

TTCD Lesson Plan (25): Participatory Science

Unit: Participatory science	Grade(s): All	Class Size: 1-30	Lesson Duration: 1 hour	Location(s): Classroom
Topic(s):	Participatory science, Birding, Beluga Monitoring			
Student Prerequisites:	N/A			
Essential Questions:	What is participatory science, and how can it help improve public understanding of science and the environment? How can local participatory science help communities better understand their local environment and changes over time? How can anyone, regardless of their background or expertise, contribute to scientific research through participatory science? How can birding surveys and other participatory science activities help us understand and protect local wildlife populations?			
Student Objectives:	Students will be able to define participatory science and explain its significance in improving public understanding of science and the environment. Students will identify how individuals, regardless of background or expertise, can contribute to scientific research through participatory science projects. Students will reflect on the value of regional versus hyper-local participatory science and when a community might want to maintain control over its own data versus share with others. Students will explain how data gathered from participatory science projects, like birding surveys, can contribute to wildlife protection. Students will actively engage in a birding survey as part of a participatory science project, practicing data collection, observation, and recording.			
Standards:	Supports NGS Standards: G1-SG-3: Understand that scientific knowledge is ongoing and subject to change as new evidence becomes available through experimental and/or observational confirmation(s). G1-SG-4: Understand that advancements in science depend on curiosity, creativity, imagination, and a broad knowledge base.			

	MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. Relevant NGS Crosscutting Concepts: Patterns: Patterns can be used to identify cause and effect relationships. Cause and Effect: Cause and effect relationships may be used to predict phenomena in natural or designed systems. Cultural Standards E.1: Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them by: recogniz[ing] and build[ing] upon the inter-relationships that exist among the spiritual, natural and human realms in the world around them, as reflected in their own cultural traditions and beliefs as well as those of others; E.2: Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them by: understand[ing] the ecology and geography of the bioregion they inhabit;
Local Context:	Students will go on a local birding excursion, observing birds in their local ecosystem and noting what they see to help inform local birding databases. Students will learn about ongoing participatory science projects in Alaska.
Vocabulary:	Participatory science: a research method that empowers anyone to contribute data and knowledge to scientific endeavors. Birding: the identification and observation of wild birds in their natural habitat Bird Migration: Birds migrate to move from areas of low or decreasing resources to areas of high or increasing resources. The two primary resources being sought are food and nesting locations.
Dena'ina language words:	
Materials:	• Print out one copy for each student of page 16 of this document: https://assets.ebsco.com/m/6b6c11d3016dab38/original/Engaging-High-School-Students-Scientific-Discovery-Lessons-Activities.pdf • Pens and/or pencils for each student. • Clipboards • Binoculars • Field guide to local birds. • Camera (optional) • Projector

Instructor Prep:	Invite a colleague or friend with a background in birding to help co-teach this lesson. It will help to have someone with you who can readily identify the birds in the local ecosystem. Alternatively, if you lack a background in birding, do some prep work so you feel comfortable easily identifying at least five birds in the local ecosystem. Create an eBird account.
Introduction:	Introduce the concept of participatory science: a research method that empowers anyone to contribute data and knowledge to scientific endeavors. Some examples of participatory science include: • The Christmas Bird Count: One of the longest-running participatory science programs, started in 1900 by the Audubon Society which helps us better understand birds so we can better protect them! • The Great Sunflower Project: Encourages people to collect data on pollinators in their gardens, schools, and parks. • North American Butterfly Monitoring Network: A network of volunteers who monitor butterfly abundance and distribution • River Plastic Survey: Participants report plastic debris found in rivers to help scientists understand plastic transport and accumulation A local example of a participatory science project is the Alaska Beluga Monitoring Program. The volunteers collect important data on beluga distribution and habitat use in nearshore waters of the Inlet while building working relationships with professional scientists. The critically endangered Cook Inlet beluga is an important part of the regional ecosystem. Its abundance rapidly declined beginning in the 1980s and it continues to decline as it faces ongoing human-caused physical and noise threats such as ship and boat traffic, construction, oil and gas activities, fishing, and aviation. While this beluga population is being studied extensively, data on distribution, seasonal habitat use, and behavior throughout Cook Inlet is still insufficient. By participating with ongoing monitoring efforts, participatory scientists can help fill data gaps and contribute to beluga recovery! This collaboration has led to standardized scientific monitoring protocols, volunteer training to support monitoring efforts, and coordination of shore-based beluga monitoring activities at multiple sites along Cook Inlet. The data collected is shared with scientists and federal agencies and is used to update marine mammal research and management activities, pinpoint important foraging locations, and understand the impact of human activities on belugas. Ask the class: Can anyone think of an example or a reason why a community might NOT want to share data they have collected locally with scientists, federal agencies, or outside community members? - Protecting data sovereignty: Data sovereignty is the right of Indigenous peoples to control data from and about their communities and lands. By controlling their data, communities can ensure it is used in a way that aligns with their values and priorities. - Preventing misuse: Communities may fear that sensitive data could be used to exploit their resources - the data could be used against them to limit things like

subsistence hunting and fishing or lead to destructive land management practices like mining or road building.

