

ACTIVITY 2.1: IÑUPIAQ KNOWLEDGE

Science of the Iñuunialiq: Year 1 STUDENT WORKBOOK

Land-based Iñupiaq Science Aligned with NGSS



Created by Crystal J. Redgrave, Omar Mahmound, Lori Moore, Denise Keys, and
William Johnson for Northwest Arctic Borough School District
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BACKGROUND

Savvaqtuḷiq (Hard Work): *In the old days, we could not survive if anyone was not working hard. Today we must continue to be known as hard workers in order to feel better about ourselves, be employed, and be successful in harvesting our traditional resources. Hard work produces a well-conditioned body and healthy mind.*

Kamaksriḷiq Numtim Iḷiqtanik (Respect for Nature): *Traditionally, our Elders have said that God gave us the responsibility of protecting our lands, air and waters and all that live there for our good and the good of our children. We carry out our responsibility by respecting all of nature, God's creation.*

Quvianniutikun Tipsisa ḷiqḷiq (Humor): *A good sense of humor is an important part of Iḷupiaq life. Our ancestors knew the importance of humor to good health and healing. Good natured teasing and joking kept all happy. Humor was used to teach and correct others, especially children, without making them feel put down. Clowning was used in story, song and dance to entertain. Care must be taken so that humor is never used to put someone down or to be vicious.*

Anḷiḷiqḷiq (Hunter Success): *All of the traditional skills and values necessary for a hunter to be successful are still necessary today as well as new skills needed to be successful in the new modern job environment. All Iḷupiat must now be taught the skills and values needed to successfully survive and provide for their families. In the old days, only men were taught to be the providers. Today and in the future, this responsibility must be met by both men and women and often shared. Knowing Iḷupiaq life ways, values and knowledge are more important than ever. Knowing modern job skills and their necessary educational background is just as important. We truly walk in two worlds, hopefully with a strong Iḷupiaq spirit.*

Kiḷuniḷmi Suragatlasiniḷiatiq (Domestic Skills): *In prior times domestic skills were primarily the work of women. Besides the hard work of keeping a clean and healthy household, they were required to see that the entire family were clothed, food preserved, prepared, fed and shared. The men built the homes necessary in each seasonal subsistence site. Now many of these responsibilities are shared, including the raising of all children.*

Atchiksuatḷiq (Humility): *In humility is strength. A humble person is strong of character and does not need to boast. A boastful person shows lack of character.*

BACKGROUND

Iñuuniaqatiunik Ikayuutitig (Responsibility to Tribe): Every Iñupiaq of the Northwest Arctic tribes is responsible to all other Iñupiat for the survival of our cultural values and traditions. We are connected to each other through our cultural spirit handed down to us through our teachings and values. We are responsible for the survival of our tribes as a distinct Iñupiat group. We must make sure that our tribal leaders are working.

Aṇayuqaagiich Savaaksraṇich (Family Roles): It is important that each member of a family is taught their role in the family so that love, harmony, and happiness prevail. That is when Elders can teach both young and adult and all will carry out their role in cooperation with all others.

Kaṇiqsimauraatiq Irrutchiṇ (Spirituality): Our ancestors were very spiritual people. They believed that living things created by God had a spirit. They believed that all creation was spiritually connected. They taught us to respect everything so we could live in harmony with nature. Today a great part of our spirituality is taught to us in the form of religion. The rest is still taught to us through our traditional values and customs.

Iṇsimatiq Aḡiṇḡmik (Knowledge of Family Tree): To have family whom you love and who love you is important to an Iñupiaq. Our life is richer if we know who our relatives are and can stay in contact with them.

Iḷisimatiq Uqapiatiḡmik (Knowledge of Language): Language holds us together. When our Elders began meeting in 1976 the first thing they told us was how important it is for us to know our language. The Iñupiaq language has holistic, scientific and spiritual concepts that are difficult to explain in the English language. Our language is beautiful, respectful, descriptive, and humorous. Without our language we will not be able to preserve our culture wholly or understand fully what it is to be Iñupiaq.

LESSON OVERVIEW

Each lesson is comprised of the following eight sections:

- Activity 1: Bell Ringer;
- Activity 2: Iñupiaq Knowledge;
- Activity 3: Science Concepts;
- Activity 4: Data Analysis;
- Activity 5: Lab Question;
- Activity 6: Lab;
- Activity 7: Claim, Evidence, and Reasoning and
- Activity 8: Closure.

