TWO PERSPECTIVES

Overview:

Students will develop an understanding of the difference between traditional Native knowledge and western science and how integrating both can provide the best outcome for scientific understanding of climate change.

Objectives:

The student will:

- Evaluate statements that assert the importance of traditional knowledge;
- Describe the benefits of integrating traditional and western systems of knowledge; and
- Analyze the benefits, importance and potential problems of integrating western science and traditional Native knowledge.

Targeted Performance Measures Tested on the Alaska High School Qualifying Exam (HSQE):

R4.3 (a) Identify and assess the validity, accuracy, and adequacy of evidence that supports an author's main ideas. (b) Critique the power, logic, reasonableness, and audience appeal of arguments advanced in public documents.

Targeted Alaska Grade Level Expectations:

Science

[11]SF1.1-SF3.1 The student demonstrates an understanding of the dynamic relationships among scientific, cultural, social, and personal perspectives by investigating the influences of societal and/or cultural beliefs on science.

[11]SG2.1 Students demonstrate an understanding of the bases of the advancement of scientific knowledge by describing the importance of logical arguments.

Vocabulary:

facet – one of numerous aspects, as of a subject

hypothesis – a statement that explains a set of facts and can be tested to determine if it is false or inaccurate

indigenous – the term that is used in international discourse to refer to the original people of a particular territory, namely the traditional tribal grouping who are self-conscious of their pre-colonial use and occupation of the land; most Indigenous people have Creation Stories that place their people in their traditional territory

knowledge – the fact or condition of knowing something with familiarity gained through experience or association

science – the investigation of natural phenomena through observation, experimentation, and theoretical explanation; science makes use of the scientific method, which includes the careful observation of natural phenomena, the formulation of a hypothesis, the conducting of one or more experiments to test the hypothesis, and the drawing of a conclusion that confirms or modifies the hypothesis

traditional knowledge – a cumulative and dynamic body of knowledge that builds upon the historic experiences of a people and adapts to social, economic, environmental, spiritual and political change

worldview – a composite set of presuppositions, beliefs, and values a person possesses that shape their overall perspective from which an individual interprets the world and their place in it; refers to a collective set of fundamental convictions people hold and on which they base their actions

TWO PERSPECTIVES

Whole Picture:

The process of understanding the world we live in is approached in a unique way by everyone. Many things factor into perspective. Race, ethnicity, gender, culture, and religion all may play a part. Education, personal experience and upbringing are also important factors in our approach to a world view. Sometimes western science methodology seems in stark contrast to traditional, indigenous ways of gaining knowledge about the environment, but it is when these two perspectives come together that some of the richest understanding is gained. Bridging the two perspectives is important as many communities are facing changes from a warming climate.

The term "traditional knowledge" refers to historic experiences of a people that forms the basis for a way of life. Traditional knowledge is used as a basis for decision making and includes mental inventories of local places, routes of travel, and resources, including animal and plant species. Traditional knowledge also encompasses belief systems that play a fundamental role in community and relationship structure and guides everyday life. An indigenous worldview is a holistic one, recognizing the traditional knowledge belief system that incorporates spirituality and relationship.

Western science often works contrary to the holistic perspective, isolating specific subjects for intense scrutiny and study. Science makes use of the scientific method, which means careful observation of a narrowed focus, the formulation of a hypothesis, the conducting of one or more experiments to test the hypothesis, and the drawing of a conclusion that confirms or modifies the hypothesis.

In concert, the two views present a much broader understanding than one in isolation. "Traditional knowledge can provide scientists with more accurate and timely hypotheses to use in their search for the causes of declines in wildlife, saving time, money, effort, and undue delay in action (P. L. Cochran, unpublished manuscript, 2002)."

Materials:

- Scissors
- Glue
- VISUAL AID: "Perspective"
- VISUAL AID: "Cochran Quotes"
- VISUAL AID: "Common Ground"
- STUDENT WORKSHEET SHEET: "Native and Western: Two Perspectives"

Activity Procedure:

1. Display VISUAL AID: "Perspective," page one. Allow students to comment on what the picture represents. After student have had time to draw conclusions, explain that the picture is a famous perceptual illusion in which the brain switches between seeing a young girl and an old woman. Display page two. Ask students to identify the different perspectives of both the top and bottom figures. (In the top figure the Eskimo figure has his back turned, the Native American face is looking left. In the bottom figure it could be one person behind a candlestick or two people facing each other with the candle behind.)

