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02. Ecological Relationships Lesson #1: OBSERVATION IS A SKILL

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Ecological Relationships Lesson #1: Observation is a Skill

Overview: This lesson consists of three activities that introduce youth to guided scientific inquiry. They will learn to make careful observations, ask questions, and create connections to their own lives while learning about the classification of abiotic and biotic factors in the natural world.

Learner Outcomes

Youth will:

1. Understand the relationship between abiotic and biotic factors.
2. Know the difference between “looking” and “seeing”.
3. Be able to use three sentence starters: “I notice”, “I wonder”, and “It reminds me of” to focus their observations.

Getting Ready

Materials: Youth will need their journal and pencil; staff will need the handout.

Preparation: It is highly recommended that staff review the entire lesson before beginning. This is an extensive lesson that may require staff to divide tasks in order to implement it effectively.

Location: It is best to do this along a trail since the goal is to explore different organisms.

Background

The following material is adapted from Schutsky, Kaufman, & Signell, 2006 and is necessary to instruct this lesson.

Abiotic vs. Biotic

Abiotic: Non-living things that make life on earth possible. For example: sunlight, geology, water, temperature, wind, and periodic disturbances.

Abiotic Factors- Make life possible while shaping the ecosystems.

a. Sunlight- The amount of available sunlight varies from place to place on Earth and within individual ecosystems. Producers, organisms that can produce their own food, rely on sunlight to photosynthesize.

b. Geology- The study of geology varies widely from place to place. For example, soil can be coarse sand on beaches and deserts or fine clay in riverbanks and marshes. The shape of the land, or topography, also helps to determine the makeup and water availability of any ecosystem.

c. Water- Availability of water directly affects the organisms of an ecosystem. The biological diversity of an area is dependent on the presence of water. Organisms depend on different amounts of water to survive and must adapt to what is available.

d. Temperature- Varies widely between ecosystems and changes seasonally within an ecosystem. The majority of biotic factors are unable to maintain an internal temperature more than a few degrees above or below the surrounding temperature; this limits where different species can be found.

e. Wind- The driving force behind weather patterns; it shapes ecosystems daily through seed dispersal, shifting substrate, and storm damage. It also aids evaporation and is a constant threat of desiccation to terrestrial organisms.
Lesson at a Glance

The More You Look, the More You See (10 minutes)
Youth start off with a warm up activity in which the staff members give them an “eye exam”. They are shown a sign that says “Spring in the the Woods” and asked, “What did the sign say?” Many of them will miss the duplicate “the”.

I Notice, I Wonder, It Reminds Me Of (30 minutes)
Youth work in partners using three prompts (1) I Notice…Making Observations (2) I Wonder…Asking Questions (3) It Reminds Me Of…Making Connections to Observations. These prompts are useful in investigating nature, discovering new things, and encouraging curiosity.

Abiotic Simon Says (15 minutes)
Youth are introduced to the classification of abiotic and biotic factors; they practice this classification through an energizer called Abiotic Simon Says. This activity takes place while walking from one location to another.

Concluding the Lesson (5 minutes)
Youth reflect about developing their observation skills through their experiences in Yellowstone National Park.

f. Periodic Disturbance- Most ecosystems undergo periodic disturbances that interrupt the “normal” functioning of the ecosystem. As an example, forests can have disturbances like floods, fires, or encroaching geothermal activity. These disturbances happen frequently enough that species have developed adaptations, which help them survive or take advantage of the disruption. In many cases, organisms absolutely rely on disturbances for their survival, such as the Douglas fir, whose cones need the heat of the fire to open.

Biotic: Living Organisms. Organisms, adapt to living within certain ecosystems, can engage in competition for resources like water, sunlight, space, food and nutrients. They often engage in actions that are mutually beneficial to each species. The most important ecological distinction between organisms is how they get their nutrients. Organisms get their nutrients in three basic ways: the producers though photosynthesis, consumers through ingestion, and decomposers through absorption.
Suggested Procedure

Warm Up Activity: The More You Look, the More You See (10 minutes)
The staff will:
1. Prepare participants by telling them they will get a quick “eye exam” to make certain they have their eyes open.
2. Show them the “Spring in the the Woods” (refer to handout: “Spring in the the Woods”) for 2-3 seconds and then remove the sign from view. Then ask: What did the sign say?
3. Most youth will not notice the duplicate ‘the’. Give them a second chance to read the sign. Repeat the question: What did the sign say? Usually participants will catch the error after a second look.
4. Follow up this activity with the question: Why is it important to look closely in the natural world? (D1)

Transition: Explain that one of the most exciting parts of living in Yellowstone National Park or being an ecologist is getting to look closely at the world around you and make connections. There is an infinite amount of activity in the natural world around us, no matter where you are. It is important to stop, be patient, and observe what is happening. The human brain is a powerful organ that can jump to conclusions based on past experiences. Looking at something is a superficial act, but seeing means understanding what it is you are looking at. Observation is a skill that must be learned. The next activity will give you the skills to make observations.

