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MNDNR

MINNESOTA MASTER NATURALIST

Minnesota Master Naturalist Explorers Winter Curriculum

ADAPTATION AND DORMANCY ARE KEYS TO SURVIVING A MINNESOTA WINTER

IN PARTNERSHIP WITH:

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ADAPTATION AND DORMANCY ARE KEYS TO SURVIVING A MINNESOTA WINTER

Authors:
Dawn Flinn, Education Coordinator, Minnesota Department of Natural Resources
Britt Forsberg, Explorers Coordinator, University of Minnesota Extension
Darren Lochner, Explorers Coordinator, University of Minnesota Extension

Curriculum Reviewers:
Sara Aker, Prior Lake Savage School District
Bev Blomgren, Minnesota Master Naturalist Volunteer
Pete Cleary, Naturalist, Dodge Nature Center
Cara Rieckenberg, Program Coordinator, School of Engineering and Arts

Partners/Sponsors:
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GETTING STARTED WITH EXPLORERS

The Minnesota Master Naturalist Explorers program, developed in 2011, worked with elementary students across the state of Minnesota to foster their curiosity about the world and provided an opportunity for Master Naturalist volunteers to share their knowledge and passion for the outdoors with youth. The Minnesota Master Naturalist program, a partnership between the University of Minnesota Extension and the Minnesota Department of Natural Resources, operated the Explorers program with generous support from the Legislative-Citizen Commission on Minnesota Resources (LCCMR) through the end of the grant period on June 30, 2015. The following materials were developed to assist Master Naturalist volunteers as they planned one hour sessions, once each week for four to eight weeks.

First Day Schedule

Arrive early and be prepared with supplies to set the room up. You should have familiarized yourself with the activities you will be conducting prior to this day.

Welcome individuals as they arrive. Attendance should be taken to assist with learning names. When all participants have arrived, introduce yourself. Share something interesting about yourself with the group. Introduce the Explorers Program and briefly mention that you are a volunteer with the Master Naturalist Program, a program sponsored by the Minnesota Department of Natural Resources and University of Minnesota Extension. It is helpful to share basic information about the structure of the program, "For the next six Mondays we will be learning about the outdoors and nature. Each week we will be spending some time outdoors so be sure you dress for the weather."

Conduct an ice breaker activity to start the day.

Hand out Explorers backpacks, journals, tree cookie name tags, pencils and permanent markers. Have participants put their names on these items. Ask what it means to be an Explorer. Refer participants to page 1 of their journal for what Explorers do and what the rules for Explorers are.

Introduce the Minnesota Weatherguide Environment Calendar by showing the day's date and the calendar features. Briefly mention that each week participants will be using the calendar to look at average temperature and phenological events. Phenology and the study of seasonal changes can be introduced on the first day.

It is recommended to take a brief hike around the schoolyard the first day. The hike can be used to make basic nature and weather observations.

Wrap up for the day. Ask the participants what they observed outdoors and summarize the topic of the day. Collect backpacks, journals, pencils and name tags. Take materials home with you in the materials bin.

Every Day

Consider bringing in a natural "object of the day" that relates to the topic you will be teaching about. This can be placed at the front of the room for the participants to look at as they come in to see if they can figure out what it is and what they will be exploring that day. Suggestions can be found at the beginning of each main activity.

Welcome participants, take attendance, hand out backpacks, journals, pencils and name tags.

Refer to the Minnesota Weatherguide Environment Calendar for weekly phenology, average temperatures and other relevant information.

ICE BREAKERS

The ice breaker activities are designed to be used at the beginning of each session or incorporated throughout the daily lessons. They can help participants feel comfortable with each other and the leader as well as help transition from the normal school day to the Explorers program.

Nature Makes Me Feel

Have everyone stand in a circle. Explain that each person should start by saying, "Nature and/or being outdoors makes me feel _____" and then respond with an expressive gesture. The leader gives an example, "Being outdoors make me feel HAPPY" and then he/she smiles or "Rain makes me want to jump in puddles" followed by jumping up and down. Adapt question based on the season and/or the current weather. When everyone has taken a turn, you can go around again with a different response.

Who Am I?

Place a name tag with an animal or plant found in Minnesota during the winter on the back of each individual. Participants are only permitted to ask one yes or no question per person about their animal or plant. They can go back through the group a second time and ask one question per person if the group is small or more time is needed. The goal is for the participant to guess the plant or animal on his or her back. This activity can also be done by giving only one participant the name of a Minnesota plant or animal and have the class ask questions to figure out the answer.

Animal Search

Prior to the participants' arrival, come up with a list of five native Minnesota animals. This number might vary depending on the size of the group. Spread the participants out around the classroom or outdoors. Whisper the name of one of the animals into each participant's ear. There should be at least two participants with the same animal name. When all players have been named, instruct them to find the rest of their "species" or fellow animals by making the sound or acting like the animal. The activity ends when all animals have found their fellow partners. Examples of animals might include owl, bear, wolf, wild turkey, frog or snake.

NATURE JOURNALING

Adapted from a *Keeping a Journal,* Monarch Lab, University of Minnesota.

Objective

To learn the basics of a nature journal.

Supplies

Explorers' nature journals

Pencils

Thermometer

Minnesota Weatherguide Environment Calendar

Objects of the Day: Examples of nature journals, plant and animal sketches and field guides

Magnifying glass (optional)

Camera (optional)

Background

Keeping records and taking measurements are important to being an Explorer. Good observations come from spending time looking at natural surroundings and making recordings through data collection and drawings. These recordings can be important for short and long term understanding of the environment.

The nature journal can be used to keep track of observed natural characteristics and changes in the environment made through written observations, recorded data and/or drawings. Observations might be based on the senses; sight, smell, touch or recorded data such temperature (actual vs. average), clouds types and wind. The journal is also a tool to record the seasonal phenology and changes around the schoolyard and surrounding neighborhood.

Emphasize that the participants do not need to be expert artists or writers to be good at journaling. Every journal entry is a good entry. Encourage participants to notice as many details as possible. Add labels to the drawings and note details like the date, location and weather. Provide examples of journal entries for the participants either from your own experience or in the Explorers' nature journal to help them get started.

Phenology is the science of seasonal changes and their effect on the natural world. A phenologist is someone who studies the changing of the seasons. Tracking events takes time and patience. First, you have to learn to be a good observer. Second, you have to become an accurate recorder of what you observe. Third, you have to become a critical thinker, finding links among the phenomena you are observing.

Activity

1. Explore and discuss the objects of the day.
2. Ask the participants why it is important to keep nature related records and measurements. What tools and supplies are needed? What would cause us to all have different observations?
3. Encourage participants to practice observation and description skills using words and drawings. Journal prompts are often helpful with weekly entries. Prompts might be sentences or key words that often help to initiate a journal entry. Refer to *Nature Observation* in the Explorers' nature

journal (page 3). The first time the journals are used, take a brief field trip around the schoolyard and record things the participants see. Share the list with each other.