   Discuss the pictures. Use the following as prompts:
   a. Could you say the first picture is just an old lady? Just a young woman? Why or why not?
   b. Is it possible to view each of the pictures without seeing both images? (Yes.)
   c. If you see only one piece of the image, do you have the full perspective? (No.)
   d. To what life experiences can you apply this exercise or thought process?
   e. Is it also possible to have more than two perspectives? (Yes.)
   f. How could an exercise such as this apply to science, specifically the science of climate change?
2. Explain today's lesson will look at two perspectives: Native knowledge and Western science, and how the two work well in concert to understand climate issues. Display VISUAL AID: "Common Ground." Review the diagram with the class.
3. Display VISUAL AID: "Cochran Quotes," page one and discuss.

"Traditional knowledge can provide scientists with more accurate and timely hypotheses to use in their search for the causes of declines in wildlife, saving time, money, effort, and undue delay in action." (P. L. Cochran, unpublished manuscript, 2002)

Possible questions to use as discussion starters:

a. Do you agree or disagree with this statement? Why?
b. What is the benefit to those who hold traditional knowledge of sharing it with scientists?
c. How can sharing traditional knowledge speed up the process for a scientist in forming a hypothesis about an observed issue? Can you think of an example?

Display VISUAL AID: "Cochran Quotes," page two and discuss.

"Although it is evident that there is a deep correlation between what communities observe and what science can prove, Western-based science has had little success in the past decade accessing and using Alaska Native traditional knowledge and science.

"Henry Huntington, who has combined traditional knowledge and scientific research in his studies of the bowhead whale, notes the reluctance of scientific researchers to depart from more established research methods. He also notes language barriers between Native and scientific researchers and the difficulty of accessing traditional knowledge, which is rarely written down." (*The Melting Ice Cellar: What Native Traditional Knowledge is Teaching us About Global Warming and Environmental Change* by Patricia Longley Cochran and Alyson L. Geller, MPH.)

Possible questions to use as discussion starters:

a. What do you think might make it easier for scientists to work with community members who hold traditional knowledge?
b. Is it possible to weave traditional knowledge into the scientific method in meaningful ways? How?
c. How might you, as a future community leader, help bridge the gap between traditional knowledge and western science?

4. Hand out STUDENT WORK SHEET: "Native and Western: Two Perspectives." Allow students time to complete.

Language Links:

Ask a local Native language speaker to provide the words in the local dialect for words in the chart below. The local dialect for these words may differ from the examples provided. Share the words with students to build fluency. Include local words in songs, stories and games when possible.

English	Gwich'in	Denaakk'e	Lower Tanana	Deg Xinag	Your Language

Extension Ideas:

Ask students to access the full paper, "*The Melting Ice Cellar: What Native Traditional Knowledge Is Teaching Us About Global Warming and Environmental Change*" by Patricia Longley Cochran and Alyson L. Geller, MPH through the link on www.uniteusforclimate.org, read the full paper, then write a three-paragraph summary that includes a personal response.

TWO PERSPECTIVES

Answers:

1. Answers will vary.
2. Answers will vary.
3. Answers will vary.
4. Answers will vary.
5. a, b, c, and d are all plausible answers.
6. a, b, c, d, and e are all plausible answers.
7. a. Answers will vary but should indicate that digging deep into the ground always showed it frozen, so it seemed plausible that ice just continued to the center of Earth.

   b. Answers will vary but should indicate scientists now know that permafrost only exists in Earth's crust, and just a few thousand feet down, at most. Below that depth it warms, and, in fact, below the crust it is very hot, containing magma and a solid metal core, which is about 4000˚ Celsius.

Knowledge	
Native	**Western**
"Chief Henry used to say k'ukkøtl e¬eyonh meaning 'the cold weather has aged' – because they could remember when they were children when it was so super cold. But even in their time it wasn't as cold as it used to be or the stories that they used to hear. That the weather was so cold that there were times that people were traveling, and when they were traveling it was so cold the dog's tail would freeze off. And they'd pick up the dog tail and put the dog tail around their neck to keep warm." Eliza Jones, Koyukuk Elder	*Over the past 50 years, Alaska has warmed at more than twice the rate of the rest of the United States' average. Its annual average temperature has increased 3.4°F, while winters have warmed by 6.3°F. The higher temperatures are already causing earlier spring snowmelt, reduced sea ice, widespread glacier retreat, and permafrost warming.* Alaska Fact Sheet Global, www.climatechange.gov
These give perspective on: the climate is warming	