I notice, I wonder, It reminds me of (30 minutes) (F1)

I notice… Making Observations
1. Explain to youth that they will be making observations with a partner about an interesting organism or natural object.
2. Divide youth into pairs and ask them to find an object.
3. The first prompt, “I notice…”

b. Introduce three types of questions. Explain these three different types of questions:
   i. Questions that can be answered through more observations. These are especially useful when observing, because they often lead to deeper observations.
   ii. Questions we can find the answers to through scientific resources. These are questions that cannot be answered through simple observations, but that others have studied extensively.
   iii. Questions we cannot answer because they are outside the realm of science or they are unknowable. These questions are fun and interesting to wonder about, but cannot be answered through scientific inquiry.
4. Pick someone’s question that can be answered through more observation. Ask youth if they can answer it and how long they would have to observe to get an answer.
5. Extension: Have the youth write down questions that they would like to look up later.

It reminds me of… Making Connections
1. Explain that they will be completing this sentence starter out loud, without pausing, and they should try to come up with as many statements as possible.
2. Give youth one minute to make “It reminds me of …” observation.
3. Next, lead a group discussion using the following questions:
   a. What were some of your favorite “It reminds me of” statements?
   b. Have them take turns with a partner and ask a few to share with the group.

Transition: Explain that these three prompts are very useful in investigating the natural world, discovering new things, and keeping us curious. Science is about coming up with the best explanation for all the available evidence. It is also about being open-minded to other explanations and possibilities. In science, nothing is ever proven, only supported. One tool scientist’s use is classification to group observations in the natural world. One common use of classification is to sort abiotic and biotic objects; in the next activity we will practice this classification.
a. Explain that they will be making observations quickly, without pausing. Explain the importance of saying observations out loud, because it is easier to commit things to memory. Have them say all of the things they notice, even if they seem obvious.
b. Next, give them the prompt “I notice…” and instruct them to finish the sentence without giving it much thought.
c. Explain that it is normal for this to be challenging at first. Encourage them to use the five senses and listen to what others are saying for inspiration. Mention that, if they notice they have stopped talking, their brain may have slipped back into “idle” mode.

4. Give youth one minute to make “I notice…” observation.
5. Next, lead a group discussion using the following questions:
   a. What is a new observation you learned from your partner?
   b. Is there something you observed that no one else observed?
   c. Was there anything you both observed?
6. Explain the importance of corroboration and redundancy in science. If more than one person saw the same thing, that could be important corroboration. If only one person sees something, that might be important because it may have been missed by others and needs further exploration.

I wonder… Asking Questions
1. Explain that they will be speaking out loud again using “I wonder” statements that ask questions. Tell them, “Just like before, don’t edit yourself, just keep asking questions. If you get stuck listening to someone else to see if they inspire you.”
2. Tell them they will have one minute to make “I wonder…” statements.
3. Next, lead a group discussion using the following question: What were some of the best questions you came up with?
   a. Have youth share some of their wonderings. Take a sample question that could be answered through observation or investigation and explain how it could be explored further.

Abiotic Simon Says (15 minutes)
This activity is most effective if conducted while walking from one location to another.

