL INFORMATION

The truth about bats:

- Bats are not blind.
- Bats can find tiny insects in the dark, they will not get tangled in your hair.
- Bats are not rodents.
- Bats do not all carry rabies. Bats are very clean.
- Bats are the only mammals that can fly.
- Bats help control the insect populations, pollinate plants, and help in reseeding areas.

RESOURCES

Eddy, Beth. Wintergreen Lifesavers: Spark in the Dark, http://www.owu.edu/~mggrote/mog/chemistry/page8.html, 2/6/03

Eagle Bluff Environmental Learning Center. Night Hike lesson plan. Lanesboro, MN. June, 2001.

Central Wisconsin Environmental Station. Night Hike Lesson Plan. Stevens Point, WI. August, 2015.

Lesson Plan written by Patty Brodeen, March 2003, modified August 2015 by Kelly Vorron