"The rut has been disrupted in recent years because of changes in the weather. Their breeding season (moose) has moved later." R.S. Middle Yukon Advisory Committee Meeting February 13, 2008, noted in Seasons Out of Balance: Climate change impacts, vulnerability, and sustainable adaptation in interior Alaska, p. 167, S. McNeeley, 2009	*In the 13 years between 1995 and 2007, eight years show a predominance of positive temperature anomalies for the whole moose hunting season starting end of August through the end of September (nine of the 13 years show above-average temperatures for September), particularly in the three years 2005-2007. Combined these represent the warmest consecutive three-year period of all hunting seasons in the historical records.* Seasons Out of Balance: Climate change impacts, vulnerability, and sustainable adaptation in interior Alaska, p. 132, S. McNeeley, 2009
These give perspective on: moose hunting/moose behavior is changing	

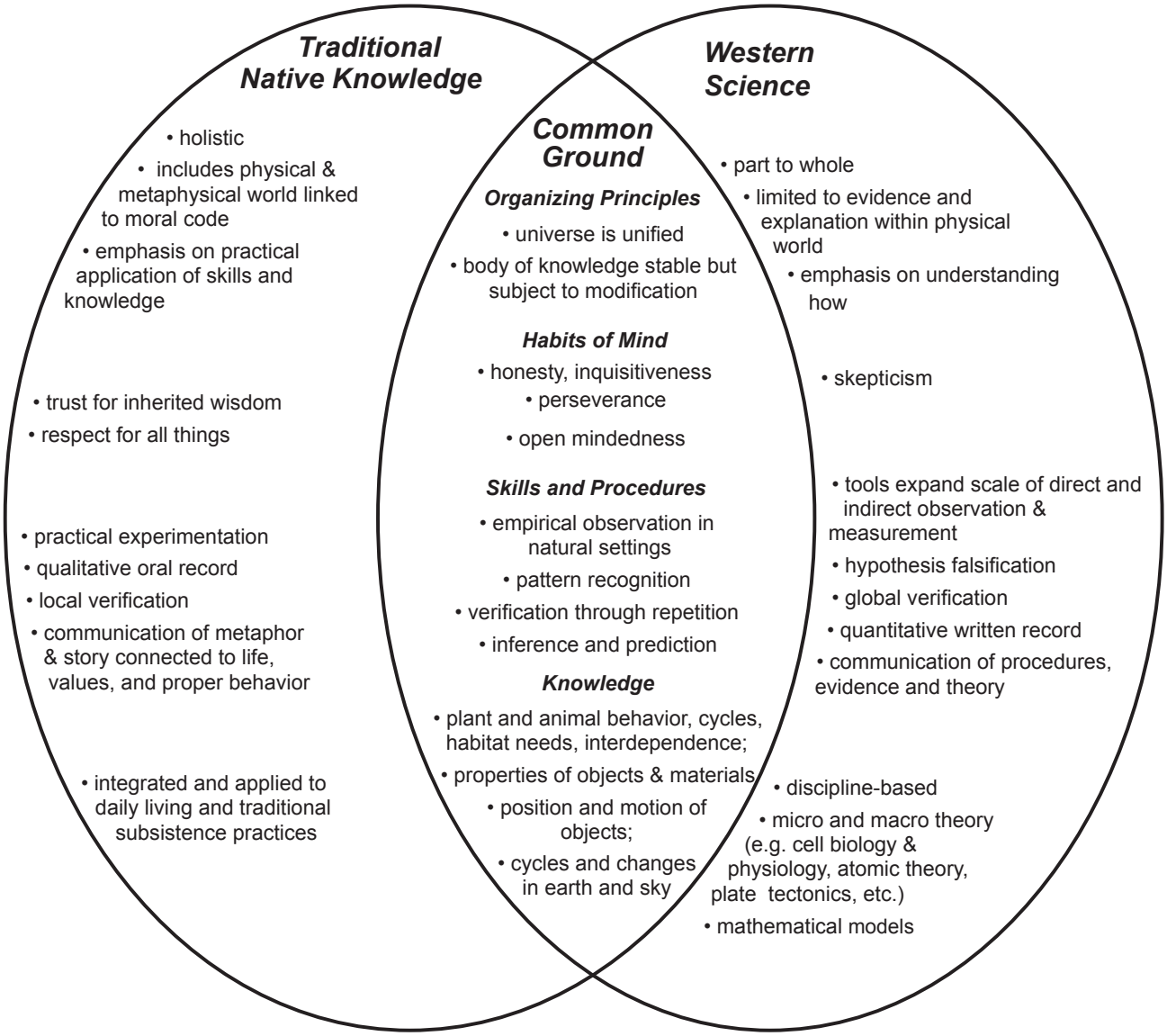
"Old timers, I used to listen to the old timers lots, you know, and they tell us that the weather is going to get old; it's going to stay warm all the time in years to come. And that's what's happening now. Right now it's happening. Winter – like in the fall time it stays warm until way in November sometimes." Tony Sam, Huslia Elder (Sam 2004)	*Temperature records for Alaska are spotty prior to the 1940s. The Alaska Climate Research Center provides historic temperature data for many communities around the state. Data collection, coupled with "on the ground" observations, provide a picture of a century of change in the state, trending toward a warmer climate.* Alaska Climate Research Center, http://climate.gi.alaska.edu Seasons Out of Balance: Climate change impacts, vulnerability, and sustainable adaptation in interior Alaska, p. 88, S. McNeeley, 2009
These give perspective on: the climate is warming	