4. One way to practice recording observations is to map the area of the schoolyard that will be visited during the Explorers program. Note key features like buildings, trees or paths. See *Draw a Map of Your Site* in the Explorers' journal for the mapping exercise (pages 4-5). The key can be used to draw symbols such as trees, shrubs or other landscape features to place on the map. The compass rose can be used to label the cardinal directions of North, South, East, and West. A good way to remember the letters and order on the compass rose is Never Eat Soggy Waffles. Consider sharing an aerial map of the schoolyard from a program such as Google Maps to show the participants another perspective of the area. Participants might also select a site in the schoolyard or a tree to observe once a week through the Explorers program. Drawings and photographs may be used to document the changes week by week. Assign a date to each of the recordings.
5. Record weekly weather observations such as temperature and general weather conditions such as precipitation and clouds on the *Weather Tracker* pages in journal (pages 10-11). Clouds may be classified by type or by the amount of coverage – clear, partly cloudy, mostly cloudy or overcast. Ask the participants how making weather observations is different when outside versus looking out the window or viewing photographs. Encourage the participants to compare the weather forecast printed in newspaper or on TV for a particular day with the actual weather conditions. Was the meteorologist accurate? Refer to the Minnesota Weatherguide Environment Calendar as a reference for average temperature data and weekly phenology.
6. Share the information presented in the phenology section of the Minnesota Weatherguide Environment Calendar. It is found after each month's calendar page. Define "phenology" and discuss seasonal changes to watch for in the upcoming month. Show participants the checklist of typical seasonal changes on the *Winter Phenology* page of the Explorers' nature journal and invite them to look for these changes as they go outside (page 7). Participants should observe and record any of the signs of winter in their journals and share with the group.
7. Other questions refer to the season. What are signs of winter? Refer to the Minnesota Weatherguide Environment Calendar and the Explorers' nature journal (page 7). Why it is important for naturalists and scientists to notice as many details as possible? Encourage participants to make general predictions of seasonal phenology. How do winter temperatures and hours of daylight/darkness change as the season changes and what effects do these changes have on plants, animals and weather in the area? What changes happen outdoors when winter arrives, temperatures decrease, etc.? Encourage the participants to observe changes as the seasons change from fall into winter and winter into spring on the *Phenology* page of the Explorers' nature journal (page 6).

Extensions

Constructing a Nature Journal

Objective: To construct a take-home nature journal.

Supplies: Colored cardstock paper, white paper, hole punch, straight stick, and a rubber band.

Activity: Construct nature journal by folding at least five sheets of white paper and place inside a folded cardstock cover. Punch two holes near the folded edge and wrap a rubber band around one end of the stick, guide the rubber band down through the hole then along the back of the journal and up through the second hole. Finally, wrap the rubber band around the other end of the stick. Illustrated directions can be found at www.makingbooks.com/elastic.shtml. The nature journal can be personalized with the participant's name and drawings. Journals can be constructed at any point during the Explorers Program. Encourage participants to make journal entries near their school, neighborhood or favorite outdoor location. Participants are also welcome to add photos to the journal along with a description of the object.

Onion Hike

Objective: To follow a trail using only your sense of smell.

Supplies: Scents that are easy to follow such as an onion. You may also use flavor extracts from the spice aisle at the grocery store.

Activity: Mark out a trail using only an onion (or other smells such as honey, maple, mint, anise, vanilla, etc.). Rub the scent on trees through the woods. Have participants try to follow the scent. You may consider hiding a treasure at the end of the trail as an added incentive. Ask participants if it was difficult to find the scent. What other scents did they discover? What makes this activity hard or easy? How do animals use their sense of smell in the winter? Have participants mark the scent trail on their Explorers' nature journal map and journal about what they discovered.

Bicycle Spokes

Objective: To challenge the sense of sight and hearing and change participants' perspectives on making observations.

Supplies: None

Activity: Have participants sit in a circle, then scoot directly back and lie down on their backs to form the shape of a wheel with spokes. Be silent for one to five minutes. Ask participants to describe what they heard. How many different sounds did you hear? What proportion of the sounds was non-human? Were you surprised or impressed by anything you heard? What did you see from this perspective? In what ways would you act differently if this was your perspective all the time? How do animals use their sense of hearing to survive in the winter? In their Explorers' nature journals, have participants write about their experiences lying under the tree.

NATURE OBSERVATION BASICS

Objective

To explore the schoolyard using multiple senses and record observations in the Explorers' journal.

Supplies

Explorers' nature journals

Pencils

Objects of the day: Ruler, magnifying glasses or binoculars

Linnaeus List or other field guides (optional)

Background

Making detailed observations of the environment is important to scientists, naturalists and everyday people. Using all the senses can result in a well-rounded understanding of the surroundings.

Every known living organism is classified and named by a set of rules and guidelines. Those rules are used by all scientists around the planet. The names scientists use are called scientific names, not common names.

Common names are the ones you might use when talking with your friends or family. You call your pet a dog or a cat which is the common name. Scientists call those animals by a set of several names like *Felis catus*. That's a domestic cat. Common names for organisms can be confusing because anyone can make them up, and they may apply to more than one species. For example, the mountain lion also has other common names such as panther, cougar, or puma. The scientific name for the mountain lion in North America is *Puma concolor*. *Puma concolor* refers to only one specific animal.

Scientific names follow a specific set of rules. Scientists use a two-name system called a binomial naming system. Scientists name animals and plants using the system that describes the genus and species of the organism. The first word is the genus and the second is the species. The first word is capitalized and the second is not. A binomial name means that it's made up of two words (bi-nomial). Humans are scientifically named *Homo sapiens*. The name is always in Latin because when this naming process started, most people everywhere knew Latin. Scientific names help scientists to study organisms, especially when working with other scientists since they know which species is being discussed no matter where in the world they may be.

The descriptions used in field guides often refer to the characteristics such as color, size and shape in addition to feeding and nesting habits and the distribution or range of the plant or animal. The range map on the *Field Guide* page can be used to show where the organism is found in Minnesota (page 15).

Activity

1. Explore and discuss the objects of the day.
2. Discuss what tools (if any) are needed to make nature observations. How might the tools assist with making observations?
3. Ask the participants if they have made any recent nature observations.
4. Review the expectations/rules for going outside.

Tips to share with the participants:

- Wildlife is often easily scared by sudden movement and loud noises.
- Participants should be within the view and be able to hear the instructor at all times.
- Stay on the trails and pathways, unless told otherwise
- Walk slowly.
- Look up, down and all around. If something catches your interest, stop to sketch it or write about it.

