

Educational Activities and Lessons for Encounters

<http://www.encountersnorth.org/wildexplorer/>

Prepared by Patricia H. Partnow, Ph.D.

How to use the Encounters polar bear radio programs as classroom resources

Anthropologist and writer Richard Nelson recorded and produced three programs as part of the Encounters radio series about polar bears: Polar Bear Natural History, Polar Bears and Climate Change, and Polar Bears and Traditional Knowledge. Each can be the focus of a separate class. Alternatively, the three can be taught together in a single unit, in conjunction with other resources on this website. The lesson plans on this site are flexible to accommodate both possibilities.

Background About the Recordings

Richard Nelson was interviewed in August 2011 by Encounters Web Content Specialist Liz McKenzie to explore how he prepares for and records his programs. Following is a summary of that interview.

- Who does the research before you go out into the field?

Richard does most of the research himself, though he is sometimes helped by others. He investigates information on the Internet (being very careful to determine that the information is reliable) and in books, and sometimes talks to experts before venturing out into the field.

- How do you always happen to have the right facts on the tip of your tongue when they're needed?

Richard immerses himself in the topic for several weeks before leaving for his fieldwork so he will have the facts in mind when they're needed.

- Is any of the commentary edited into the program after the field experience?

No, Richard records his comments as he is watching the animals. He does not add information when he returns to the studio, because he wants the Encounters programs to be authentic, nonfiction engagements between himself and the natural environment.

- What equipment do you take with you?

Richard's equipment must be small, simple, and light enough to carry comfortably. He takes a digital recorder that's about the size of a three-ring binder and can be slung over his shoulder. He wears headphones so he can hear himself and check on the quality of the recording. Attached to the headphone is a microphone that records his voice. He also uses a

hand mike, which he has placed inside a clear plastic parabolic dish that magnifies the sounds of the animals and the environment.

- Does an assistant accompany you into the field?

No, Richard prefers to do the recording by himself.

- Do you carry a gun?

No, not usually—a gun is too heavy and clumsy to carry while recording. Richard does carry pepper spray, and when he's camping out, he surrounds his tent with a portable electric fence that keeps bears away.

- How long do you usually have to wait for the animals to show up?

It varies. Richard has waited up to three years for the chance to record programs about some subjects, though when he has gone on remote locations he has been lucky to find the animals within his allotted time in the field (usually a week or two). This is because he conducts careful research ahead of time with scientists and local people who know where and when the animals are likely to be.

- How long does it take to edit and broadcast a show after it has been recorded?

It usually takes several full days to a week to edit a program. Most programs are not broadcast immediately, and may be rebroadcast repeatedly for several years after the initial show. Each radio station has its own schedule, so it is impossible to say when a given program will be broadcast. Most of the shows are available for listening on the Encounters website (<http://encountersnorth.org>).

- How many hours of recording go into a single broadcast?

Richard records many, many hours—much of it consisting of sounds of the environment—to produce a single 28-minute broadcast. He usually records his commentary several times and chooses the best for broadcast. Most commentaries made in the field are about an hour long and are edited down to broadcast length.

- Any other comments?

Richard loves listening to the sounds of nature and encourages young people to go outside, even if only into their backyards, with a recorder or video camera, record what they hear, and learn to identify the sounds.

Polar Bear Natural History Lesson Plan and Activity Ideas

Guiding Questions

- How are polar bears adapted to life on the Arctic sea ice?
- What habitats do polar bears depend on?
- Why are polar bears important?
- How might a person interested in recording animals prepare for a recording fieldtrip?

Enduring Understandings

- Polar bears are uniquely and completely adapted to life on the Arctic sea ice.
- Polar bears live in a part of the world that is more immediately affected by climate change than other parts of the world.
- We can learn about the natural environment and its creatures by close observation, accompanied by research.