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Ukiaksraaq (early fall)

Ukiaksraaq begins as summer light starts to soften and often runs from late August into September. Berry patches ripen across the tundra, fish camps wind down, nights grow cooler, and the first yellow leaves appear along the rivers. Families watch weather, water, and animal movement closely, because this is a season of gathering, travel, and preparing before freeze-up.

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LESSON 1: BLUEBERRIES AND LIGHT



Iñupiaq families have long gathered asiavik (blueberries) in late summer and early fall, often watching slope, sunlight, and frost conditions closely because berry patches do not ripen evenly. In many camps, people knew that a warm, sunny stretch could sweeten berries quickly, while smoke, fog, or early frost could ruin a patch. This knowledge was taught through careful seasonal observation so children would learn to respect the land and harvest only what they need.

ACTIVITY 1.1: BELL RINGER

BELL RINGER

Iñupiaq Value

Kamaksritiq
Nutim Iñiqtanik

Respect For
Nature

Traditionally, our Elders have said that God gave us the responsibility of protecting our lands, air and waters and all that live there for our good and the good of our children. We carry out our responsibility by respecting all of nature, God's creation.

Write Iñupiaq Phrase for Value

Writing Prompt

1. Reflect on a time when you went berry picking. When did you go? Where did you go? Who did you go with? Why did you go?
2. How does today's Iñupiaq value connect to the lesson topic?
3. What did you learn last class?

Response

ACTIVITY 2.1: IÑUPIAQ KNOWLEDGE

IÑUPIAQ VOCABULARY

Write the Iñupiaq word.

blueberry

berry

sun

light of the sun

heat, of the sun

to be shiny

to have color

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ACTIVITY 2.2: IÑUPIAQ KNOWLEDGE

READING 3: IÑUPIAQ DIALOGUE

	COASTAL	ENGLISH
READER 1	Napmuñniaqpich?	Where are you going?
READER 2	Aullaqsrugiağniaqtuṇa.	I am going berry picking.
READER 1	Qanutchiñik.	What kind?
READER 2	Asriaviich.	Blueberries.
READER 1	Asriaviich piñnuqtut? Asriaviich nigiruni nakuurut.	Are the blueberries ripe? The unripe berry is bitter.
READER 2	Asriaviich piñnuqtut. Asriaviich nigiruni nakuurut.	Yes, the blueberries are ripe. The berries are good to eat.
READER 1	Asriaviich nani naurruvat?	Where do the blueberries grow?
READER 2	Asriaviich naurruvat nunaviñni.	The blueberries grow on the tundra.

ACTIVITY 2.2: IÑUPIAQ KNOWLEDGE

READING 3: IÑUPIAQ DIALOGUE

	KOBUK	ENGLISH
READER 1		Where are you going?
READER 2		I am going berry picking.
READER 1		What kind?
READER 2		Blueberries.
READER 1		Are the blueberries ripe? The unripe berry is bitter.
READER 2		Yes, the blueberries are ripe. The berries are good to eat.
READER		Where do the blueberries grow?
READER 2		The blueberries grow on the tundra.

ACTIVITY 2.3: IÑUPIAQ KNOWLEDGE

READING 4: IÑUPIAQ SONG

COASTAL

Naami imña ilannaga _____ (X3)

Samma Samani asriaviññi qtuq

Maunaquitchi pattiaglalluput (X3)

Samma Samani asriaviññiaqtuq

Qalutaqtugigich ikukkiq!
aimmagmun (X3)

Samma Samani asriaviññiaqtuq

ENGLISH

Where oh where is my friend _____?
(X3)

Way down yonder in the blueberry
patch.

Come on, Kids, let's go finder
her.(X3)

Way down yonder in the blueberry
patch.

Scooping up berries, put them in a
basket. (X3)

Way down yonder in the blueberry
patch.

ACTIVITY 2.4: Iñupiaq KNOWLEDGE

READING 1: HARVESTING AND PRESERVING BERRIES

FILL-IN-THE-BLANK

Historically, berries were _____ in various methods. Some stored berries in sealskin _____. Others dug a hole in the ground to store their berries next to the _____. When they did this, a hole was lined with large leaves, then the berries were set inside with more leaves added to the top. Then, the hole was sealed with _____.