- Ensuring community benefit: Communities want to ensure that research conducted within their communities serves their own interests and that they see the benefits when their data is used.
- Lack of trust: Past experiences with researchers or government agencies have led to distrust, making communities hesitant to share data.
- Maintaining control over traditional knowledge: Communities may choose not to share data that contains traditional knowledge without ensuring appropriate protection and respectful use.

Now that we have a better understanding of the pros and cons of participatory science, we are going to be participating in a common participatory science project – birding! Ask the class: Can anyone tell me what birding/bird watching is?

Birding is the identification and observation of wild birds in their natural habitat.

Ask the class: Why might information about birds be useful to a community?

- Birds are excellent indicators of environmental health, as they are often the first to show signs of change in ecosystems: Large, rapid bird declines alert us to an environmental problem that needs immediate attention.
- This data can be used by the community, conservation organizations like TTCD and researchers to monitor bird populations, track changes in ecosystems, and inform conservation strategies like areas in need of protection.
- By learning about birds and their habitats, people can develop a greater appreciation for the natural world and the interconnectedness of all living things

Begin a discussion on bird migration. Ask the class: What is migration? What is Migration?

Migration is the regular, seasonal movement of animals from one place to another, often in search of food, better climate conditions, or breeding grounds. In the context of birds, migration usually involves traveling long distances between breeding and wintering habitats.

Ask the class: why Do Birds Migrate?

Food availability, nesting sites for breeding, temperature and climate, daylight

Ask the class: What are some common bird species that migrate:

Arctic Tern: Known for having the longest migration of any animal, the Arctic Tern travels from the Arctic to the Antarctic and back each year.

Canada Goose: These large waterfowl migrate from the northern parts of North America to warmer southern regions for the winter.

	Barn Owl: Found in many parts of the world, barn owls migrate to find more food as temperatures drop in their breeding areas.
Activity	1. Give each student a handout of page 16 of this document, a clipboard, a set of binoculars and a pencil or pen: https://assets.ebsco.com/m/6b6c11d3016dab38/original/Engaging-High-School-Students-Scientific-Discovery-Lessons-Activities.pdf 2. Explain to the class that this is going to be a group activity, so we should walk together as a group on the nature walk and participate in identifying birds one at a time. 3. Lead the class on a nature walk. When a student sees a bird, ask them to raise their hand and stop as a group. 4. Work together to fill out the identification box on the worksheet, asking students to share what they observe about the bird and write down their descriptions on the worksheet. 5. Return to the classroom as time allows. Focus on identifying at least five birds as a class before returning to the classroom.
Wrap-Up:	Projected on a screen, pull up the eBird website. Log the birds that you saw as a class. Explain to the class that eBird is crucial for science and conservation because it leverages participatory science, providing a massive, globally accessible database of bird observations that researchers use for studies on bird populations, migration patterns, habitat changes, and the effects of climate change <i>Evidence of Learning:</i> Ask the class – if you were a regular birder that observed birding patterns year after year, what is one change that you might notice that might cause you to have concern? - A bird that you usually see during one part of the year is not there anymore, a food source that you typically see birds using is not there anymore, a water source that you typically see birds using is not there anymore, a bird that is typically migrating during one time of year has not left your area. Closing question: how can participatory science empower all people to be scientists? Follow Up: How can it empower local communities?
Lesson Adaptations:	• Open a larger discussion about data sovereignty. Ask students to get in small groups and brainstorm scenarios in which they think sharing data with other local entities would be useful versus when it might be most useful to keep local data within the community. ◦ Ask the class if anyone can think of real world examples they or their family members have encountered with sharing data? • Have students pick one bird that they are going to focus on trying to find during

	the nature walk. Give students time to research their bird before the nature walk. After the nature walk, give each student time to present on the bird they researched as well as their in-person observations. Page 14 of this document could be used to guide this exercise: https://assets.ebsco.com/m/6b6c11d3016dab38/original/Engaging-High-School-Students-Scientific-Discovery-Lessons-Activities.pdf
Extensions:	1. Participate in a beluga monitoring survey in addition to a birding survey, downloading a data sheet here and logging the information observed afterwards: https://akbmp.org/monitor/ 2. Participate in a flora and fauna participatory science observation, using page 21 of this document to guide the activity: https://assets.ebsco.com/m/6b6c11d3016dab38/original/Engaging-High-School-Students-Scientific-Discovery-Lessons-Activities.pdf
Reflections:	How did it go? What did students understand most/least? What could change about instruction or lesson plan?
Resources Used:	Worksheet Resources: Engaging Students in Scientific Discovery Alaska Beluga Monitoring Program Citizen Science