Concepts

Adaptations

Ecosystems

Climate change

Habitat

Life Cycle

Food web

National Science Standards

NS.5–8.1 SCIENCE AS INQUIRY: As a result of activities in grades 5–8, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

NS.5–8–3 LIFE SCIENCE: As a result of their activities in grades 5–8, all students should develop an understanding of

- Structure and function in living systems
- Reproduction and heredity
- Regulation and behavior
- Populations and ecosystems
- Diversity and adaptations of organisms

NS.9–12.3 LIFE SCIENCE: As a result of their activities in grades 9–12, all students should develop an understanding of

- Biological evolution
- Interdependence of organisms
- Behavior of organisms

Alaska Grade Level Expectations

5th grade:

- Identifies inherited traits and those that are not inherited.
- Makes a food chain including the sun.

6th grade:

- Identifies statements as either factual or statement of opinion or interpretation of facts.
- Describes basic behaviors organisms use to meet the requirements of life
- Diagrams a food web using familiar plants and animals.
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities.
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge

7th grade:

- Compares or explores the results of mutations to identify that some mutations result in adaptations which are beneficial to a species, some have no apparent effect, and some are harmful.
- Diagrams a food web that includes and describes the role of producers, consumers, decomposers and describes or identifies the energy source.
- Identifies the sources of scientific statements and evaluates the sources
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge

8th grade:

- Researches how resources are used in the local environment and allocated across competing groups
- Describes that genes pass on traits from parents to offspring
- Describes that each parent contributes genetic information equally
- Describes behaviors of most organisms as either inherited or learned
- Describes that energy flows and matter cycles but is conserved within an ecosystem
- Organizes a food web that shows how matter cycles within an ecosystem

- Identifies local issues and the role of public policy
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge

10th grade

- Describes how natural selection leads to speciation and extinction.
- Describes the relationship between structure and function in body systems
- Describes the relationship between the carbon cycle and global climate change
- Investigates interactions in a system
- Describes human impact on the climate
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge
- Describes the role curiosity, creativity, imagination, and a broad knowledge base play in scientific advancements

11th grade

- Evaluates the credibility of sources of scientific information when conducting a scientific investigation
- Researches how the processes of natural selection cause changes in species over time
- Describes the relationship between the structure and function in body systems
- Describes the behaviors that must be learned for living organisms to meet the requirements of life.
- Describes the relationship between the carbon cycle and global climate change
- Analyzes the potential impacts of different changes, such as climate change or habitat loss, within an ecosystem
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge

Authentic Assessments

Assess student engagement with the enduring understandings and guiding questions according to the specific activities you choose and appropriate rubrics you devise. Examples of assessment instruments include:

- Six Trait Writing Assessments for written work
- Engagement in higher level thinking skills during student-conducted research and class discussions
- Evidence of an understanding of the main ideas of the programs
- Skills in conducting group and all-class work
- Research skills as appropriate to students' grade levels

Teaching Strategies and Ideas

1. Introduce the program by comparing a political or topographic map of the Arctic with the Alaska Department of Fish and Game's polar bear range map at <http://www.adfg.alaska.gov/index.cfm?adfg=polarbear.rangemap>. Point out Kaktovik, Alaska, Churchill, Manitoba, and other communities that are in polar bear territory. Compare the polar bear range map with the home territories of the Iñupiaq or Inuit people, whose traditional settlements are depicted on a map at <http://www.uaf.edu/anlc/resources/anlmap/> and <http://www.uaf.edu/anla/collections/map/>.
2. Listen to the broadcast. The first time you play the program, have students listen for enjoyment and information. Consider projecting the fifteen photographs that are on the www.encountersnorth.org/wildexplorer/polarbears/ page as the audio is playing. Afterward, place students in pairs or groups of up to four to talk about what they remember from the broadcast while a recorder takes notes in each group. After students have listened to the program, compile a jigsaw list of what they learned.
3. Ask students to describe how they think Richard Nelson is feeling as he describes the polar bears. What evidence do they have for their answers?
4. Make a KWL chart. (Alternatively, do a KWL chart before hearing the program the first time and have students listen with a purpose.) Have the class check facts and enlarge their knowledge by dividing the topics up so each student has a specific assignment. Student topics might include:
 - a. Description of the polar bear, including its adaptations to the Arctic
 - b. Life cycle
 - c. Food web and what polar bears eat and what eats them
 - d. What a habitat is and a description of the polar bear habitat