Yet another method was to set the berries in _____ baskets and covered with large leaves or _____ in _____. The basket was then placed in a deep _____ hole and covered with _____ and earth.

Generally, the _____ people had access to sealskin pokes, and the _____ people had access to birch bark.

If the previous _____ was exceptionally cold and light snow has caused the ground to _____ deeply, people anticipate that August will be the most promising blueberry picking _____.

cached	birchbark	Coastal	freeze
permafrost	seal oil	Upper Kobuk	pokes
mud	moss	winter	time

ACTIVITY 2.5: Iñupiaq KNOWLEDGE

READING 2: TRADITIONAL BERRY-PICKING

Special trips are sometimes made to gather berries or other plants, but often this is done along with another activity such as fishing. These outings are anticipated with much pleasure by the whole family. Picking is done mostly by women and children, sometimes joined by relatives or friends who have come along. If the father is free, he may accompany his family, especially if the trip involves overnight camping. A young son who has learned how to run the outboard motor might be at the boat's helm.

If the previous winter was exceptionally cold and a lot of snow has caused the ground to freeze deeply, people anticipate that August will be the most promising blueberry picking time. Older women take along their Birch bark baskets, often inherited from their mothers. Children may carry plastic buckets or perhaps cloth or plastic bags if they will also pick lowbush cranberries. The older women who use wooden ladles to beat blueberries into the buckets,

as their mothers and grandmothers did in the past. Even though many leaves fall in with the berries, it is the fastest method. Others pick with one or both hands, depending on their dexterity. Big, ripe, juicy berries are tempting enough so that the pickers occasionally pop them into their mouths instead of into their baskets. Every so often, the family takes a break to share dried fish, or meat, chat and joke among themselves and compare the amount each person has collected after the break picking continues or they move someplace where other berries can be found. Each family keeps track of how many barrels of blueberries and sacks of cranberries it has picked the members take real pride in their success.

Of all the berries found along the Kobuk River, blueberries are the most abundant, followed by lowbush cranberries. Plant with lower yields are salmonberries

ACTIVITY 2.5: Iñupiaq KNOWLEDGE

READING 2: TRADITIONAL BERRY-PICKING

and cloudberrries, Alpine bear berries, bearberries crowberries and American red currants. Also picked and eaten off the bush are rose hips.

Some berries are stored in home freezers today. Low bush cranberries which keep well, can simply be put in bags in the family's cache or storm shed. Some women spread them in the sun to dry before storing them in gunny stocks.

The *Kuġvaġmut* of 1880 served akutuq, a mixture of chopped caribou fat, berries and seal oil as a special treat during the mid-winter ceremonies. Today, it is still served for special occasions like birthday parties and funerals, and people enjoy it so much that they are inventing new variations. In one blueberry is mixed with boiled flanked fish meat and seal oil and in another caribou fat is mixed with seal oil and canned fruit cocktail.

Blueberries are also eaten with canned milk and sugar, or they are

cooked with cornstarch and sugar and then used as pudding or jam. For a tangy variation, blueberries and Oregon salmon berries are cooked with wild rhubarb. Kobuk River villagers prefer bearberries and cranberries mixed with seal oil or fish oil. Cranberries fried in oil are said to help cure a sore throat.

--Anderson et al., 1998, p. 231

ACTIVITY 3.1: SCIENCE CONCEPTS

NGSS, CORE IDEA, LEARNING GOAL, I KNOW STATEMENTS

HS-PS4-4 WAVES AND THEIR APPLICATIONS IN TECHNOLOGIES FOR INFORMATION TRANSFER: Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.

CORE IDEA Different frequencies of electromagnetic radiation interact with matter in different ways; visible light can be reflected while ultraviolet light can damage living cells.

FOCUS QUESTION What is the relationship between blueberries and light?

LEARNING GOAL I can explain the relationship between Blueberries and Light.

I KNOW STATEMENTS

FOUNDATIONAL LEVEL

- **I know** that some materials allow light to pass through them, while others block it or change its path.
- **I know** that waves with more amplitude (taller waves) carry more energy than waves with less amplitude.
- **I know** that light can heat up objects when it shines on them.