5. Refer to *Nature Observation* in the Explorers' nature journal (page 3). Spread the participants throughout the schoolyard. Encourage them to complete the observation page by using their senses. Senses may be used at the same time or encourage them to isolate one sense at a time (i.e. blindfolding or closing eyes helps to focus on other senses). Gather the participants together and compare and contrast the lists.
6. Ask the participants what unusual items they recorded. What sense resulted in the longest list? What sense was the most challenging to use? Encourage the participants to make nature observations when they go home and report their findings at the next gathering.
7. Refer to the *Field Guide* page in the Explorers' nature journal to introduce field identification (page 15). Also show the participants examples of field guides such as the Linnaeus List. Discuss what features help to identify plants and animals and review what information is included in a typical field guide. The field guide page in the journal provides an opportunity for the participant to create an imaginary or real plant or animal. The field guide includes information such as common name, scientific name, description, picture and range map.

Extensions

Find a Pencil

Objective: To build observation skills and appreciation for camouflage.

Supplies: Pencil

Activity: Set boundaries and have participants line up along one edge of the playing area, facing away from the area. While the participants have their eyes closed, hide a pencil anywhere within the playing area. Once the pencil is hidden, the participants may look for it. If a person finds it, he or she should not give away (1) where the pencil is, and (2) that he or she knows where it is. Upon finding the pencil, the player should slowly, nonchalantly return to the starting line and act as overtly cool as possible. When most of the participants have found the pencil you may have the group point the pencil out for the remaining lookers. Play several rounds, hiding the pencil in harder places each time (on top of the leaves, behind the teacher's ear, stuck in a tree, tucked in the leader's shoe, etc.) Why was the pencil hard to find? What does this tell us about how careful our observations really are?

Closer Look

Objective: To amaze participants with the details not readily observable in nature and to practice using scientific tools.

Supplies: Magnifying lenses or binoculars

Activity: Review how to use the tools and give each individual or pair of participants binoculars or a magnifying lens and allow them to explore. Consider narrowing the focus of a hand lens exploration by challenging participants to discover the smallest living thing or something they never knew existed. Test the binoculars use by asking participants to read words or count something far away. In what ways do these tools help you explore nature? In what ways do they hinder your exploration?

Paint Chips

Objective: To challenge observation skills and increase awareness of nature's many details.

Supplies: Paint sample strips

Activity: Distribute paint sample strips from a hardware or paint store to each participant. Instruct each participant to find a color in nature that exactly matches a color on the paint sample. Did you find an exact match? Is an exact match possible? Why or why not? Were you surprised by how easy or challenging it was to find a match?

Slice of Silence

Objective: To establish a sense of place by using all senses to explore.

Supplies: None

Activity: Have participants find a quiet place to sit alone in a natural area. Give them at least ten minutes to sit and savor the quiet. Discuss the experience: What did you see? Hear? Smell? Touch? How did your experience change as time passed? You may also use blindfolds if available to help participants focus on their senses of hearing. Have participants list the different sounds – natural and those caused by humans. Ask how sounds could be different during different times of the day. With a partner or the whole group, have students share what they noticed when they closed their eyes

WINTER WEATHER WATCH

Objective

To determine and record basic weather observations such as cloud cover, precipitation and temperature.

Supplies

Explorers' nature journals

Pencils

Minnesota Weatherguide Environment Calendar

Cloud photos/drawings

Thermometer

Object of the day: Weather page cut from a newspaper or glass jar with frozen water to observe condensation as the ice melts

Background

Meteorologists are scientists who study the weather and the atmosphere. They are best known for forecasting the weather. In this activity, participants will make and record their own weather observations. They will also make connections between changes in the weather and seasonal changes in nature by using the Minnesota Weatherguide Environment Calendar.

High and low temperatures – by recording the daily high and low temperatures throughout the season and comparing them to the rest of the year, participants will see that fall and spring experience greater temperature differences than summer and winter months. By comparing the average temperature for the date and actual readings participants can make seasonal connections and know what kind of weather to expect.

The water cycle is the process through which water molecules move between the atmosphere and the Earth's surface. The main components are precipitation, condensation, evaporation, infiltration, and transpiration.

- Precipitation – moisture, often in the form of rain or snow, that falls to the ground
- Evaporation – when water molecules turn to vapor form and rise into the atmosphere
- Condensation - the opposite of evaporation, when water vapor in the air converts into liquid form
- Transpiration – when plants give off water vapor through tiny pores in their leaves
- Infiltration – the process of water soaking into the soil from the ground level

A cloud is made up of many tiny droplets of condensed water or ice crystals. Clouds help return water to the earth through condensation and precipitation.. Note that the warmer summer months usually result in more variety in cloud types.

A few common cloud types include:

- Cirrus – High wispy, thin clouds spread out high in the sky, horsetails

- Stratus – Clouds in low flat layers, spread out over most or all of the sky, fog
- Cumulus – Big puffy clouds, like giant cotton balls, reduce transpiration and evaporation
- Cumulonimbus – Clouds that can grow very large and tall, often bring rain and storms

The back of the Minnesota Weatherguide Environment calendar and the Explorers' nature journal provide photos of different cloud types. In addition, check out the following websites:

http://cloudappreciationsociety.org/collecting/ has a helpful diagram of cloud types.

Web Weather for Kids – Clouds: http://eo.ucar.edu/webweather/cloud3.html

Snowflakes - are six-sided and are each made of up to 200 ice crystals. Snowflakes form in clouds where the temperature is below freezing. The ice crystals form around tiny bits of dirt that have been carried up into the atmosphere by the wind. As the snow crystals grow, they become heavier and fall toward the ground. In Minnesota snow is usually the main form of precipitation in the winter. Snow forms when the air is below freezing. If the air near the ground level is too warm, the snow will melt on its way down, changing to rain or freezing rain (often referred to as sleet). A blizzard is a long-lasting snowstorm with very strong winds and high amounts of snowfall. Three conditions must be met for a blizzard to form; cold air at the ground level, high moisture, and lift. Warm air must rise over cold air. www.weatherwizkids.com/weather-winter-storms.htm demonstrates how winter storms occur.

