Light: The Return of the Sun

A Two-Way Science Learning Unit for Qikiqtani Lower Elementary (Grades 1-3) Students

University of Manitoba
Centre for Research, Youth, Science Teaching and Learning
July 2008

NSERC CRYSTAL CRSNG CREAS

Table of Contents

Cover Image: Kenojuak Ashevak's *The Woman Who Lives in the Sun*. Stonecut in red on laid Japan paper. West Baffin Eskimo Cooperative, 1960.

Guiding Principles of the Unit

- Provide two-way learning experiences by integrating Inuit knowledge, ways of knowing, beliefs and values and contemporary scientific knowledge, processes and attitudes.
- Draw upon traditional and contemporary Inuit cultural examples as contexts for student learning.
- Include the local community and its people in students' learning opportunities as the classroom is an extension of the school and local community.
- Foster language development in Inuktitut and, where required or encouraged, English.
- Use diagnostic and formative assessment to inform planning and teaching and monitor student learning.
- Engage students by starting lessons by providing first-hand experiences for students or drawing upon common experience.
- When using story to engage students, use the interrupted-story-line as a vehicle to prompt questioning first-hand investigations.
- Deliberately promote scientific attitudes of mind (curiosity, problem-solving, working to end) student through thoughtful independent consideration of questions and challenges posed.
- Move from the experiential, first-hand experiences to the psychological; that is, after providing concrete experiences assist students in making sense of experiences by using purposeful strategies to promote understanding such as role plays, illustrations and analogies.
- Assist students in their consolidation of ideas only as an extension of the initial experiential and psychological learning experiences.
- Within the lesson and throughout the unit, move from concrete to more abstract ideas.
- Provide opportunities for student-initiated and directed investigations.
- Provide opportunity for students to make connections among science and all other learning areas.
- Foster student independence, creativity and curiosity by providing opportunity for students' ideas and questions and follow-up opportunities for problem-solving and investigation.
- Provide students the opportunity to make connections between what they are learning and career opportunities.

Cross-Curricular Applications

This unit is developed with an emphasis on developing oral and written language skills within the context of light. The activities that are recommended encourage student expression of their experience in written, visual and oral form.

The unit has strong connections to appreciating the importance of light, both within an historical context and a contemporary context. Students are encouraged to consider how sources of light and knowledge of light have changed, informed, and improved the quality of life and the very survival of their families, members of their local community, and the inhabitants of Nunavut. The emphasis on light within a societal context is inextricably linked to an understanding of light as a science phenomenon.

Students are encouraged to explore light with the assistance of members of the community who have experience and traditional and/or contemporary expertise in the suggested activities. Sunlight, moonlight, and other sources of natural light, artificial light sources, darkness, shadows, bending light, reflecting light, and celebrating the return of the Sun are only some areas that students can develop a greater sense of their own language and culture and a rich understanding of light and the properties of light.

There are obvious connections to personal health and well-being. Teachers are encouraged to use the experience of health professionals with the community when teaching about healthy lifestyles, eye safety, and injuries that impair vision.

The activities suggested are starting points. Broaden the focus by adding stories and activities of your own or from the experiential base of your community.

Conceptual Ideas and Progression

Light: The Return of the Sun is designed as an interdisciplinary resource for teaching about light in Grades 1-3. Light has always been a source of wonder and a fascinating phenomenon to explore whether the explorer's age is one or one hundred. We hope this sense of wonder and curiosity is captured in the science lessons you will be teaching and in the first-hand investigations of light that your students will be carrying out. **We suggest that you begin teaching this unit several weeks before the dark period begins when the decreasing period of daylight is evident to young learners.** In this way children will become familiar with our dependence on light and understand the joy expressed by their ancestors when the Sun first appeared about the horizon and indicated the end of the dark months and the passing of the worst of the winter season.

We created the unit to build upon science lessons in Kindergarten that develop an awareness of colour and science lessons in Grade 1 that develop knowledge and appreciation of the five senses. In this way, children begin their study of light being able to identify and name the primary and secondary colours of pigments and to mix these colours with white and black to create tints and shades and matching colours. They have also sorted objects by colour, sequenced tints and shades of a colour from light to dark and dark to light, and investigated colour in the local environment.

Studies of the five senses provided your students with knowledge of the sense of sight and the body part with which it's associated. They can identify and describe the iris and pupil of the human eye and the parts of the body that protect the eye (eye lash, eyebrow, and eyelid). They also understand that the senses provide the sight, sound, taste, smell, and tactile information that makes humans and other animals aware of the environment around them and of changes to that environment.

The recommended sequence for supporting student conceptual development of the phenomenon of light is suggested below. For the most part, the activities and the concept and skill development embedded within the activities are sequential. The experiences and ideas primarily focus on observations, listening to the ideas of others, developing scientific thinking about what was observed, and communicating new knowledge verbally, pictorially, mathematically, and through writing. Teacher will be addressing the following key ideas:

1. There are different sources of light in our school, homes, and community.
2. Lights have many uses.
3. The qulliq is a source of light and heat.
4. The Sun is a source of light and heat.
5. It's important to protect your eyes and skin from sunlight.
6. The Sun appears to change its position in the sky over the course of a day.
7. Shadows are made by objects that block the Sun's light or light from another source.
8. The period of sunlight in our community changes season to season and from day to day in some seasons.
9. In late spring and early summer the Sun doesn't set and is always visible in the sky.
10. In mid-winter the Sun doesn't rise and is never visible in the sky.
11. Darkness is the absence of all light.
12. Our ancestors celebrated the "Return of the Sun" at the end of the period of darkness.

Skills Development

This unit emphasizes that the learning of science ideas is inextricably linked to the development of the processes of science. As asserted by the Northwest Territories Elementary Science Primary Program Guide, the legislated curriculum for Nunavut schools, science experiences should provide opportunity for the development of conceptual understanding within the context of relevant investigative experiences. Although individual scientific process skills may be emphasized in specific activities, they are to be supported more holistically in teacher-facilitated or student-directed inquiry.