ACTIVITY 3.4: SCIENCE VOCAB

#	TERMS	#	TERMS
1	electromagnetic radiation	5	solar radiation
2	wavelength	6	energy
3	spectrum	7	heat
4	photosynthesis	8	blue light

#	DEFINITIONS
	The chemical process plants use to convert light into glucose.
	The distribution of colors or wavelengths, such as the visible light spectrum.
	The form of energy that travels through space as oscillating (vibrating) electric and magnetic fields.
	The radiant energy emitted by the Sun in the form of electromagnetic waves that travels through space and reaches the Earth.
	Visible light with a wavelength roughly between 380 and 500 nanometers.
	The physical measurement of a wave from crest to crest.
	The transfer of thermal energy from one object or system to another due to a difference in their temperatures.
	The capacity to do work.

ACTIVITY 4.1: DATA ANALYSIS

DATA ANALYSIS- PART 1

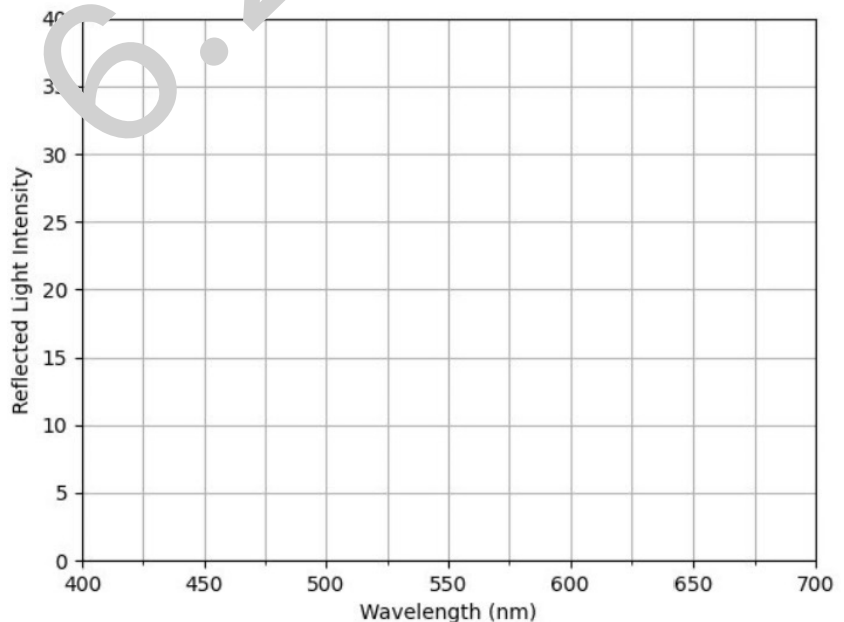
WAVELENGTH (NM)	REFLECTED LIGHT INTENSITY
420	12
460	38
500	22
540	8
580	14
620	11
660	9

Light Intensity vs Wavelength

Scientists used a light sensor to measure how much light is reflected from the surface of an unknown object at different wavelengths.

Graph the Data

Directions: Plot each data point, connect the points with a smooth line, and use the visible spectrum chart to interpret the peak wavelength.



ACTIVITY 4.1: DATA ANALYSIS

DATA ANALYSIS- PART 3

Directions: Use the table and your graph to answer the questions:

1. At which wavelength is the reflected light the strongest?
2. Describe the pattern you see in the graph?
3. Based on the graph, what color(s) might this object appear?
(Use the color spectrum reference chart)
4. What is the median of the wavelength values from the table?
5. Estimate the intensity at 480 nm.
6. Between **420 nm and 460 nm**, how fast is the intensity changing?
(*change in wavelength divided by change in intensity*)

ACTIVITY 5.1: LAB QUESTION

**PHENOMENON
HOOK**

A blueberry looks blue in ordinary light, but does it still look blue under every wavelength?

LAB QUESTION

How do different light wavelengths change the color, and surface temperature of blueberries?

CLAIM

A direct response to the scientific question being asked.

ACTIVITY 6.1: LAB

WRITE THE LAB QUESTION	
SAFETY RULES	<ul style="list-style-type: none">• Do not look directly into UV or colored light sources.• Keep liquids and wet hands away from powered lights and cords• Mount the lights at a fixed distance before turning them on
LAB MATERIALS	<ul style="list-style-type: none">• Blueberries (fresh) - ½ quart• HFS Thermal Camera• Infrared Thermometer gun• Equal-power UV, White, Blue, Red, Yellow, And Green Light Sources• Light Stands Or Fixed Mounts• Ruler Or Fixed Spacing Guide

ACTIVITY 6.1: LAB

LAB**QUESTION**

How do different light wavelengths change the color and surface temperature of blueberries?