- e. Issues related to the health and wellbeing of polar bears
5. Listen to the broadcast a second time, this time taking notes on students' assigned topics. Have students conduct research to fill in the blanks on the KWL chart. Refer to other resources on the website, particularly the text at <http://www.encountersnorth.org/wildexplorer/polarbears/naturalhistory.html>. Note the many links provided on that page.
 6. Alert students that the second time they listen, they should attend to sound effects such as the wind or crunching snow or bears chomping on bones. Discuss: How can a radio program provide mental pictures to help the listener see what Richard Nelson is seeing? What comparisons does he make between polar bears and listeners' common knowledge to make his information vivid?
 7. (Optional) An alternative activity as students listen to the radio broadcast a second time is for them to draw what they're hearing.
 8. Check for understanding: Review the definitions of "habitat," "food web," "life cycle," "adaptation," and "yearly cycle."
 9. Have students design Jeopardy questions for their fellow students on their chosen topics. Put all questions together and play the game as a class.
 10. As an alternative to Jeopardy, you might have students compile an FAQ list about polar bears.
 11. Discuss with the class how students would prepare for the polar bear expeditions that Richard Nelson went on. Who would they go with? What would they wear? What equipment would they have with them? What escape route or vehicle would they have handy?
 12. Talk about how Richard Nelson conducted his research. See <http://www.encountersnorth.org/bio.htm> for information on the topic. Refer also to the Background about the Recordings section above.
 13. Have students conduct research on another local species and record a program about that species. Offer suggestions for novel ways to present the facts: for instance, "a female bear weighs as much as ten average fourth graders," or "the fur of the ___ animal constitutes 30% of its volume," or "it would take the ___ animal four months on a Weight Watcher's diet to lose all its body fat." In other words, encourage them to use comparisons with everyday items or facts to describe the animal in their broadcast. Students can link their recordings to the website www.echospace.org (a site produced by a consortium of museums and culture centers in Alaska, Hawaii, Massachusetts, and Mississippi) as an example of student-produced work.
 14. Writing activities: The polar bear programs provide a number of writing prompts, both fiction and nonfiction. For instance:

- a. Factual reports on various aspects of polar bear natural history
 - b. Poems expressing the feelings of the humans as they observe the bears in their natural habitat, or word pictures of the setting
 - c. A short story in which the student encounters a polar bear
 - d. The story of one polar bear and her cubs throughout the year
 - e. A letter to the government of the state or nation expressing concern for and solutions to the threats to polar bears' continued health in the Arctic
15. Have students design and produce posters working singly, in groups, or pairs. Each poster should be about 24" x 30", in color, with drawings, photographs, graphs, maps, or other visuals. The only words should be the titles. Suggestions for poster topics are:
- a. Food web and threats to polar bears
 - b. Habitat
 - c. Life cycle
 - d. Yearly cycle
 - e. Adaptations to the Arctic
 - f. The evolution of the polar bear
16. Students duplicate outlines of the poster images on 8.5" x 11" paper, and distribute copies of these pages to those students who are not in their groups. The recipients in turn label the outlines to show their understanding of the messages and information depicted on the posters.

Additional Resources

- Please refer to the many links on this website.
- In addition, investigate <http://www.squidoo.com/polarbearaware>

Polar Bears and Climate Change Lesson Plan and Activity Ideas

Guiding Questions

- How is the earth's climate changing?
- Why is the earth's climate changing?
- How do changes in climate affect polar bears?
- How and why do human interests sometimes conflict with polar bear interests?
- How might a person interested in recording animals prepare for a recording fieldtrip?

Enduring Understandings

- The earth's climate is becoming, on average, warmer.
- Changes in the earth's climate are at least in part the effects of human activity.
- Because of the polar bear's fine-tuned adaptations to the Arctic sea ice, changes in this environment have profound effects on polar bears' survival.
- The needs of animals such as polar bears and those of humans are sometimes in conflict with each other.
- We can learn about the natural environment and its creatures by close observation, accompanied by research.