The skills to be developed are expected to be appropriate to the level of the learner. These skills and a typical developmental sequence are outlined in detail in the NWT Primary Program Guide. Attention is given to providing students with first-hand experiences that promote skills such as:

ObservingCommunicating
ClassifyingMeasuring
PredictingPlanning Investigations
InferringInterpreting Information
RecordingFormulating Investigative Questions

These skills involve coordination between cognitive and muscular skills, often referred to as psychomotor skills. Handling and manipulating equipment require not just the physical ability to perform a task but also the intellect to know how to measure or observe accurately. It is anticipated that by the end of upper elementary a student might be able to, with assistance, conduct a scientific investigation. This unit provides opportunities for students to work physically and cognitively towards this end.

Attitudes and Beliefs Development

An explicit goal in the development of this resource and the other resources being developed in this Qikiqtani project and the accompanying professional development provided for teachers is to use these as a vehicle to contribute to student ‘success’ in science. Although success in science is often attributed to measurable outcomes such as knowledge acquisition and development, the intent of this development project is much more encompassing. It extends this notion of success to investigate the influence of ‘two-way’ learning experiences on students’ perceptions of success in their personal attitudes and beliefs.

What does success in science mean to Inuit students? It is anticipated that students will experience success in a variety of ways, beyond the border of knowledge into the domain of attitudes and beliefs. Attitudes are regarded as states of mind, behavior or conduct regarding some matter, as indicating opinion or purpose. The program of study suggested in the activities that follow will foster student curiosity and creativity, and openness to new ideas of thinking. As well students will develop confidence in their perceptions of self as students of science. Similarly they will develop confidence as evidenced in risk-taking and their effort to conduct science investigations. Their participation in the processes of science will foster their perseverance, precision and objectivity in solving scientific problems. As members of a team they will develop in their respect for and ability to work co-operatively towards purposeful goals with their peers.

Above all, it is anticipated that students will develop a more positive sense of themselves as Inuit in contemporary society as they learn about the inextricable link between science and the world in which they live. It is anticipated that students will see science as part of their life trajectory both in future formal and informal settings as a result of science study that advocates ‘two-way’ learning.

Curriculum Applications

In this context, the conceptual knowledge base and essential skills identified by these curricula are paired with Inuit cultural values, beliefs, and heritage to become the cornerstone of the learning provided in this unit. The topic of light in the Return of the Sun unit is explored from two major themes in the Pan-Canadian and NWT science curriculum documents. These are Energy and Control and Daily and Seasonal Changes. The NWT curriculum addresses these themes in the Grade 1 topics *Energy in Our Lives* and *Daily and Seasonal Changes*.

The General Learning Outcomes include:

- Make connections to [Inuit and] First Peoples beliefs on the origin of the Sun [and Moon];
- Identify the Sun as a source of heat and light;
- Recognize that the Sun is the principle source of energy used on the surface of Earth;
- Identify everyday uses of [light] energy;
- Demonstrate an understanding of ways in which energy, in its many forms [light and heat] is used in daily life;
- Describe different uses of energy [light and heat] at home, at school, and in the community, and suggest ways in which energy can be conserved;
- Investigate some common devices…that use [light] energy and ways in which these can be controlled;
- Select one of the most common forms of energy [light or heat] and predict the effect on their lives if it were no longer available;
- Demonstrate an understanding of changes [in the position of the Sun and duration/intensity of the light from the Sun] that occur in daily and seasonal cycles…
- Investigate changes that occur in a daily cycle and in a seasonal cycle;

- Describe how…humans adapt and prepare for daily and seasonal changes;
- Describe, using their observations, changes in heat and light from the Sun over a period of time (e.g. measure and describe outdoor temperature changes at different times of the day; observe and describe how the position of the Sun influences the length and shape of shadows;
- Develop vocabulary and use language to bring meaning to what is observed and thought;
- Explore and select ways to represent ideas, actions, and experiences and to communicate with others.

Things to Consider in Preparing to Teach the Unit:

In order for you to foster the development of the conceptual knowledge base and essential skills paired with Inuit cultural values, beliefs, and heritage in this unit give consideration to the following:

Your students' capabilities and interests:

- What will be the language of instruction? If the language of instruction is English, how can you include and affirm Inuktitut in your instruction?
- Will students be keeping a written learning log? Again, will it include and affirm Inuktitut?
- What contexts suggested are likely to be of most interest and relevance to your students?
- Should the investigations suggested be teacher- or student-directed?

Your capabilities and interests:

- Consider the conceptual knowledge base, essential skills and Inuit cultural values, beliefs, and heritage affirmed by this unit. Where will you find the teaching challenging?

- What personal experiences, knowledge and skills can you bring to this unit? The unit provides opportunity for your strengths to be incorporated into the unit

The capabilities and interests of your teaching context:

This resource has been developed with consideration for northern Qikiqtani regions and its students. How can you work collaboratively with the school community to see the intentions of

the unit a reality? Who are the individuals that can assist in ensuring **Inuit Qaujimajatuqangit** is incorporated into this unit.

About the Activities

Select a Starting Point:

Although a sequence of instruction has been provided for this unit of study your starting point will be a reflection of your students' backgrounds and interests.

Select Knowledge, Beliefs & Values to Develop:

Again consider the interests of your students especially in terms of their Inuit Qaujimajatuqangit background.

Select Appropriate Skills to Develop:

Consider the investigative abilities of your students. What investigative skills are most appropriate for your students? The investigations suggested could either be teacher-facilitated or student-directed depending on the capabilities of your students. What is most appropriate?

Develop an Instructional Sequence:

Use the information provided in previous sections of this resource to assist in developing a coherent instructional sequence. The list of activities is only a suggestion of what might be addressed.