PROCEDURE

1. Place the blueberries in a single layer at the marked test position.
2. Darken the room.
3. Set the first light at the agreed distance and aim it at the berries.
4. Turn on the light, wait the agreed exposure time, observe apparent color.
5. Use the HF96 or infrared thermometer gun to record blueberry surface temperature.
6. Repeat for UV, blue, red, yellow, and green light without changing distance or exposure time.
7. Take a handful of blueberries and gently rub the surfaces to remove the waxy coating.
8. Repeat using the UV, white, blue, red, yellow, and green light to record apparent color and the HF96 or infrared thermometer to record surface temperatures.

ACTIVITY 6.2: PRE-LAB QUESTIONS

**LAB
QUESTION**

How do different light wavelengths change the surface temperature and color of blueberries?

QUESTIONS

1. What is the independent variable in this investigation?
2. What two measurements will you record for each light condition?

3. Why must each light be kept at the same distance and power level?
4. What is the real safety risk when working around UV light sources?

ACTIVITY 6.3: LAB DATA

RECORD DATA

Directions: Use the data to decide which wavelengths best support the blue appearance and higher surface temperatures.

REGULAR BLUEBERRIES

LIGHT	COLOR	SURFACE TEMP
UV		
WHITE		
BLUE		
RED		
YELLOW		
GREEN		

BLUEBERRIES WITH WAXY COATING REMOVED

LIGHT	COLOR	SURFACE TEMP
UV		
WHITE		
BLUE		
RED		
YELLOW		
GREEN		

ACTIVITY 6.4: POST-LAB QUESTION

LAB QUESTIONS

1. Under which light did the regular blueberries appear the bluest?
2. How did the blueberries look different under the lights without the waxy coating?
3. Which light produced the greatest surface warming if any?
4. Which berries, waxy coating intact or waxy coating removed, had the higher temperatures?
5. Why can an object look different when the wavelength of incoming light changes?
6. What limitation in this setup keeps it from perfectly modeling sunlight?

ACTIVITY 7.1: CER

CLAIM, REASONING, AND EVIDENCE (CER)

LAB QUESTION: HOW DO DIFFERENT LIGHT WAVELENGTHS CHANGE THE COLOR AND SURFACE TEMPERATURE OF BLUEBERRIES?

CLAIM (Your direct answer to the question)

Different light _____ change the color appearance of blueberries because the blueberry's waxy coating reflects certain wavelengths and the _____ pigments absorb others. At the same time, they change the surface temperature based on the _____ absorption by the blueberry's anthocyanin pigments.

EVIDENCE (Scientific data and facts that support the claim)

- **Color Observations:** Under **white light**, the blueberries appear their natural _____ color because white light contains all wavelengths in the visible light _____. Under _____, _____, _____, and _____ lights, the berries change color because they can only reflect the wavelengths present in the source light. Under _____ light, the berries look especially brilliant _____, especially when the reflective waxy coating is intact.
- **Temperature Data:** The surface temperature measured with the _____ thermometer was highest under _____, _____, _____, and _____ light and lowest under _____ and _____ light.

ACTIVITY 7.1: CER

CLAIM, REASONING, AND EVIDENCE (CER)

- **Waxy Coating Removal:** When the waxy coating was removed, the colors of the berries appeared _____. The surface temperatures for the de-waxed berries were **[higher / lower]** by approximately **[insert temperature difference]** _____ compared to the berries with the coating intact.

REASONING (The scientific explanation connecting your claim and evidence)

- **Light Reflection and Color Perception:** An object's color depends on the wavelength of light it reflects into our eyes. Blueberries contain a _____ coating that scatters and _____ blue and UV light and pigments called anthocyanins, which normally absorb red, yellow, and green light while reflecting blue light. Under pure red, yellow, or green light, there is no _____ wavelength to reflect, making the berry appear dark, black, or a shade of the incoming light color.

ACTIVITY 8.1: CLOSURE

EXIT TICKET

Read, and respond.

How does harvesting blueberries teach children to read the land on which they live?

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