Activity

1. Explore and discuss the objects of the day.
2. Ask participants what they might typically observe in nature during this time of year. Refer to *Winter Phenology* checklist in the Explorers' nature journal (page 7). Explain that weather can affect how animals behave.
3. Highlight daily weather information along with phenology information for the week found in the Minnesota Weatherguide Environment Calendar. Refer back to this information when outside with the group.
4. With the help of participants, draw, label and discuss the main parts of a water cycle including: precipitation, condensation, evaporation, infiltration and transpiration. You can do this on a white board or large sheet of paper or in the Explorers' nature journal (page 8).
5. Discuss the water cycle's connection to weather, the movement of water and ways water moves through the cycle in the winter.
6. Have participants look at the different cloud types in their journals. In addition, show photos in the Minnesota Weatherguide Environment Calendar, or copies of cloud photos from websites. Discuss how clouds are formed. Ask where clouds fit in the water cycle. Which type of cloud brings us sleet? Snowstorms?
7. Go outside and have participants lie on their backs to observe the clouds. They can sketch their shapes in their journal. Ask participants how many different cloud types they observed. Are there differences in the clouds depending on the direction you look? Can you predict what the weather might be tonight? What types of clouds do you see? What else do you notice in the sky?
8. Use the Explorers' nature journal *Temperature* page to explain how to read a thermometer (page 9). Have one person from the group determine the actual temperature by looking at the thermometer you brought along. Have participants record the temperature in their journals. As

an instructor, you can keep a graph of daily temperatures and average daily temperatures found in the Minnesota Weatherguide Environment Calendar. Together, look at trends across the weeks of the Explorers program. Discuss how changes in temperature can affect organisms.

9. While outside also record wind speed, cloud conditions and precipitation for the day on the *Weather Tracker* pages in the Explorers' nature journal (pages 10-11). Compare and contrast conditions from week to week. Also, notice if there is a difference in the number of birds you see or other animal behaviors depending on the various weather conditions.
10. Gather items and head inside. Ask participants to watch the evening weather forecast during the week (or review the forecast online) then check to see if the meteorologist was correct with the forecast the following day. When you return the following week, discuss what participants noticed about the forecast during the week. Discuss what they noticed the following week.

Extensions

Snowflakes

Objective: To observe differences in snowflakes.

Supplies: Black construction paper, magnifying glasses

Activity: Put sheets of black paper in a freezer and remove right before conducting the activity. Take participants outside on a day it is snowing with a piece of black construction paper and a magnifying glass. Collect snowflakes as they are falling with the paper and look at them up close with a magnifying glass. Identify the shapes of snowflakes. www.its.caltech.edu/~atomic/snowcrystals/class/class.htm is a helpful resource.

Beaufort Scale

Objective: To understand how to describe wind speed.

Supplies: Copy of Beaufort Scale from www.weatherwizkids.com/weather-wind.htm

Activity: Determine wind speed using the Beaufort Scale which is an empirical measure for the intensity of the weather based mainly on wind power. The wind speed is determined by making basic environmental observations.

Find the Wind

Objective: To determine which the direction the wind is traveling.

Supplies: Container of bubbles

Activity: Since we cannot see the wind participants, investigate the direction and speed of the wind using bubbles. Ask if participants can feel the breeze. How can you tell if it is a windy day? Have them look for different signs of the wind blowing (the movement of plants, branches on trees, exhaust in the air, etc.). Make a list of ways to "see" the wind. Now blow bubbles and try to determine which way the wind is blowing. Do the bubbles change direction? When? Why? Are the bubbles moving in the same direction as the clouds? Winds often blow in different directions. Warm air can blow in one direction and cold air in another. Check out www.weatherwizkids.com/weather-wind.htm to learn more about wind.

WHAT IS WINTER?

Objective

To understand why we have winter in Minnesota.

Supplies

Large, round object Earth such as a globe or beach ball to represent the

4 flashlights

Explorers' nature journals

Pencils

Watch or clock with a dial

Object of the Day: Globe

Background

Seasons are a result of Earth's relationship to the sun. In Minnesota, the less direct sunlight of the winter season brings many changes to nature. Many people think that winter happens because the Earth is tilted farther away from the sun, but the Earth is actually closer to the sun in winter. The Earth's path around the sun isn't a perfect circle; it is more of an oval (ellipse). This causes the Earth to be at different distances from the sun at different times during the year.

We have winter here in Minnesota because the northern hemisphere is tilted away from the sun during part of the year. This tilting results in less direct sunlight and radiation hitting the Earth's surface. With less of the sun's energy to absorb, temperatures drop and we experience the winter season. At the equator there is no distinct difference between the seasons since the sun's rays hit it at the same angle all year round. The winter solstice on December 21 is the longest night of the year and marks the meteorological first day of winter.

www.bigelow.org/virtual/handson/seasons_rotation.html has a helpful diagram to show the Earth's rotation.

Activity

1. Explore and discuss the object of the day.
2. Ask some questions about the winter season: What do you like about winter? What happens in the winter? What plants and animals do you see in the winter? What else do you see in the winter? What do you not see in the winter? Why do we have seasons on Earth? How are the seasons in the southern hemisphere different from the seasons where we are?
3. Have the participants arrange themselves in a circle and choose four volunteers to be the sun and give each a flashlight.
4. Have the sun participants stand with their backs together in the center of the circle and point their flashlight beams outward. Be careful not to shine the flashlights in the eyes of the participants around the circle.
5. Take the object you chose to represent the Earth and point out to participants where they currently are on the planet. The location can be marked by tape or by pointing your finger. Explain that the Earth is tipped on its axis.

6. Walk around the outside of the circle to demonstrate the Earth orbiting the Sun. Start in the spring, then move into summer, fall and finally end in winter.
7. Stop at different points around the circle, making sure you are in the path of a flashlight beam. Point out which month you are in and how much light your position on the globe is receiving during each season.
8. Relate this new knowledge to the beginning discussion and ask participants questions to evaluate their understanding of what causes the changes we see in winter. If time, reinforce the information presented in the demonstrations through diagrams or video. Helpful videos can be found at www.youtube.com/watch?v=EPJ_HUcg8L07 and www.youtube.com/watch?v=NydSuHoQZqk.
9. Go outside and show how to generally determine which direction is south. Using a watch with a dial, point the hour hand at the sun. Half way between the hour hand and the 12 on the watch will be south. At night if there is a crescent moon you can draw an imaginary line between each crescent point. Follow the line to the ground and where it touches is south.
10. If participants haven't already, enter the directions north, south, east and west onto their nature journal map in the lower right hand corner (pages 4-5). If already entered, see if they put south in the correct location.
11. Have participants sit or stand in a circle, representing the sun. Pick one person to be the earth. Have the earth walk around the sun tapping people on the head and say "solstice, solstice, solstice." When the earth taps someone on the head and says "equinox," the person tries to tag the earth as he or she runs around sun and back into the empty spot. Play again as time permits.
12. Back in the classroom, show that the winter and summer solstices (usually December 21 and June 21) occur when the earth is closest to the sun and the spring and fall equinoxes (usually March 20 and September 22) are when the earth is the farthest away from the sun. Ask participants if they think the daylight is getting longer or shorter at this time. Why or why not?