Activities

Two Activities that Occur Daily
Determining the Location of the Sun and Graphing Daylight Hours

1. Determining the Location of the Sun in the Sky

What You Need

1. A location on the school grounds with an un-obscured view of the sky and horizon where the Sun rises and sets
2. Opportunities for the children to observe, on a regular basis, the location and position of the Sun relative to the horizon

What You Do

- Five to ten minutes before the start of the morning recess of the day the "Return of the Sun" unit begins, show the children the location on the school grounds where they will be looking for the Sun.
- Model for the children, where they will need to stand, and the direction they are to face.
- In this position, show the children how to determine the location and position of the Sun relative to the horizon – without ever needing to look directly at the Sun.
- Say something like the following, "As I face in the direction I asked you to stand, the Sun is to my left." Using the mittens on my hands as my measure, I know the Sun is the width of three mittens above the horizon.
- **Link to Inuit Knowledge**: According to John MacDonald (*The Arctic Sky*, 1998, pp. 116-117), using a mitt was the way the Inuit had traditionally measured the height of the sun. He quotes Noah Piugaattuk saying: "They would measure the sun be stretching out their arm and using their mitt. The way to measure the sun was to line up the bottom of the mitt with the horizon and if the top of the mitt lined up with the bottom of the sun then it was called Pualutaniktuq" (p. 116).
- After all of the children have practiced, have them join the other children for recess.

- When back in the classroom, make a note of the time, date, the location of the Sun in the sky, and distance above the horizon, using your non-standard measure (mitten width, not length or thickness).
- As the children get settled, tell them that they will be monitoring the Sun's position at various times during the day over the next 3-4 weeks.
- Remind the children that they are always to stand in the same location, facing the same direction.
- In this position, they will be determining the location of the Sun in the sky (by direction and distance above the horizon) during morning recess, noon recess, and afternoon recess.
- Have children raise their hands if they think the answer to the question, "Do you think the Sun will always be to our left and the distance of three mittens above the horizon?" is "Yes".
- Engage the children in a discussion by asking both the children who answered "yes" by raising their hands and the children who answered "No" by not raising their hands, "How do you know?"
- Provide sufficient time for this discussion.
- When the children have little more to say, mention that we will be observing to determine if the Sun is always to our left and three mitten widths above the horizon.
- Ask the children what we should be observing and measuring when we look for the Sun in the sky during morning, noon, and afternoon recesses over the next 3-4 weeks.
- **Note**: Consider making data tables, like the one below, for the children to each record their observations and measurements by day, by week, and perhaps by month. It should also be possible for children to pictorially represent each day's data on a small sheet of paper that has a drawing of the horizon they would see while standing in the chosen location on the playground. Given the subtle change, however, I would suggest that drawing be made on the same day of each week the unit is taught (and beyond the period of darkness if you so choose). Over time the children's drawings will show that the Sun is gradually appearing lower in the sky.

LOCATION OF THE SUN IN THE SKY								
Date	Time of Observation			Location of Sun in Sky			Height of Sun	
	AM Recess	Noon Recess	PM Recess	To the Left	In Front	To the Right	Number	Measure
01 October	X			X			2	Mitten widths
01 October		X			X		4	Mitten widths
01 October			X			X	2	Mitten widths

What You Look For

- Does the child follow the directions for observing and measuring the position and height of the Sun?
- Does the child use his/her observational data to know that the location of the Sun in the sky changes in the course of a day?
- Does the child use his/her measured data to know that the height of the Sun relative to the horizon changes in the course of a day?
- Does the child use his/her observational and measured data to know that the Sun is highest in the sky at approximately12:00 Noon and that it is neither to the right or left, but in front of the him/her?
- Does the child use his/her observational data to know that the location of the Sun in the sky at a particular time of the day changes from week to week?
- Does the child use his/her measured data to know that the height of the Sun relatives to the horizon and at a particular time of day is decreasing as the Dark Period approaches?
- Does the child understand that the Sun does not rise above the horizon during the Dark Period?

2. GRAPHING DAYLIGHT AND DARKNESS

What You Need

1. Computer access to the Weather Underground website (http://wunderground.com/global/CA_NU.html)

   On this site you will find information for your community under the heading "Astronomy" that provides data on the "Length of Visible Light" and "Length of Visible Day". Beginning in June and July for many communities, you will also find information on the number of minutes and seconds the length of the day is shortened (e.g., "tomorrow will be 6m and 9s shorter)".
2. A table like the one that follows that allows the children to record the hours of daylight and the hours of darkness.
3. **Note**: You may prefer to flip the table and have the "Hours in a Day" run horizontally across the page rather than vertically. Such an arrangement would also allow for a time of sunrise column and a time of sunset column (if this information would be meaningful to the children you teach).

What You Do

- Bookmark the Underground Weather website. If possible, place the bookmark in the bookmark bar where it is easily located by the children.

- Decide if you will record the length of daylight and the length of darkness in hours or hours and minutes.
- Decide if the data will be recorded on the table using coloured crayons, pencil crayons, or prepared strips of paper (made to fit the table's cell and the length of the 24 hours column or row – thus, requiring only cutting).
- Discuss with the children the information they will be collecting and recording.
- Show the children the prepared chart and engage them in a discussion of how the information from the Underground Weather website will be presented.
- Have the children name, discuss, and negotiate the colour that they believe best represents daylight and the colour that best represents darkness.
- When consensus is achieved, guide the children's recoding on the table of the first day's data.
- Each week, select two children as the "length of daylight" reporters.
- Train these two children to logon to the Underground Weather website using the bookmark and to retrieve the necessary information: length of visible day and the minutes and seconds the length of visible day is shortened.
- Help the two children to record the length of visible day and the length of darkness on the prepared chart.
- Model and guide the children in their presentation to their classmates of the recorded data and the number of minutes the length of the visible day is shortened.
- On Thursday and Friday of each week, the two children responsible for collecting, recording, and communicating the length of visible day information are to train two classmates, selected by you, who will take over this job the following week.
- As the week progress, use guided questioning to help the children to interpret and understand the recorded information and to link the declining number of daylight hours with the increasing number of hours of darkness as well as the children's observations of the location of the Sun in the sky and measurements of the Sun's relative position above the horizon.
- Continue in this way, week by week, until the end of the unit (and beyond the period of darkness and the return of the Sun if you so choose).

What You Look For

- Can the child identify and accurately record the length of day information from the bookmarked Underground Weather website.
- Can the child accurately interpret to record the length of day and length of darkness on the "Hours of Daylight and Darkness" table?
- Can the child communicate to his/her classmates the information on the "Hours of Daylight and Darkness" table?
- Can the child determine the hours of darkness in a day if he/she knows the hours of daylight?