"Because of too much change in the weather, it makes is hard for people to go out in the bush. There is not much permafrost and the ground is still too soft under the snow." Old Crow, p. 71 The Earth is Faster Now.	*Research by Dr. Vladimir E. Romanovsky, professor of geophysics at the University of Alaska Fairbanks, shows permafrost has warmed about 1.5 degrees Celsius during the past 30 years. He predicts sinking buildings, roller-coaster roads, and boreal forest changing to wetlands could be realities of the near future if current warming persists.* Alaska Science Forum, www.gi.alaska.edu/ScienceForum
These give perspective on: permafrost is thawing	

Weisstein, Eric W. "Young Girl-Old Woman Illusion." From MathWorld--A Wolfram Web Resource. http://mathworld.wolfram.com/YoungGirl-OldWomanIllusion.html

COMMON GROUND

The diagram below illustrates both similarities and differences in the characteristics of traditional Native knowledge and Western science.



"Traditional knowledge can provide scientists with more accurate and timely hypotheses to use in their search for the causes of and declines in wildlife, saving time, money, effort, and undue delay in action."

(P. L. Cochran, unpublished manuscript, 2002)

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NAME: _____

NATIVE AND WESTERN: TWO PERSPECTIVES

"As observers of the natural world deeply connected to their environment, Alaska Native people possess a wealth of knowledge about the environment that often precedes scientific data collection by many years—even decades." ~*The Melting Ice Cellar: What Native Traditional Knowledge is Teaching us About Global Warming and Environmental Change* by Patricia Longley Cochran and Alyson L. Geller, MPH.

The following activity illustrates how Native observations and Western science dovetail to form a picture of climate trends in Alaska. Scientists recognize Native knowledge as a vital perspective in the understanding of climate change.

Directions: Cut out the eight rectangles below for use on page two. Sort the pieces into the correct column, glue to secure, then complete the information requested.

Temperature records for Alaska are spotty prior to the 1940s. The Alaska Climate Research Center provides historic temperature data for many communities around the state. Data collection, coupled with "on the ground" observations, provide a picture of a century of change in the state, trending toward a warmer climate.

Alaska Climate Research Center, http://climate.gi.alaska.edu
Seasons Out of Balance: Climate change impacts, vulnerability, and sustainable adaptation in interior Alaska, p. 88, S. McNeeley, 2009

In the 13 years between 1995 and 2007, eight years show a predominance of positive temperature anomalies for the whole moose hunting season starting end of August through the end of September (nine of the 13 years show above-average temperatures for September), particularly in the three years 2005-2007. Combined these represent the warmest consecutive three-year period of all hunting seasons in the historical records.

Seasons Out of Balance: Climate change impacts, vulnerability, and sustainable adaptation in interior Alaska, p. 132, S. McNeeley, 2009

"Because of too much change in the weather, it makes is hard for people to go out in the bush. There is not much permafrost and the ground is still too soft under the snow."

Old Crow, p. 71 The Earth is Faster Now.