Extensions

Extensions adapted from *ecotime,* Jeffers Foundation.

Snowball Fight

Objective: To understand different descriptions and views of snow.

Supplies: Paper and pencils

Activity: Give each participant a piece of white paper (scratch paper is acceptable). Ask participants to write a word on each sheet to describe winter or snow. Make sure that they print the words large enough and legible. Next, participants will crumple the paper into a snowball, stand up and throw the snowballs at each other on your signal. Have participants pick up the nearest snowball. Go around the circle to have participants share the one word description for winter or snow with the group. Write the responses on the board and discuss. Which words could be used to describe winter and snow today? Are there additional words to describe winter and snow that were not included in the snowball fight?

Melting Contest – Ice and Salt

Objective: To understand how salt affects ice.

Supplies: Ice cubes, two plates and salt

Activity: The freezing point of water is lowered when it is mixed with salt. During the winter we often apply salt to the roadways and sidewalks to prevent or melt ice. This experiment involves racing two ice cubes to see which will become a pool of water first. Place an ice cube or cup of snow on each plate. Make sure each ice cube or pile of snow is the same size. Sprinkle salt onto one of the ice cubes. Ask participants to make predictions. Which ice cube will melt faster?

A Special Place Through the Seasons

Objective: To observe the seasonal changes in one particular place.

Supplies: Explorers' nature journals, pencil, digital camera (optional)

Activity: Select a special place in the neighborhood or special tree and take a photograph or make a drawing during each season of the year. Record the dates in a journal along with photographs or drawings. Describe the changes noticed throughout the year in and around the area selected. Consider making journal entries more than one time during each season.

INTRODUCTION TO A TREE

Objective

To understand how to observe and record the different types of trees growing in the schoolyard and compare their characteristics.

Supplies

Explorers' nature journals

Pencils

Magnifying glasses

Rulers

Branches with both opposite and alternate arrangements as well as buds

Tree cookie name tags, large tree cookie or photo of tree cookie

Objects of the Day: Deciduous and coniferous tree branches with buds

Tree field guides (optional)

Background

Trees can be found on most schoolyards and are a great way to watch the season progress as daylight gets longer. The main part of this activity will occur on the first visit but throughout the weeks make sure to take a little time every session to have participants observe their trees, looking for any changes and noting them in their journals.

There are two main types of trees. In general, deciduous trees lose all of their leaves in one season and coniferous trees keep their sharp and narrow leaves called needles on the tree year-round. Coniferous trees produce cones that carry their seeds. In fall, deciduous trees begin to shed their leaves to conserve energy and limit damage to the tree from the snow and storms during the winter.

Many people think you can't tell trees apart once the leaves have fallen off. However, by closely examining the buds and bark, you are often able to identify trees.

The main parts of the inside of a tree include:

- inner wood – supports the tree, stores growing compounds and sugars
- xylem – carries water and minerals from roots to leaves
- cambium – makes trunk, branches and roots thicker
- phloem – carries food (sap) from leaves to rest of tree
- outer bark – dead tissue that protects the tree from injury (much like human skin).

More information can be found at

www.mndnr.gov/forestry/education/treeforallseasons/index.html

Activity

1. Explore and discuss the objects of the day.

2. Ask participants how they might identify trees in the winter. Make a list of tree features that may be helpful in identification: height, diameter, bark texture, leaves, shape etc.
3. Point to a tree or show a winter tree photo and ask participants to make some general observations. How might those features change in the spring, summer, and fall seasons? How many different kinds of trees could they find on the school grounds? Have them write their prediction in their Explorers' nature journals.
4. Show and discuss the differences between a deciduous and coniferous tree.
5. Open to *Buds and Branches* in the Explorers' nature journal (page 14). Using real branches, show the difference between an opposite and alternate branch and have participants make a quick sketch of each in the appropriate circle. Then show at least two different kinds of winter buds and have participants sketch one in the bottom circle.
6. Have each participant predict the number of kinds of trees in the schoolyard and write it in their journals. Go outside and give participants five to ten minutes to find and count as many different kinds (not numbers) of trees as they can within the boundaries you set. When time is up call them back in and have them write their answer in the Explorers' nature journals. How close were they to their predictions?
7. Group participants in pairs and have them select a tree to adopt in the schoolyard. Pass out rulers and magnifying glasses for participants to make detailed observations.
8. Ask participants to record and sketch their trees on a *Nature Observations/Field Sketches* page in their Explorers' nature journals (pages 24 – 26). They should include: leaves/or buds (color, shape, size, and other observations), bark (color, shape, size, and other observations), tree height and shape and any other observations. Make sure participants write down the date of their observations. If they have made a map in their journal of the schoolyard add the location of their tree to this map (pages 4-5).
9. If time, include other observations like what does the tree smell and feel like? What signs are there that animals have used the tree? Do a bark rubbing. Determine the circumference (C) around the tree. Using a flexible tape measure, measure to the nearest inch the distance around a tree at a point 4½ feet up from the ground (C). Then convert this number into the tree's diameter (D) using one of these formulas D = C x .3183 or D = C/3.1416.
10. Take a few minutes every week to have participants revisit their tree and record any changes they see.
11. Gather participants together and return to the classroom. Using their tree cookie name tags, refer to *Inside a Tree* in the Explorers' nature journal and review the different parts, how to pronounce them and what they do (page 12). Could they see any of these parts on their tree? Why or why not? Do they think the phloem is active now? Why or why not? What about the xylem?
12. Ask participants to notice the different trees that they see on their way home or when traveling to other places.

Extensions

Know Your Branch

Objective: To recognize characteristics of branches by touch.

Supplies: One tree branch for each participant, blindfolds (optional)

Activity: Place a stack of branches on a table or the floor. Ask each participant to be blindfolded or close his or her eyes and find a branch. Once each participant has a branch, ask them to get to know the branches by feeling and recognizing characteristics like length, branching or texture. Place the branches back in the middle, have the participants take the blindfolds off and then find the branch they were holding. The branches can be a mix of deciduous and evergreen species, shapes and sizes.

Connect the Branches

Objective: To closely observe tree branches and pay attention to all characteristics.

Supplies: Pairs of branches

Activity: Before the Explorers session, cut branches of several different tree species in half. Assign one branch to a participant and ask him or her to find its match in the classroom by using clues like color and texture of bark, branching, buds, shape or size.

Meet a Tree

Objective: To identify trees using senses other than sight.

Supplies: Blindfolds

Activity: In groups of two or three, participants blindfold one member of their group and carefully lead the person to a tree. The blindfolded person gets to know the tree by feeling, smelling, listening to it, feeling for the tree's neighbors, etc. When the blindfolded person is confident that he or she knows the tree, the rest of the group leads the blindfolded person back to the starting point. After removing the blindfold, the newly sighted person attempts to relocate his or her tree. Rotate jobs until everyone has had a turn. Were participants able to find their trees? How did participants identify their trees? How are some trees different from other trees?