- Can the child interpret the data on the “Hours of Daylight and Darkness” table to identify trends and relationships between the decreasing hours of daylight and the increasing hours of darkness?
- Can the child relate the trends identified in the Underground Weather data to his/her observations and measurements of the location of the Sun in the sky.
- Can the child explain the relationship between the Sun and daylight?
- Can the child answer the question, “What determines how many hours of daylight there will be in a 24 hour day?”
- Can the child answer, “What determines the number of hours of darkness in the 24 hour day?”
- Can the child answer the question, “If the Sun appears to be low in the sky and close the horizon at noon recess, do you think we will have a long period of daylight or a short period of daylight? Explain your answer.”
- Can the child answer the question, If the Sun appears to be high above the horizon during morning recess will the hours of daylight be more or less than a day when the Sun appears low in the sky at morning recess?

Example of a Length of Daylight/Darkness Table

HOURS OF DAYLIGHT AND DARKNESS (November 1-14)															
HOURS IN A DAY	24														
	23														
	22														
	21														
	20														
	19														
	18														
	17														
	16														
	15														
	14														
	13														
	12														
	11														
	10														
	9														
	8														
	7														
	6														
	5														
	4														
	3														
	2														
	1														

	0														
		01	02	03	04	05	06	07	08	09	10	11	12	13	14
		DATE													

1. Introduction to the Unit: When There Was No Light

Viewing and Responding to a Work of Art

What You Need

1. Germaine Arnaktauyok's coloured ink drawing, *When There Was No Light* (1997)
2. Excerpt from Germaine Arnaktauyok's autobiography
3. Germaine Arnaktauyok's written explanation of *When There Was No Light*
4. Drawing paper (8cm x 8cm piece for each child)
5. Pencil crayons
6. Science notebooks/journals
7. For your own background information: *The Creation. A legend told by Arnaruluk to Knud Rasmussen* (1908) and presented in John MacDonald's (1998, 2000) The Arctic Sky: Inuit Astronomy, Star Lore, and Legend (p. 260-261)
8. Board space for the "Light" word wall where the new science words introduced and used in the lesson are listed for all to see

What You Do

- Have the children quietly sit on the floor, forming a semi-circle in front of you. Show the children Germaine Arnaktauyok's coloured ink drawing, *When There Was No Light*. Tell them the name of the artist, information about her life (see "Materials and Resources" section), and the title she gave her drawing.
- Using a "Look-Think-Pair Share", invite the children to silently **look** and **think** about what they **see** in the drawing before **presenting** their observations to a partner (a child sitting next to them) and **listening** carefully to the observations their partner has made (approximately 5 minutes for observing, listening and partner sharing).
- Invite pairs of children to share their observations of the drawing with the class by raising hands. Explain that each child called upon is to present the observations of their partner, not their own observations.
- Make a note of the identifying and descriptive words used by the children.
- With hands in the air, call upon a pair of children to present to the entire class. Other pairs of children may volunteer to present, **if** they have a new observation to share.

- When there are no new observations, ask the children: “What legend/story do you think Ms Arnaktauyok might be telling in her picture?”
- Invite children to share their ideas (inferences) with the class by raising hands. Again, noting the language the children are using.
- **Link to Inuit Knowledge** - Where possible, use the children’s shared ideas and language in your description of the legend that accompanies the image, or in a retelling of your own reading of the darkness portrayed in *The Creation* legend (in the “Materials and Resources” section that follows the activity/lesson)
- In a wondering tone, encourage the children to think about what it must have been like to live in a world of darkness where the only light comes from a hunter licking a finger. What if no one was around to lick a finger? How would Germaine Arnaktauyok have drawn this scene? What do you think we would see in such a drawing?
- End this portion of the lesson by asking the children: “What does the lit finger remind you of?” Without saying what they think, ask the children to close their eyes and picture it in their mind? When they have a good image in their mind’s eye, they can quietly stand up, pick up a 8cm x 8cm piece of paper from you, return to their table/desk, and use pencil crayons to draw and label (identify) the object that the lit finger reminded them of.
- As the children complete their drawings, ask that they sign the back, and place the drawing in their science notebook/journal.

What You Look For

The following questions should assist you in formatively assessing each student’s (a) thinking and understanding of light, sources of light, and darkness, (b) scientific vocabulary, and (c) ability to distinguish an observation from an inference:

- When you ask children to **describe** what they see in Ms Arnktauyok’s drawing, do they name the objects and colours portrayed in the scene (e.g., one human, three white rabbits, one white bird standing, eight birds in flight, one bow, three arrows with feather quills), or do they tell a story (**make inferences**) about the scene (a male hunter whose noise as he walks across the snow causes the birds to fly away)?
- Do the children who have an opportunity to speak provide descriptive words to identify the objects (particularly the Sun-like object radiating what looks like light beams or light rays) and scene portrayed in the drawing?
- Do the children use the title of the drawing, *When There Was No Light*, to give meaning to and makes sense of their shared observations (to infer)?
- Do the children draw a picture of a source of light that the lit finger reminded them of, and identify their light source in writing?

When There Was No Light
Germaine Arnaktauyok

GERMAINE ARNAKTAUYOK – BIOGRAPHICAL INFORMATION

I was born in a camp on the mainland near Igloolik. The hunting was not very good at Igloolik as it is on an island. The area where my family lived was good for sealing, and there were caribou herds that migrated through the region. In the summer we would move deeper inland and camp in tents. We would go caribou hunting and fishing, and then we would come back to the main camp in the fall. It wasn't until years later, in the mid-1960s, that my parents moved into Igloolik. They were getting older and I think they had to be closer to a nursing station and other services. That was when I started school.

I had a normal childhood. There were about eight of us, so there were other kids to play with. I was the oldest girl, with two older brothers. My mother, Therese Nattok, told me that I was born in late September, about 10:00 a.m., and there was a first snow that morning. She said it was very pretty.

Another interesting think my mother told me was that when she was a young girl, she used to help a blind woman. She would take her places she wanted to go. The blind woman told my mother that if she ever had a daughter to name the child after her, she would have very good eyes. So I was named after her because I was the first girl to be born to my parents. I have wondered why she said that, because I have terrible eyesight. But when I think about it, maybe she meant that I have better inner eyes – visual insight, that I use in my work.