Concepts

Adaptation

Greenhouse effect

Cyclical climate change

Ecology

Ecosystems

Habitat

National Science Standards

NS.5–8.1 SCIENCE AS INQUIRY: As a result of activities in grades 5–8, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

NS.5–8–3 LIFE SCIENCE: As a result of their activities in grades 5–8, all students should develop an understanding of

- Structure and function in living systems
- Reproduction and heredity
- Regulation and behavior
- Populations and ecosystems

- Diversity and adaptations of organisms

NS.9–12.3 LIFE SCIENCE: As a result of their activities in grades 9–12, all students should develop an understanding of

- Interdependence of organisms
- Behavior of organisms

National Geography Standards

NSS.G–K–12.5 ENVIRONMENT AND SOCIETY: As a result of activities in grades K–12, all students should

- Understand how human actions modify the physical environment
- Understand the changes that occur in the meaning, use, distribution, and importance of resources.

NSS–G.K–12.6 THE USES OF GEOGRAPHY: As a result of activities in grades K–12, all students should

- Understand how to apply geography to interpret the present and plan for the future.

Alaska Grade Level Expectations

5th grade:

- Makes a food chain including the sun.

6th grade:

- Identifies statements as either factual or statement of opinion or interpretation of facts
- Describes basic behaviors organisms use to meet the requirements of life
- Diagrams a food web using familiar plants and animals.
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge

7th grade:

- Compares or explores the results of mutations to identify that some mutations result in adaptations which are beneficial to a species, some have no apparent effect, and some are harmful
- Diagrams a food web that includes and describes the role of producers, consumers, decomposers and describes or identifies the energy source.
- Identifies the sources of scientific statements and evaluates the sources
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.

- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge
- Designs and conducts a simple investigation about the local environment

8th grade:

- Analyzes the differences in various scientific explanations and models
- Researches how resources are used in the local environment and allocated across competing groups
- Describes that energy flows and matter cycles but is conserved within an ecosystem
- Organizes a food web that shows how matter cycles within an ecosystem
- Identifies local issues and the role of public policy
- Evaluates and discusses the evidence presented by stakeholders who support or oppose public policy
- Designs scientific and technological solutions to a local problem
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge

10th grade

- Describes how natural selection leads to speciation and extinction.
- Describes the relationship between the carbon cycle and global climate change
- Investigates interactions in a system
- Describes human impact on the climate
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge
- Researches and analyzes how resources are used in the local environment and allocated across competing groups
- Analyzes whether data supports a conclusion
- Describes the role curiosity, creativity, imagination, and a broad knowledge base play in scientific advancements

11th grade

- Evaluates the credibility of sources of scientific information when conducting a scientific investigation
- Researches how the processes of natural selection cause changes in species over time
- Describes the relationship between the carbon cycle and global climate change
- Analyzes the potential impacts of different changes, such as climate change or habitat loss, within an ecosystem
- Researches how social, economic, and political forces strongly influence which technology will be developed and used
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge

Authentic Assessments

- An excellent rubric to assess the development of a student's investigation was developed by the Iowa Pathways and Iowa Public Television and is available on this website through a link to http://www.julenereed.com/Julene_Reed/CBL_%26_Curr_Standards.html. To download a pdf of that rubric, click on the highlighted first sentence of the third paragraph.
- In addition, see Item #14 below for an example of items to assess in a student project. Design a four-point rubric based on these items.

Teaching Strategies and Ideas

1. Introduce the program by comparing a political or topographic map of the Arctic with the Alaska Department of Fish and Game's polar bear range map at <http://www.adfg.alaska.gov/index.cfm?adfg=polarbear.rangemap>. Point out Kaktovik, Alaska, Churchill, Manitoba, and other communities that are in polar bear territory. Compare the polar bear range map with the home territories of the Iñupiaq or Inuit people, whose traditional settlements are depicted on a map at <http://www.uaf.edu/anlc/resources/anlmap/> and <http://www.uaf.edu/anla/collections/map/>.
2. Listen to the broadcast. The first time you play the program, have students listen for enjoyment and information. Consider projecting the fifteen photographs that are on the www.encountersnorth.org/wildexplorer/polarbears/ page as the audio is playing. Afterward, place students in pairs or groups of up to four to talk about what