Tree Height

Adapted from *Teachers' Guide to Arbor Month*, Minnesota Department of Natural Resources

Objective: To estimate the height of a tree using ratios.

Supplies: Twelve inch ruler, masking tape, measuring tape

Activity: Height is the hardest tree measurement to obtain. Use a ruler and follow the instructions below to estimate the height of trees in the schoolyard.

1. On a 12-inch ruler, mark the 1-inch and 10-inch lines with masking tape.
2. Group participants in pairs.
3. Person A stands at the base of the tree.
4. Person B, while holding the ruler up in front of their eyes at arm length, moves back until they can see the whole tree from top to bottom between the 0-inch and the 10-inch mark on the ruler.
5. Person B then moves the ruler until the base of the tree is exactly at 0-inches and the top of the tree is sighted exactly at 10-inches.

6. Person B sights out from the ruler's 1-inch mark to a point on the trunk above the base.
7. Person A marks this spot on the trunk with tape.
8. Measure the distance from the base of the tree to the 1-inch mark (X) on the tree.
9. Together, multiply by 10 to get an approximate height of the tree.

HOW ANIMALS SURVIVE WINTER

Adapted from *Winter Wildlife*, Edwards YMCA Camp and *How Animals Survive in Winter, Schoolyard Ecology Explorations*, University of Minnesota.

Objective

To understand ways animals survive a Minnesota winter.

Supplies

Explorers' nature journals

Pencils

Sunflower seeds or other decomposable item, enough for each child to receive at least 20

Large sheet of paper

Marker

Woodchuck drawing

Linnaeus List field guides

Plastic sandwich bags

Vegetable shortening

Objects of the Day: Pictures of different animal homes/shelters, samples of animal fur

Background

In temperate regions, animals must contend with challenging environmental conditions in winter when temperatures are cold and food is scarce. They have developed several strategies for winter survival.

Some animals migrate, leaving the adverse conditions behind and moving to other regions where the conditions are more suitable. Migration is defined as the regular movement of animals over relatively long distances. Many animals migrate great distances to escape harsh winter conditions.

Some animals remain active, often developing thicker coats like deer and rabbits or huddling together to keep each other warm like honey bees clustering in the winter hive. They may also eat food they have stored for the winter like gray squirrels. A few animals like the snowshoe hare and short-tailed weasel change color from brown in the summer to white in the winter to help them camouflage with their surroundings.

A unique and not completely understood strategy for survival is hibernation. Hibernation is defined as a state in which an animal's metabolic rate is reduced to a minimum and the animal enters a deep sleep, surviving on food reserves (fats) stored in the body. Scientists have found a special substance in the blood of hibernating animals called HIT (Hibernation Inducement Trigger) that they believe controls hibernation. A woodchuck's heart rate goes from 80 beats per minute when active to four or five beats per minute when in hibernation. Its body temperature drops from 98˚F to 38˚F. And, the woodchuck's incisors, which grow continuously and are kept short by all the gnawing it does, quit growing during hibernation. True hibernators do get up every few weeks to nibble on food, and in the case of the woodchuck, use an underground toilet room.

In comparison, dormancy occurs when an organism's metabolic rate drops to a minimum but it keeps a relatively high body temperature, usually due to its large size. As commonly mislabeled,

bears are not true hibernators because they are able to reproduce and are easily awakened during winter. Black bears enter dormancy rather than deep hibernation, and although their respiration rate drops to two to three times per minute, their body temperature only drops to around 95˚F.

The following summarizes what some Minnesota animals do to survive in winter:

Hibernate –woodchuck (groundhog), ground squirrels, some bats, chipmunk, frogs, turtles, and some bats.

Dormant –black bear, skunk, raccoon, most insects, and mussels.

Migrate – many birds, some bats, monarch butterflies.

Active: some birds, some bats, red squirrel, gray squirrel, cottontail rabbit, red fox, gray fox, white-tailed deer and fish.

Note: A few birds may use more than one strategy. For example, the American robin usually migrates but some are active in parts of Minnesota during the winter if there is enough food and water.

Activity

1. Explore and discuss the objects of the day.
2. Ask the participants what they and their families do differently in winter to survive the cold weather and snow. Are there animals that do the same things to survive winter? Discuss animal responses to winter with your participants, using the background information provided above or other resources.
3. Describe the four major strategies for survival: dormancy, hibernation, remaining active, and migration. Write these strategies on a large sheet of paper.
4. In their Explorers' nature journals, ask participants to write down the four main survival strategies and then list at least one Minnesota animal they think uses each strategy.
5. As group, record ideas on the large sheet of paper (you can save this sheet to refer to when doing the *Animal Signs*). When all the ideas are gathered, discuss which animals do and do not hibernate. You may want to suggest animals if participants do not list all the categories. Ask why they think an animal would hibernate. Share specifically what happens to the woodchuck's body during winter hibernation compared to the summer.
6. Discuss how part of getting ready for hibernation is eating a lot of food before winter in order to build up fat reserves. Fat will be used as food during hibernation to help keep the animal alive and also as insulation. If the animal does not store enough fat it may not survive. Note: Not all animals that hibernate store fat; a chipmunk is one example of an animal that does not store fat when it hibernates.
7. Play the food gathering game. It is preferable to do this outside but it also can be done inside. Tell the participants that they will each have the chance to be a woodchuck preparing for hibernation and that they need to find and eat enough food in order to survive the winter. In Minnesota woodchucks start preparing early by eating green plants, vegetables and fruits throughout the summer to fatten up. Hibernation then kicks in during the fall when temperatures drop and food becomes unavailable.
8. Split the group in half. Half will be the woodchucks and the other half will be the food hiders. Define the area where the food can be hidden; keep the range fairly small.

9. Give each of the hiders 10 pieces of food (you can use sunflower seeds, corn, or any other decomposable item). Have the woodchucks close their eyes and turn their backs to the defined area. Allow the hiders to spread out their food for one minute then call them back.
10. The woodchucks will now have a few minutes to find as many pieces of food as they can. They must stop when they are called back to the starting point.
11. Have the woodchucks count how many food items they found. If they collected 10 or more they survived the winter, if not they died.
12. Switch groups and play again. Play as many times as you would like. You may want to increase the amount of food each time, in theory allowing more woodchucks to survive. Or decrease the amount of food and compare. Discuss the importance of food for survival.
13. Place a snack size plastic bag full of vegetable shortening on the snow along with an empty snack bag. Have the participants feel the top of the bags, pressing gently toward the snow. Ask if there is a difference in temperature. Which one is warmer? Why? Fat isn't just used for food, it also provides insulation for the animal in the winter. What do you use as insulation in the winter for your bodies? Are certain types of clothes better than others? What would happen to us on a cold winter day if we were outside all day without proper clothing?
14. To wrap up ask what else is important for the survival of a hibernating animal. Discuss how habitat and finding a place to hibernate is very important. If their shelter isn't well protected they could be exposed to the elements, harming their chances of survival from either exposure to the cold or predators.
15. If time, have participants run, skip or hop either in place or around the area pretending they are looking for shelter and also to warm up (and get out some energy). Visit any real shelters that may be discovered (tunnels, squirrel nest, tree holes, etc.)
16. Gather activity materials and return indoors.