When I was a child, it seemed natural to me to make art. I can remember drawing on gum wrappers and any bits and pieces of paper I could find, My father would travel to Igloolik for supplies, and I remember that I told him I wanted colours. He mentioned this to the priest, and once he sent me red, green, blue, and yellow crayons. I never questioned being an artist. I guess I was lucky. It sees I knew exactly what I wanted to be, and then I just worked at it (p.5).

Germaine Arnaktauyok. 1997. *Autobiography*
(from interviews conducted in Winnipeg, November 9-10.
In Darlene C. Wright (curator), Germain Arnaktauyok (exhibition catalogue).
Winnipeg, MB: Winnipeg Art Gallery.

GERMAINE ARNAKTAUYOK'S EXPLANATION OF HER DRAWING, *WHEN THERE WAS NO LIGHT*

I wanted to do a traditional-looking picture from a time when the kudlik was the only light source that was used. So it is dark and light and in full colour. It is said that in olden times, people used to lick a finger and it would become illuminated. That was the only light source they had.

I thought it would be interesting to work on light and dark and put it together. There are flying ptarmigans, and rabbits, and a hunter with his finger lighting the whole thing so you can see the animals and birds.

Germaine Arnaktauyok. (1998). Winnipeg, MB: Winnipeg Art Gallery.

ARNARULUK'S *THE CREATION*

This legend tells of the creation of the Earth, its human inhabitants, and dogs. It also explains how the Sun, Moon, and stars came to be. Initially it was darkness and there was no death. But people became too numerous, until their numbers were checked by a great flood, the proof of which is seen in sea shells

found inland, far from their coastal origin – a common post-glacial phenomenon in many parts of the Arctic. To prevent a recurrence of disastrous overpopulation, light with concomitant death was accepted by the people, and so came the Sun, Moon, and stars "for when people die they go up to Heaven and grow luminous" (MacDonald, p. 260)

That time, very long ago, when the earth was made, it dropped down from above – the soil, the hills and the stones – down from the heavens; and that is how the world came into existence. When the world was made people came. They say that they came out of the earth. Babies came out of the earth. They cam out among the willow bushes, covered with willow leaves. And they lay there among the dwarf willows with eyes closed and sprawled. They could not even crawl about. They got their food from the earth.

Then there is a story of a man and a woman; but how came it to be? It is a riddle – when did they find each other, when did they grow up? I do not know. But the woman made babies' clothes and wandered about. She found the babies, dressed them, and brought them home.

That is how there came to be came many people.

When there were so many of them they wanted dogs. And a man went out with dogs' harness in his hand, and began to stamp the ground, calling "Hoc, hoc, hoc!" Then the dogs sprang out of little tiny mounds. And they shook themselves well, for they were covered with sand. That is how men got dogs.

But men increased; they grew more and more numerous. They did not know death, at that time so very long ago, and they grew very old; at length they could not walk; they grew blind and had to lie down.

Nor did they know the Sun; they lived in the dark; the daylight never dawned. It was only inside the houses that there was light; they burnt water in the lamps; at that time water could burn.

But the people who did not know how to die grew too many; they overfilled the earth – and then there came a mighty flood. Many men were drowned, and me grew fewer. The traces of this flood are to be found on the tops of high hills, where you often find shells.

Then when men had grown fewer, two old women began one day to talk to each other. "Let us be without the daylight, if at the same time we can be without death!" said the one; doubtless she was afraid of death.

"Nay!" said the other. "We will have both light and death."

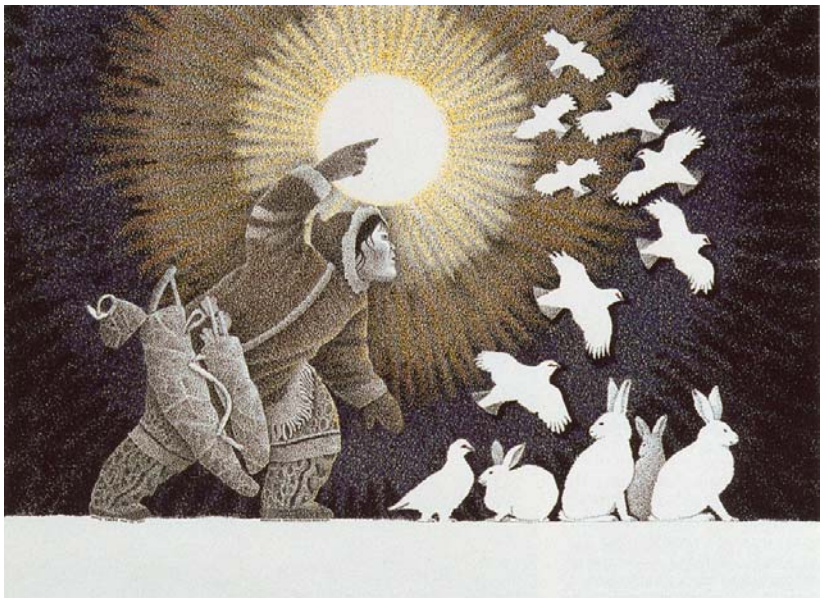
And as the old woman said those words, it was so – light came and with it death…

As men by this time had light, they could go on long seal-hunting expeditions, and no longer needed to eat soil. And with death came the Sun, the Moon , and the stars.

For when people die, they go up to Heaven and grow luminous.

Arnaruluk, told to Knud Rasmussen, 1908, as cited in John MacDonald, 2000, *The Arctic Sky: Inuit Astronomy, Star Lore, and Legend*. Toronto, ON: Royal Ontario Museum, pp. 260-261.