The staff will:
1. Begin by asking youth if they are familiar with the terms abiotic and biotic. Refer to the background information to explain and discuss abiotic and biotic factors.
2. Have participants return to the object they first identified. Ask if the object is abiotic or biotic? Have them explain how they know.
3. Next, play an energizing version of “Simon Says” in which youth perform the action called out by the staff member only if the action involves something abiotic. (F2) For instance, if the staff calls out “Simon says…pick up soil,” the youth are to pick up soil. If the staff calls out “Simon says…touch a tree,” any youth who moves towards a tree is out for that round, because the tree is abiotic.
4. Repeat using various living and non-living objects until youth understand the difference between abiotic and biotic factors.
5. Possible Abiotic Simon Says Call Outs:
   Abiotic Simon Says
   …pick up soil (abiotic)
   …find a rock (abiotic)
   …point to a piece of scat (abiotic)
   …point to the sun (abiotic)
   …hug a tree (biotic)
   …pat your friend’s back (biotic)
   …flap your arms like a bird (biotic)
   …quack like a duck (biotic)
6. Lead a group discussion about the abiotic vs. biotic actions that were used in Abiotic Simon Says. Example discussion questions:
a. Is soil truly abiotic?
b. Is something that was once living and is now dead, abiotic or biotic? (Refer to abiotic/biotic definition in background).
c. Abiotic and biotic could be thought of as a western science concept, how do different cultures view the natural world, through the lens of living/and non-living organisms?

Conclude: (5 minutes) Explain that developing the skill of observation can change the way you experience the world. If you approach life with curiosity and make observations, generate questions, and foster connections, than you will be opened up to a world of wonder. Ask youth how they might further develop their skills of observation through their own experiences in Yellowstone National Park? (S1)

Assessment Check Ins:

(D1): Examines prior knowledge, interests and misconceptions of the skill in making observations. This information will assist the staff in planning instruction.

(F1): Provides insight on (a) what youth are learning from making observations, (b) examines what ideas they understand in science, and (c) connects their observations to their prior experience.

(F2): A creative way to explore what they understand about abiotic and biotic organisms.

(S1): Assesses what youth have learned and transfers it into their experience at YELL-YCC.

Staff Notes:
The following material is from the University of California at Berkeley, Lawrence Hall of Science. 2012.

**Identifying organisms is the primary goal of outdoor experiences.**

- Once we have identified something in nature, often we don’t notice much else. Identification sometimes substitutes for deeply observing what something really is. When organisms are reduced to a species, we can fail to notice the details of the individual we are observing. Exploring the complexity and nuances of nature by observing and asking questions can be more useful that just receiving an answer.

**Observing in nature means being still and quiet.**

- You don’t have to be quiet and still to observe. Saying things out loud helps cement them in our memories and talking with peers helps spark new ideas and open windows for new observations and connections.
- Sometimes, being quiet and still in nature is the perfect tool for observing, but sometimes thinking out loud and discussing is also the perfect tool.
Teaching Knowledge

Spirit of Scientific Inquiry and Investigation

- Scientists who study memory functions in the brain have found that making connections is what keeps our memories stable and accessible. This is because accessing memory involves making associations between new information and what we already know. The more connections that can be made to prior knowledge, the more stable the memory, as it is more firmly placed within an existing conceptual framework. The “it reminds me of” exercise specifically helps youth make connections to what they already know. Creating metaphors and analogies also help to generate more interesting questions. In addition, it can be easier to remember things that you’ve said out loud, because information is processed in both the speech and the auditory centers of the brain.

Introducing Content:

- Avoid providing information that might discourage youth from investigating for themselves. Focusing on facts, like identifying the organism can switch youth into a more passive mode. Waiting till after they have made observations and explanations and generated questions of their own will often make youth more receptive to hearing interesting facts about an object. As you ask youth to share their sources of information, make sure that you share yours as well.

Common Relevant Misconceptions

The best way to learn is to be told lots of information.

- We often assume that when we tell someone something, they will learn it. However, people learn in all kinds of different ways and hands-on learning is one of the best. When youth observe and start asking questions, they are engaging their curiosity.
- When teachers provide a quick answer or a set of facts, it tends to shut down this curiosity. The idea is that when youth are excited about something and full of questions, they are more likely to keep learning and investigating the natural world.

References:


The lesson plan titled: Spring in the Woods is from the ABC’s of Ecology. This served as the warm up/intro activity in this lesson renamed The More You Look, The More You See. This lesson was modified in the following way: Instructional language was changed to match the REC.

The lesson plan titled: Abiotic Simon Says is also from the ABC’s of Ecology. This served as the closing activity in this lesson. This lesson was modified in the following way: Instructional language was changed to match the REC.


The lesson plan titled: I notice...I wonder...It reminds me of... is from the BEETLES program which served as the central activity in this lesson. This lesson was modified in the following ways:
  a. Some instructional language was changed to match the REC
  b. The introduction and conclusion are additions to this lesson
  c. Some instructional notes were not included based on relevance.

Handouts:

The following material is from Schutsky, Kaufman, & Signell, 2006.