Extensions

Frozen Frogs

Adapted from *Winter Wildlife*, Edwards YMCA Camp

Objective: To understand how frogs survive winter.

Supplies: Frogs & Toads of Minnesota poster, lime green gelatin, hot water, small paper cups or plastic snack bags, tablespoon

Activity: Ask what frogs and toads do in the winter? Show the Minnesota DNR Frogs & Toads of Minnesota poster. Explain how frogs hibernate either on (not under) the mud at the bottom of a body of water, or go under the ground or leaf litter. Some frogs like the wood frog, gray tree frog, spring peeper and striped chorus frog hibernate on land and actually freeze solid except for their vital organs which contain a special substance that acts as an antifreeze.

Follow instructions for making a small box of lime green gelatin (hot tap water works instead of boiling). Fill a small paper cup or snack size plastic bag with about one tablespoon of liquid gelatin. You can make the gelatin before class starts but must keep it at room temperature. Tell participants they are frogs and need to find a good spot to hibernate without having their bodies freeze solid. Have them place their "frogs" outside, then collect them after 20 minutes or longer. (Note: Frogs partially gel after about 20 minutes in 18˚F temperature). If some liquid still remains, their frog

survived hibernation. For more information, read www.scientificamerican.com/article.cfm?id=how-do-frogs-survive-wint

Blubber Finger Test

Adapted from *ecotime,* Jeffers Foundation.

Objective: To understand how fat insulates.

Supplies: Two bowls, ice, water and vegetable shortening such as Crisco

Activity: Fill two bowls equally with ice and water and let them stand for five minutes. As they sit, apply vegetable shortening to one of the participant's pointer fingers to represent blubber (animal fat) and leave the second pointer finger uncovered. Place the participant's two pointer fingers into a bowl and see which finger he or she can keep in longer. Participants should find that the finger covered with "fat" can stay in the cold water longer, just as the fat on hibernating animals protects them from winter chill.

Mitten Test

Adapted from *ecotime,* Jeffers Foundation.

Objective: To understand how warm-blooded animals are able to produce their own body heat.

Supplies: Pair of mittens, three thermometers

Activity: This activity has a direct connection to how humans and animals keep warm during the winter months. You will compare the temperature in the room that that in a mitten and human body temperature. Ask participants where the temperature will be the warmest. Determine the room temperature by placing a thermometer on a desk or table. At the same time place one thermometer in one mitten and another in the other mitten along with a participant's hand. Wait two minutes and record the temperature in each location. Compare your answers. Talk about how humans and animals keep warm in winter. Would the results be the same if a bird or a fish wore mittens?

ANIMAL SIGNS

Adapted from *Tracks and Traces* Vermont Institute of Natural Science (VINS) www.VINSweb.org and *Animal Signs,* Upham Woods Outdoor Learning Center.

Objective

To identify signs of animal activity in the winter.

Supplies

Explorers' nature journals

Pencils

Colored ground flags (5 each of two colors preferred)

Animal track sheets

Ruler

Objects of the day: Animal-chewed twigs

Animal tracks field guide (optional)

Whistle (optional)

Hula hoops or bright colored yarn (optional)

Background

Animals are often hard to see, even in the winter. Learning to identify their tracks and signs is a fun way to discover the animals living in your area as well as what they have been up to. Snow cover can provide a great opportunity to find tracks, tunnels, food and other items that may not be as visible the rest of the year. Plus, all you need are your senses and some basic tools.

There are five main categories of animal signs to look for including: tracks and trails, homes, eat marks (browse on vegetation), scat (poop) and urine, and body parts. Tracks are the prints animals leave behind and their trail is the prints put together; homes could include leafy squirrel nests, mouse nests or tunnels, holes in trees or cocoons. Eat marks include cracked seeds and nuts, chewed branches and small holes in trees. Scat and urine is of course poop and pee. Body parts could include pieces of fur or bones from prey animals.

The four main track patterns to look for include:

- Galloping – push off with their front feet and then swing their two back feet around so that they land in front and a little outside of the prints made by the smaller front feet (mice, squirrels, rabbits)
- Bounding – land with their front feet planted nearly side by side, the two back feet fall into the prints made by the front feet (weasel, mink, otter)
- Waddling - alternating big-little pattern as they place their large hind feet next to their smaller front footprints (raccoons, porcupines)
- Walking/Trotting - alternates right and left feet, placing the hind feet in the prints made by the front feet making a nearly straight line of single prints

Animal track activity sheets can be found at
http://files.mndnr.gov/education_safety/education/project_wild/animal-tracks.pdf

Who Made These Tracks? www.mndnr.gov/young_naturalists/tracks/index.html

Activity

1. Explore and discuss the objects of the day.
2. Before participants arrive check the area for animal signs and make notes of where they can be found. Look for tracks, chewed twigs, nests, tunnels and other signs. Mark these with colored yarn or hula hoops (optional).
3. From the list made during the activity, *How Animals Survive the Winter*, review the animals that are active or dormant in the winter. Are there any more active animals to add to the list? These are the animals that will be leaving the tracks and other signs we will be looking for.
4. Introduce animal signs and tracks to the group. Explain that "tracking" is looking for and following animal signs. It has been an important part of human survival for thousands of years.
5. Using the *Match the Tracks* in the Explorers' nature journal, review the four main track patterns animals create: galloping, bounding, waddling and walking/trotting (pages 16-17). You may want to have the participants try to move in these different patterns.
6. Emphasizing tracks you found in the area along with the journal and additional track sheets, share how to identify some common animal tracks like rabbit, squirrel, mouse, songbirds, etc. Look at size, shape, track pattern and location when trying to identify a track.
7. Share how tracking is like solving a mystery. When trying to identify a track, ask yourself questions. Where is the track? Is it in the forest, on the playground or in a field? Certain animals are more likely to be found in the habitats they prefer. How big is the track? Remember freezing and thawing and wind can change or cover parts of a track. What is the track pattern? All these things will help you narrow down the answer.
8. Besides tracks you may also encounter other signs of animals. Ask participants for their ideas of what these signs could be. Show browsed deer and rabbit twigs as an example of what to look for when they are outside. Note: You may also choose to bring in your own real animal signs to share such as scat.
9. Divide the class into two groups. Give each group five colored flags (one color per group). Explain that they should try to mark at least one animal track, one animal home and one source of food. For the last two flags they can mark any animal signs they would like. Have each participant bring their Explorers' journal and a pencil. The instructor should also bring along the extra track sheets, ruler and optional field guide.
10. Allow each group time to find and mark their animal signs then gather them back into one large group.
11. As a large group, visit as many marked areas as you have time for, alternating between the two colors and gathering the flags as you move along. Discuss what the participants found. Encourage them to use their journal, track sheets and a ruler to help identify any tracks. They can also draw what was found. Are there any stories the tracks and signs are telling you such as where the animal lives or what it was doing?
12. If there is time, finish by visiting the animal signs you found before class. Have a few participants gather any leftover flags.