Name _____ Date _____



Long ago there was only nighttime. When a hunter needed light to see, he would lick his finger, and then his finger would give off light.
The finger that gives off light in this picture reminds me of

_____.

My Drawing

2. Our Drawings: Sources of Light

Graphing Data, Discussing Data, and Generating Questions from Data

What You Need

1. Germaine Arnaktauyok's drawing, *When There Was No Light* (on display)
2. Children's drawings from previous day
3. Paper covered bulletin board prepared for the children's construction of a pictograph that incorporates their drawings (with room for as many rows as there are objects drawn by the children – see the example of a pictograph in the Materials and Resources section)
4. Paper labels that will be used to print the name of the drawn object - to be used as labels on the pictograph (e.g., Sun, flashlight, light bulb)
5. Coloured marker for writing the labels
4. Science journals
5. "Light" word wall (add new terminology)

What You Do

- Building on the last activity, have children to meet you at the carpet with the labeled drawing of the object that the lit finger in Ms Arnaktauyok's drawing reminded them of. (Again, sitting in a semi-circle in front of you).
- Invite a child to summarize (**review**) what was done the previous day in science. Everyone must listen carefully as the child will be calling upon others at the end of his/her summary who have remembered items that were not mentioned and have raised their hand.
- Tell the children that they are going to make a graph of the "objects" in their drawings. To do this, they will need to know the name of what they drew.
- Ask one child to begin by showing and naming the "object" in his/her drawing and talking about the "things" he/she saw in Arnaktouyok's drawing that suggested the (name of object) to him/her as the object to draw.
- Write the name of the "object" on a prepared label and place it in the second row of the far left column of the bulletin board pictograph. The child can pin/tape his/her drawing to the right of this label.
- Ask the children if the lit finger reminded anyone else of the "object" drawn by (<u>insert name</u>). Invite these children to share their drawings. Add these drawings to the pictograph creating a single horizontal row.
- Continue in this way until all drawn objects have been shared and added, with the proper label, to the pictograph.
- Ask: "Why do you think people drew so many different objects when we all looked at the same picture/work of art?
- Discuss the "data" represented in the pictograph with the children.
    1. Using the drawings as evidence, ask the children to silently count the number of **different kinds** of objects that the lit finger reminded everyone in the class of.

2. Invite a child to tell the number of different kinds of objects and, using the pictograph, to show what he/she counted to get that number.
3. Ask: “Does everyone agree with (insert name)? Did you count the same number of different kinds of objects? (If there are students who did not arrive at the same number, determine how they counted.)
4. Determine, by asking the children, the object that the lit finger reminded most children of. Call upon one child to explain how they knew (name of object) was the object “most” of the children thought of. Invite this child to show the part of the pictograph that they used to determine/calculate the answer.
5. Invite the class to count out loud the number of drawings displayed in this row as you point to each drawing beginning with the one nearest the label.
6. Ask: To answer this question do you need to know if there is another "object” (or row in the pictograph that has more drawings?
7. Ask: “Looking at the pictograph, what object (or objects if there is more than one) were the fewest number of children reminded of?
8. With hands raised, call upon one child to answer. Ask, “How did you know this by looking at the pictograph? Determine if the children in the class agree with the child. Discuss any disagreements always making sure that the children use the “data” in the pictograph as their evidence for any claim.

- End this part of the lesson by asking children to look carefully at the pictograph, to count the number of drawings placed with each named object (in each category), and to quietly think of a question that they could ask a classmate, that the classmate could only answer by using the information in the pictograph.
- When a child has thought of a question, he/she should move quietly to their table/desk, open his/her science notebook, and write down the question created as well as the answer and how the answer can be found.
- Each child is to share and edit his/her question with a partner. Both edited question (from the child and the child’s partner) are to be written in each child’s science notebook. Answers to each question are to be calculated independently.
- As the children work, discuss with each child the information in the pictograph that he/she used to create a question, and the information in the pictograph that was used to calculate the answer to their partner’s question.
- Remind the children write the date the top of the pages in their science notebook that they have used for this work.

Closure: Invite the children to think about a title for the pictograph and to come tomorrow with their good ideas of a title that they will be willing to share with the class. Explain that a good title would be one that tells everyone what the pictograph is about (why we drew the objects we did). So, for example, we wouldn’t give it the title, “Lights We Identified in the School”. Suggest that they

explain the pictograph to members of their family and get their ideas for a good title, if it's not easy thinking of a good title on their own.

What You Look For

The following questions should assist you in formatively assessing each student's learning.

- Can the child pictorially represent, name and explain their choice of a source of light that Arnaktauyok's drawing reminded them of?
- Does the child understand how to use his/her drawing in the formation of a class pictograph?
- Does the child understand the overall structure of pictographs?
- Can the child interpret and make sense of the information in the pictograph?
- Does the child use the information in the pictograph to create and solve a problem?
- Can the child solve a problem created by a classmate that requires him/her to use the appropriate data in the pictograph?
- Does the child understand that individuals can have different interpretations of and, thus, different responses to pictures/works of art?

Materials and Resources for Activity/Lesson 2

Example of a Pictograph

The Kind of Pet We Would Like							
Bird							
Cat							
Dog							
Fish							
Created by the 13 Grade 1 students in Room 7							

Name _____ Date _____

Our Pictograph

1. Together we drew _____ different **kinds** of light.

2. Most of us drew a _____.

3. _____ of my classmates drew the same kind of light that I drew.

4. This is my question:

_____

_____

5. This is my partner's question:

_____

_____

6. My partner helped me to re-write my question. Here it is:

_____

_____

3. Selecting a Title for the Pictograph

Evaluating, Negotiating , and Problem Solving with the Principal

What You Need

1. Germaine Arnaktauyok's drawing, *When There Was No Light* (on display)
2. Pictograph from previous day
3. Chart paper and markers
4. "Light" word wall (add new terminology)
5. Science notebooks/journals
6. Pre-arranged visit to the classroom by the school principal

What You Do

- When children are seated at their tables/desks, ask those who came to school with a good title for the pictograph to raise their right hand.
- Using the chart paper and marker, list the titles as they are presented by these students.
- Display the pictograph so that all of the children can see it. Say/read each one of the suggested titles as the children look at the pictograph. Then, go through the list of suggested titles, one-by-one. Invite the children to discuss the title, but before saying anything to the class they have to think about answer to the question: "If Mr./Mrs./Ms (name of school principal) were to come into the room, would the title tell him what the pictograph was about?"
- When the students have determined the best title, invite the principal to the classroom. Encourage him/her to look at the pictograph and then ask the child who suggested the "best" title to show and tell him/her about Ms Arnaktauyou's drawings, how pictures that make up the pictograph came to be, and the pictograph title that the class decided was best. If the principal thinks the title makes sense, the pictograph will be given that title. If he/she is confused by it, invite him/her to offer a suggestion that will make the title clearer. Do the children agree that the principal's suggestion makes the title clearer?
- When consensus is reached, write the chosen title at the top of the pictograph.
- Before the principal leaves the classroom, invite several children to stand and read aloud the problems, written in their science notebooks, that they created from the information in the pictograph. When the principal has solved these problems (perhaps calling upon students for their help), ask him/her to use the information in the pictograph to create a question for the children.
- Provide several minutes for the children to independently solve the principal's problem in their science notebooks.
- Have those who have a solution to the problem raise their left hand. Invite the principal to call upon a child to give their answer and to describe how he/she arrived at that answer. The principal should also ask if other solutions were

calculated. The children with different solutions should be given time to explain the steps they used to arrive at their answers.