- they remember from the broadcast while a recorder takes notes in each group. After students have listened to the program, compile a jigsaw list of what they learned.
3. As a class, decide which facts the students want to expand on. Divide the topics up so each student or small group of students has a specific topic to investigate, such as:
 - a. How is the earth's climate changing?
 - b. Why is the earth's climate changing?
 - c. How do changes in climate affect polar bears?
 - d. How and why do human interests sometimes conflict with polar bear interests?
 - e. How have polar bears adapted to life on the Arctic ice?
 - f. What is habitat?
 - g. What is threatening the polar bear habitat?
 - h. What can humans do about it?
 - i. How likely is it that Alaska's polar bear population will become as stressed as the polar bear population of Churchill in Canada?
 4. Listen to the broadcast a second time, this time taking notes on chosen topics.
 5. Alternatively, do a KWL chart before hearing the program the first time so students listen with a purpose.
 6. Check for understanding of the concepts of adaptation, habitat, ecosystem, the greenhouse effect, and climate change.
 7. For a lesson on questions a–d posed in #3 above, see http://www.julenereed.com/Julene_Reed/Challenge_One_Exemplary_Lesson.html. Note the carbon dioxide lab experiment on the site.
 8. For a visual of ice cap changes from 1979 to 2008, see http://www.julenereed.com/Julene_Reed/CC_and_PBears_Ice_Age_Video.html. A scientific site operated by the National Snow and Ice Data Center shows daily updates at <http://nsidc.org/arcticseaicenews/>.
 9. There are also a number of resources on polar bears at http://www.julenereed.com/Julene_Reed/Guiding_Resources_for_CBL_1_2_and_3.html
 10. Talk about how Richard Nelson conducted his research. See <http://www.encountersnorth.org/bio.htm> for information on the topic. Refer also to the Background About the Recordings section above.
 11. The Encounters website contains a great deal of information about polar bears beyond the three highlighted radio broadcasts, including complementary essays that accompany the programs, a slide show, and other Encounters broadcasts. Refer students to

- those resources. In particular, the class might listen to “Russian Polar Bears,” “Patch Dynamics,” and “Ice Algae”.
12. This website also includes a number of links to other sites with resources about polar bears. To familiarize students with the various options, allow time for them to explore the website on their own. Each student should find at least three pages from three different links that he or she finds especially interesting. Have students share their finds in small groups, allowing them time to explore each other’s discoveries.
 13. Have students define an issue related to polar bears and/or climate change that they want to explore. Topics might include
 - a. evidence of polar bear distress;
 - b. evidence of changing climates;
 - c. evidence that climate change is due at least in part to human behavior and activity;
 - d. mathematical models that show how polar bear populations are changing and are likely to change in the future;
 - e. descriptions of the various interconnected parts of the Arctic environment that are changing and how this affects polar bears;
 - f. why and how polar bears’ very successful adaptation to living on the sea ice might actually be a contributing cause to its eventual extinction;
 - g. a discussion of how changes in polar bear behavior and populations might affect humans.
 14. Students undertake additional research on their chosen issue. They can work individually or in groups. The result is a poster session similar to a science fair project with visuals and explanatory text or oral presentation. The teacher can determine how elaborate the report and presentation must be, but one example is:
 - a. Must include library, internet, or archival research
 - b. May include information from an interview with a local polar bear hunter, someone who has had personal experiences with a polar bear, or a wildlife biologist
 - c. May include personal observations of the Arctic environment or of polar bears
 - d. May involve gathering data about other factors related to climate change (such as the extent of sea ice through the years)
 - e. May include maps, charts and graphs illustrating the data
 - f. May include experiments such as production of CO₂ (see the link for a lesson plan on this topic at <http://>

www.julenereed.com/Julene_Reed/Challenge_One_Exemplary_Lesson.html).

- g. Must include a plan for decreasing the degree of climate change the world is now experiencing, or for disseminating information about the issue to other students and decision-makers.