13. Wrap up with some discussion questions. How can knowing about animal signs be helpful? What careers or activities involve looking for animal signs today? Challenge the participants to find at least one animal sign near their home and show it to another person.

Extensions

Just the Facts, Ma'am

Objective: To be able to made detailed observations to describe an object.

Supplies: One natural object per person, Explorers' nature journals, and pencils

Activity: Give participants natural objects such as rocks, sticks, pinecones, etc. Instruct them to write twelve different ways to describe their object. They should be as precise and detailed as possible. When everyone is finished, place natural objects in the center of the group. Have one person take a list and read one description at a time. The group should try to guess which object is being described. Try to match all description lists with their respective natural objects. Why was it easy to guess some objects, harder to guess others? Was it difficult to come up with twelve descriptors for your object?

Digital Hide and Seek

Objective: To improve observation skills.

Supplies: Digital camera

Activity: Have one participant take a digital photo of something at your site, then have the other participants try to find the real object. Was it difficult to find what was in the photo? What landmarks could you include in your photo to help others find the object? How does this activity help you think like a scientist?

NATURE BINGO

Objective

To explore the schoolyard using a nature bingo card.

Supplies

Explorers' nature journals

Pencil

Field identification guide (optional)

Background

Nature bingo encourages participants to summarize what they observed over the past several weeks. Nature bingo is a good way to wrap up the seasonal Explorers Program.

Activity

1. A bingo card is included with the Explorers' nature journal (page 18). As an alternative, each square of a blank bingo card can be filled in with items that the participants have observed throughout the program. Include a variety of plants, animals and other natural features of the schoolyard. The images of the items can be copied from clipart or the text/name can be included and the participant can sketch each item found.

2. Before going outside review each of the items included on the bingo card.

3. The goal is to get bingo (five squares in a row) or blackout (all spaces crossed off) on the card.

4. Review nature bingo items that were found and not found in the schoolyard.

5. Ask the participants to suggest items for future bingo cards that were not listed. Small prizes/treats could be provided for those who get bingo.

Extension

Question Trail

Adapted from *Exploring The Outdoors With Aldo Leopold*, Pheasants Forever.

Objective: To improve observation skills and practice formulating testable questions.

Supplies: Blank tags with string, pencils

Activity: Give each participant a tag and a pencil, and inform them of the boundaries of activity. Allow them to wander along the trail and come up with a question about something they see. Do not allow simple questions like, "What is this called?" but instead encourage more investigative questions such as, "Why is this bark different on the branch then on the trunk?" How did this cob of corn end up in the woods?" How did this squirrel die and what will happen to it?" When participants come up with a question, they should write the question on the tag and hang it from the questioned object or nearby.

Then, gather all participants at the head of the trail and walk down the trail addressing one question at a time. At each tag, facilitate a discussion on how to make the question listed into something they could test or investigate.

EXPLORERS SCAVENGER HUNT

Objective

To explore the schoolyard to find a variety of natural and human-made items.

Supplies

Explorers' nature journals

Pencils

Activity

1. Refer to *Scavenger Hunt* in the Explorers' nature journal (page 22), for items to find around the schoolyard.
2. Review and discuss each item before going outside.
3. Record in writing or with a sketch the items found around the schoolyard and surrounding area.
4. When done searching, ask the following questions: What are some additional items not included on the scavenger hunt form? What things are alike? Which ones are different?
5. Refer to the activity *Nature Observation Basics* for more ideas on making observations.

Note: Other items to include on the scavenger hunt might be something: green, with needles, twisted, curly, round, sticky; a seed, tree bark on the ground, feather, pinecone, something flat, something smooth, rough, red, a flower, leaf, dead twig, weed, or ant. Also, ask participants to compare two different areas such as a sidewalk/paved area to grassy/natural area. List the things that are similar and different between these sites.

Extensions

Nature Alphabet Search

Objective: To search nature items and find each letter of the alphabet.

Supplies: Digital camera (optional), Explorers' nature journals, pencils

Activity: This activity can be completed as a group or individually. Groups and individuals can be assigned groups of letters (i.e. A-F, G-L, M-R, S-Z) to search for. The 26 letters of alphabet can be printed on a sheet of paper to assist with the activity. Provide examples of what different letters might look like in nature before going outside. For example, a branched twig might look like the letters V or Y. The nature letter can be captured with photos or the participants can sketch the items in their journals. Ask, which letters were easy to find? Are there common patterns and shapes found in nature?

Scavenger Hunt with a Twist

Objective: To foster reflection on scientific objectivity.

Supplies: Value-laden words on index cards

Activity: Give participants cards with a value-laden word such as gross, unnecessary, special or valuable and instruct them to find something in nature that their word describes. Have each participant show his or her finding to the group and explain how the word describes the object. Were there participants who couldn't find something for their word? Does everyone agree with

everyone else's choices? To what extent do our values predict and/or dictate our actions? What impact do our values have on how we view nature? How can you, as a scientist, remove human values from your descriptions of nature? Should you?

Nature Wristband

Objective: To create a wristband of natural items collected from the schoolyard.

Supplies: Tape (masking tape, duct tape or packing tape), natural items like small rocks, seeds, small leaves, pine needles, flowers, sticks, etc.

Activity: Measure around the participant's wrist and cut a piece of tape slightly larger than the wrist to fit over the hand. The tape needs to be sticky side out. Identify an area outside to collect natural items to stick to the wristbands. Do not stick live insects to the wristband. Try to find items on the ground versus picking them off plants. Ask the following questions: What did you find? Where did the items come from? Compare the wristbands and look for similarities and differences in natural items found. Encourage the participants to make a nature wristband at home and compare it with the one they just made.

Note: Natural items can be collected prior to class and this activity can be completed indoors.

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