- Discuss these solutions using the information in the pictograph and use questions to lead the children to the correct answer.
- Following good-byes and expressions of thanks to the principal, have the children include the steps of the principal's problem and the correct answer in their science notebook.

What You Look For

The following questions should assist you in formatively assessing each student's learning.

- Does the child assess the proposed titles based on the reason for doing the drawings as opposed to the information displayed in the pictograph?
- Does the child understand the principal's question?
- Does the child use the right information in the pictograph to answer the principal's question?
- Does the child write the principal's problem and correct solution to the problem in his/her science journal?

Link to Inuit Knowledge - In the section, "Conceptual Ideas and Progression" on page 5, it was suggested the unit begin two to three weeks before the 'disappearance' of the Sun below the horizon and, thus, the beginning of the dark period. This allows time for the introduction of string games, which were traditionally played in all but the dark period.

There are several good websites and books on string games, particularly the following:

- International String Figure Association (http://www.isfa.org) which has an Arctic section, 'The Arctic String Figure Project' (http://www.isfa.org/arctic/jenness.htm) with 164 string figures and 11 string tricks described and recorded by Diamond Jenness in the "Report of the Canadian Arctic Expedition, 1913-1918", Volume XIII: Eskimo Folk-lore, Part B: Eskimo String Figures published by F.A. Acland of Ottawa, Ontario in 1924.
- The World Wide Web (WWW) Collection of Favorite String Figures (http://alysion.org.string.htm) with step-by-step directions for string figures from around the world.
- Camilla Gryski. 1983. Cat's Cradle, Owl's Eyes: A Book of String Games. Toronto, ON: Kids Can Press. (ISBN: 0-919964-49-4)
- Camilla Gryski. 1987. Super String Games. Toronto, ON: Kids Can Press. (ISBN: 0-921103-01-8)
- Camilla Gryski. 1995. Camilla Gryski's Favourite String Games. Toronto, ON: Kids Can Press. (ISBN: 1-55074-261-2)

Begin by showing the children the image of Noah Echalook's soapstone carving, "Woman Playing a String Game", Agnes Nanogak's print, "String Game", and Luke Anguhadluk's print, "String Game". Encourage the children to talk about what they see and think (infer) when they look carefully at each piece.

The first image shows a mother with her child. The mother is focused intently on the string figure she is making. Her mouth is open, and we see her teeth. Could she be telling a story or singing a story as she moves her fingers, hands, and string? The second shows two people, one standing and one sitting with a smiling Sun between them. Are they making string figures out of doors? Why do you think the Sun has a smile? The third image has three standing figures in black and one of these figures is a woman with her child. There are two smaller figures in red. Do you think these are all images of people? In the upper right corner we see what appear to be two red animals. One looks like a caribou. What might the smaller red animal be? Do you know what the artist had drawn below the people and animals? The drawing nearest the bottom looks like a string figure. What do you think the string figure is supposed to be? Has anyone seen this string figure being made? Has anyone made this string figure? Does it have name? Do you think the print (work of art) tells a story? Is it the same story that the string figure might be telling?

Now you will have a good idea of those children in your classroom who have experiences with strings figures, whether watching other make string figures or making string figures they have been taught. Use these children as the experts in your classroom. Find out who can make particular figures (e.g., domestic and hunting tools, animals, a winking eye, and features of the land and sky) and if they know the name, story, and/or song that accompanies the figures they can make. These children can become the teachers of the other children who will learn as Inuit children traditionally learned, by watching, reproducing, and then memorizing each step. As the children in your classroom become more competent, consider inviting an elder to show more complicated figures. Encourage the elder to tell the story of the figures he/she makes and to describe how he/she first learned to make string figures.

If possible, consider taking digital photographs of the string figures that the children and visiting elder or elders make and recording the story or song that tells about the string figures the made.

MATERIALS AND RESOURCES FOR ACTIVITY/LESSON 3

NOAH ECHALOOK'S, *WOMAN PLAYING A STRING GAME*, 1987, Stone, ivory, and hide sculpture

Noah Echalook. b. 13 May 1946, Elsie Island, 70 km north of Inukjuak

AGNES NANOGAK GOOSE, *STRING GAME*, 1975, Arayaq, Stonecut print

Agnes Nanogak Goose. b. 12 November 1925, Baille Island.
Her family moved to Holman on Victoria Island in 1934 where she lived until her death on 05 May 2001.

ANDREW QAPPIK, *STRING GAMES*, 2006, Intaglio/Etching print

Andrew Qappik. b. 25 February 1964, Nunatuq.
He currently resides in Pangnirtung. Mr. Qppik played a leading role in the design of the flag and the coat of arms for Nunavut.

LUKE ANGUHADLUQ'S *STRING GAME*, 1972, Arayaq, Stonecut and stencil print

Luke Anguhadluq. b. around 1895, near Chantrey Inlet in the Black River area north of Baker Lake.. He settled in his first wooden house, at Baker lake, in the 1960s, and made his first print in the Baker Lake printmaking workshop around 1969. Died in 1982.