Polar Bears and Traditional Knowledge Lesson Plan and Activity Ideas

Guiding Questions

- How have the Iñupiat lived and interacted with polar bears through history?
- How do modern people, both Iñupiat and non-Iñupiat, live and interact with people today?
- What does a person need to know to live among polar bears?
- How might a person interested in recording animals prepare for a recording fieldtrip?

Enduring Understandings

- The Iñupiat of Arctic Alaska have a deep knowledge of polar bear natural history and behavior based on more than a thousand years of observation.
- All humans who venture into polar bear country deal with the bears' presence and habits, though their methods vary depending on experience and the reasons for being there.
- We can learn about the natural environment and its creatures by close observation, accompanied by research.

Concepts

Traditional ecological knowledge (TEK)

Predation

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- Structure and function in living systems
- Reproduction and heredity
- Regulation and behavior
- Populations and ecosystems
- Diversity and adaptations of organisms

NS.5–8.7 HISTORY AND NATURE OF SCIENCE: As a result of activities in Grades 5–8, all students should develop understanding of

- Science as a human endeavor
- Nature of science

NS.9–12.3 LIFE SCIENCE: As a result of their activities in grades 9–12, all students should develop an understanding of

- Interdependence of organisms
- Behavior of organisms

National Geography Standards

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5th grade:

- Makes a food chain including the sun.

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- Diagrams a food web using familiar plants and animals.
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge

7th grade:

- Diagrams a food web that includes and describes the role of producers, consumers, decomposers and describes or identifies the energy source.
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
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- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge

8th grade:

- Analyzes the differences in various scientific explanations and models
- Researches how resources are used in the local environment and allocated across competing groups
- Organizes a food web that shows how matter cycles within an ecosystem
- Identifies local issues and the role of public policy
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge

9th grade

- Describes the scientific principles as they apply to subsistence activities.

10th grade

- Investigates interactions in a system
- Describes human impact on the climate
- Collaborates with peers to demonstrate different ways to investigate and evaluate multiple pathways to solve a problem.
- Describes how scientific knowledge is influenced by local knowledge, culture, and technologies of various activities
- Describes how local knowledge, culture, and technologies of various activities are influenced by scientific knowledge
- Researches and analyzes how resources are used in the local environment and allocated across competing groups
- Describes the role curiosity, creativity, imagination, and a broad knowledge base play in scientific advancements

11th grade

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- Six Trait Writing Assessments for written work

- Engagement in higher level thinking skills during student-conducted research and class discussions
- Evidence of an understanding of the main ideas of the program
- Skills in conducting group and all-class work
- Research skills as appropriate to students' grade levels

Teaching Strategies and Ideas

1. Introduce the program by comparing a political or topographic map of the Arctic with the Alaska Department of Fish and Game's polar bear range map at <http://www.adfg.alaska.gov/index.cfm?adfg=polarbear.rangemap>. Point out Kaktovik, Alaska, Churchill, Manitoba, and other communities that are in polar bear territory. Compare the polar bear range map with the home territories of the Iñupiaq or Inuit people, whose traditional settlements are depicted on a map at <http://www.uaf.edu/anlc/resources/anlmap/> and <http://www.uaf.edu/anla/collections/map/>.
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3. Ask students to describe how they think Richard Nelson is feeling as he describes the polar bears. What evidence do they have for their answers?
4. Make a KWL chart. Have the class check facts and enlarge their knowledge by dividing the topics up so each student has a specific assignment. Students should investigate resources on the website and, if available, the book *Hunters on the Northern Ice*, written by Richard Nelson. Topics might include:
 - a. Special knowledge the Iñupiat have about polar bears
 - b. Ways that Iñupiaq knowledge has helped scientists understand polar bears
 - c. Special ways the polar bears use when hunting seals
 - d. The methods humans use when they hunt polar bears
 - e. How the Iñupiat (and other people) have made use of polar bear meat, fur, claws, teeth, and other parts
5. Listen to the broadcast a second time, this time taking notes on students' assigned topics. Have students conduct research to fill in