"Chief Henry used to say k'ukkøtl e¬eyonh meaning 'the cold weather has aged' – because they could remember when they were children when it was so super cold. But even in their time it wasn't as cold as it used to be or the stories that they used to hear. That the weather was so cold that there were times that people were traveling, and when they were traveling it was so cold the dog's tail would freeze off. And they'd pick up the dog tail and put the dog tail around their neck to keep warm."

Eliza Jones, Koyukuk Elder

Over the past 50 years, Alaska has warmed at more than twice the rate of the rest of the United States' average. Its annual average temperature has increased 3.4°F, while winters have warmed by 6.3°F. The higher temperatures are already causing earlier spring snowmelt, reduced sea ice, widespread glacier retreat, and permafrost warming.

Alaska Fact Sheet Global, www.climatechange.gov

"The rut has been disrupted in recent years because of changes in the weather. Their breeding season (moose) has moved later."

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"Old timers, I used to listen to the old timers lots, you know, and they tell us that the weather is going to get old; it's going to stay warm all the time in years to come. And that's what's happening now. Right now it's happening. Winter – like in the fall time it stays warm until way in November sometimes."

Tony Sam, Huslia Elder (Sam 2004)

NAME: _____

NATIVE AND WESTERN: TWO PERSPECTIVES

Knowledge	
Native	**Western**
These give perspective on:	

These give perspective on:	

These give perspective on:	

These give perspective on:	

NAME: _____

NATIVE AND WESTERN: TWO PERSPECTIVES

Directions: Using page two and the vocabulary bank (below) complete the worksheet. Use at least four vocabulary words at least once as you answer questions 1–4. Circle each vocabulary word you write.

Vocabulary Bank

facet	one of numerous aspects, as of a subject
hypothesis	a statement that explains a set of facts and can be tested to determine if it is false or inaccurate
indigenous	the term that is used in international discourse to refer to the original people of a particular territory, namely the traditional tribal grouping who are self-conscious of their pre-colonial use and occupation of the land; most Indigenous people have Creation Stories that place their people in their traditional territory
knowledge	the fact or condition of knowing something with familiarity gained through experience or association
science	the investigation of natural phenomena through observation, experimentation, and theoretical explanation; science makes use of the scientific method, which includes the careful observation of natural phenomena, the formulation of a hypothesis, the conducting of one or more experiments to test the hypothesis, and the drawing of a conclusion that confirms or modifies the hypothesis
traditional knowledge	a cumulative and dynamic body of knowledge that builds upon the historic experiences of a people and adapts to social, economic, environmental, spiritual and political change
worldview	a composite set of presuppositions, beliefs, and values a person possesses that shape the overall perspective from which an individual interprets the world and their place in it; refers to a collective set of fundamental convictions people hold and on which they base their actions

1. What is traditional knowledge and how is it different from western science?

_____

_____

_____

2. Why is it important to seek more than one perspective when examining a complex issue such as climate change?

_____

_____

3. What are the benefits of integrating traditional and western systems of knowledge?

_____

_____

4. Can you think of an example, from your own personal experience, where an Elder in your community has observed an environmental change that is of current concern to scientists? Explain.

_____

_____

NAME: _____

NATIVE AND WESTERN: TWO PERSPECTIVES

5. It is important to understand changes in moose behavior brought about by climate change as it relates to hunting season. Circle all possible reasons:
    a. to know where to find moose when it's time to hunt
    b. to petition government officials to ensure hunting season is set for the appropriate dates
    c. to ensure effective game management
    d. to have respect for the environment and the animals that live there

6. A traditional travel route over ground underlain with permafrost becomes impassable due to thawing. Circle all possible responses:
    a. establish an alternative route of travel
    b. work with community members to address the issue
    c. do nothing at all
    d. work with scientists to understand the cause
    e. work with engineers to create a passable route

7. In the *Koyukon Athabaskan Dictionary*, compiled by Jetté, J., Jones, E. & Kari, J. and published by the Alaska Native Language Center at the University of Alaska Fairbanks in 2002, Jettéé notes the Athabascan language indicate a belief that the "ice beneath the ground" or nen' yeh loo'u', constituted the bulk of the planet and reached Earth's core.
    a. How would such a belief come about?
    b. Contrast this belief with what we now know about Earth's core and explain why, in this case, traditional knowledge is not complimentary to western science.