- the blanks on the KWL chart. Refer to other resources on the website, particularly the text at <http://www.encountersnorth.org/wildexplorer/polarbears/naturalhistory.html>. Note the many links provided on that page.
6. Richard Nelson asks the same question several times during the program: “Did the Iñupiat learn some hunting techniques from polar bears?” Discuss. How would students answer this question?
 7. After listening to the program and reading the text on the website, discuss how students would prepare for the polar bear expeditions that Richard Nelson went on. Who would they go with? What would they wear? What equipment would they have with them? What escape route or vehicle would they have handy?
 8. Talk about how Richard Nelson conducted his research. See <http://www.encountersnorth.org/bio.htm> for information on the topic. Refer also to the Background About the Recordings section above.
 9. Discuss how students would prepare for a polar bear hunt. What skills would they need? What gear would they take? Who would they go with? What would they wear? How would they transport the bear after the hunt? How long would the hunt take? Have students write a story about a polar bear hunt they might take.
 10. The website lists five terms for polar bears at various times during their lifecycles: Nanuq, the general term for polar bear, Nanuayaaq—a small cub; Atiqtaq—a second year cub still traveling with its mother; Avinnaq—a young bear recently independent from its mother; and Atiqtagrualik—a mother with full grown cubs. If an Iñupiaq speaker is available, ask him or her to help students learn to say, spell, and use the words.
 11. Richard Nelson describes some of the messages Iñupiat can “read” from polar bear tracks in the snow. For additional information on the topic, refer to his book *Hunters of the Northern Ice*, pp. 191–193.
 12. For images of polar bear and tracks or other Arctic animals, refer students to <http://www.alaskastock.com/resultsframe.asp?gs=1&txtkeys1=Animal+and+Track>. Do an inventory of the different tracks on the website. With younger students, you might draw life-size tracks on paper, as well as students’ own footprints, to compare various animals’ tracks. Depending on where you live, consider taking a fieldtrip to find to identify tracks in the snow or mud near your school. What were the animals doing when they made those tracks? Were they running, walking, or standing, for instance?
 13. Students of all ages can illustrate the statement that tracks tell “Stories Written in Snow” by drawing a series of tracks, then writing

- a story based on that illustration. Students' illustrations might be framed as mysteries: their readers (other students) are to decipher the stories told in the illustrations, then read the accompanying stories to see how closely they have been able to “read” the tracks.
14. Have students explore the State of Alaska visual archive site, <http://vilda.alaska.edu>, to find images of encounters (directly or indirectly) between polar bears and people. Once on the VILDA site, type “polar bear” into the search box to find appropriate photographs. Guide students to use these primary documents to obtain information about Iñupiat and polar bears, through a five-part process:
 - a. Students examine their chosen photographs and record what they see
 - b. Students describe what they know, based on their examinations
 - c. Students describe what they infer from the photographs
 - d. Students list questions that the photographs and their inferences raise
 - e. Students conduct research to find answers to those questions
 15. If available, read the story of the ten-legged bear (see Additional Resources) and discuss its content and messages.
 16. Richard Nelson tells many hunting stories that reveal Iñupiaq polar bear knowledge. Have each student choose one of those stories and do one of the following with it:
 - a. Write the story in their own words
 - b. Compose a graphic novel based on the story
 - c. Draw or paint a representation of the story
 17. Students who live in North Slope villages can conduct interviews with residents about encounters with polar bears. To frame questions to ask, decide on what the students would like to know. Devise a survey instrument and a permission form for both student interviewers and their interviewees. Determine how to distribute the survey (e.g., online as a Survey Monkey, house-to-house interviews, sent home with students to their parents and grandparents). Sample survey questions might be:
 - a. How often do people meet polar bears?
 - b. What do people do when they encounter polar bears?
 - c. What do the bears do when they encounter people?
 - d. Are polar bears more or less commonly seen nowadays than in the past?
 - e. What theories do the interviewees have to explain any changes?
 - f. How do or have people used polar bear fur or meat?

Additional Resources

Burkher, Pauline C. and Pupils, *The Ten Legged Bear and Other Barrow Eskimo Stories*, illustrated by Wallace Itta. 1989.

Nelson, Richard K., *Hunters of the Northern Ice*. Chicago: University of Chicago Press. 1969.