Consider telling the children about the dangers of string games for harpooners described in the following interview excerpt:

Q. Have you also heard that the string games were not allowed to be played at that particular time?

A. *No, I have not heard about it, but the boys were discouraged from playing with the string games. The reason given was that when they harpooned a bearded seal they could get their hands tangled* [in the line of the harpoon, and] *they could lose a finger. So the boys were discouraged from playing with the string games for that reason. It is said that when the men that had been playing with the string games did lose some of their fingers when they harpooned a bearded seal through the breathing hole in the winter time, their finger would have gotten tangled up with the harpoon line.*

Mark Ijjangiak, IE184
Interviewed by Louis Taparduik, 11 February 1991

Name _____ Date _____

The Principal Visits Our Classroom

This is my title for our pictograph:

_____

_____

This is the title we gave to our pictograph:

_____

_____

This is the question the principal asked:

_____

_____

This is my solution to the principal's question:

_____

_____

_____

4. Sources of Light
Identifying Similarities and Differences

What You Need
1. Germaine Arnaktauyok's drawing, *When There Was No Light* (on display)
2. Pictograph from previous day
3. "Light" word wall (add new terminology)
4. Chart paper and markers
5. Science notebooks/journals

What You Do
- Have the children sit on the floor, forming a semicircle in front of you.
- Show your copy of Germaine Arnaktauyok's drawing, *When There Was No Light*, and ask the children to think about the (place the number of kinds of objects here) objects that the glowing finger reminded them of. Guide this discussion by focusing the children's attention on two questions, "How are the objects that you drew similar to the glowing finger in Arnaktauyok's drawing?" "How are they dissimilar/different?" If children are not certain what you mean, you may want to ask, "Are there any objects in our pictograph that we only find in the sky?" When children have responded, ask, "Would we call this a similarity or a difference?" Encourage the children's discussion of what it means to be similar (the same or like) and what it means to be different (not the same or unlike). When consensus for defining both terms is reached, add both words to the "Light" word wall.
- Make a two-column list on the chart paper. Give one column the heading "Similarities" and one column the heading "Differences".
- Ask: "In which column do we place 'uses a switch (to turn light on and off)'?" "Why do you think it belongs in the (name of the column) column? "What did the hunter in Ms Arnaktauyok's drawing have to do for his finger to light up?
- Invite the children to suggest items that can be added to the chart by raising their hand. They must not only name the characteristic or property (e.g., has a flame, uses a battery), but must also decide on, and justify, the column where it should be written.
- When no more comparisons can be made, invite children to discuss the number of items in each column by asking, "Have we identified more similarities or a greater number of differences?" "How do you know this?" "Do you think we would also have more differences than similarities if we were comparing a candle with an oil lamp?" "Why do you think so?"
- Ask the children if they think there are objects that create light that aren't part of the pictograph. How many can they identify and name that exist in the classroom?
- List these on chart paper as children mention them when called upon.
- Encourage the children to keep in their thoughts the number of light objects identified and to respond in full sentences. In this way, when they are invited

to respond, they can say something like; I've just found the third object in the classroom that gives off light. It's the red light on the power cord."

- When no additional items are found and identified, congratulate the children for the observations they made. Then read over the list on the chart paper.
- Have the children quietly return to their table seat or desk, and copy the list into their science notebook, leaving room at the top of the page for a title.
- When the children have copied the list, ask: "We know that all of these objects give off light, is there a name that we can call all objects that give off light?"
- Encourage children to think and respond. If "light source" is not mentioned, tell the children that the name scientists use is, "sources of light" or "light source".
- Inquire to determine if the children have heard the word "sources"? Ask: "What do you think the word, 'source' means means? Maybe a dictionary will help. Tell them that this is the word you are going to use when you talk about objects that give off light, and add it to the word wall.
- Decide as a class, what the title of the list they have just made should be.
- Listen to their suggestions.
- With guiding questions and comments, lead the children to the suggested title that best identifies the chart as a list of the sources of light in the classroom.
- As you write this title on the chart paper, have the children write it above the list in their science notebooks. Remind them to write the date in the top right corner of the page.
- Conclude the lesson by encouraging the children to think of a way they might put the sources of light on the list into groups with similarities.
- Review the meaning of the word, "similarity" by asking, "Who can remind us what the word, 'similarity' means? Listen to the children's definitions and clarify if necessary.
- Announce that tomorrow, you would like them to come with a good sorting rule (or rules) that they could use to make groups of light sources that have something in common.
- Review sorting rules that the children have used in the past, for example: rules used to sort the four food groups or to sort geometric shapes, colours, or summer and winter clothes. Answer any questions they may have about sorting and sorting rules.

What You Look For

The following questions should assist you in formatively assessing each student's learning.

- Does the child understand the meaning of the new concepts similar/similarity and different/difference?
- Can the child look at the drawings in the pictograph and identify features that are similar or different from the source of light pictured in Ms. Arnaktauyok's

drawing and suggest that these features be placed in the proper category on the chart paper?

- Does the child understand the concept ‘source of light”?
- Can the child identify and name sources of light in the classroom?
- Does the child copy the list of light sources into their science notebook?
- Can the child explain why the list of light sources in the classroom has the title it was given?
- Does the child add the title and date to the list of light sources in their science notebook?
- Does the child recall using sorting rules to place items with a similarity or similarities in a group?

Reminder: Provide time during the school day for the children to practice their string figures.

MATERIALS AND RESOURCES FOR ACTIVITY/LESSON 4

EXAMPLE OF "SIMILARITIES" AND DIFFERENCES" TABLE

HOW OUR DRAWINGS ARE LIKE/UNLIKE THE LIT FINGER	
Similarities (Like)	Differences (Unlike)
Has beams or rays	Uses a bulb to make light
Lets us see when it is dark	Has batteries
Lets us see animals	Makes a flame

EXAMPLE OF 'SOURCES OF LIGHT IN OUR CLASSROOM' LIST

THE LIGHT SOURCES IN OUR CLASSROOM
1. Lights in the ceiling
2. Screen of the computer monitor
3. Red light on the power cord
4. Lamp on the teacher's desk
5. Light that shows the computer is on
6. Overhead projector
7.

Name _____ Date _____

Our Title _____

Name of the Light Source	How Many?

My sorting rule is:

_____

_____

5. Sources of Light in the Classroom
Sorting and Classifying

What You Need

1. Science notebooks
2. Pencils
3. List of “Light Sources in Our Classroom” created in the previous activity
4. Labeled contour drawing or printed image of each light source identified in the classroom
5. Two hula-hoops or string circles to be placed on the classroom floor for the sources of light sorting activity
6. “Light” word wall (add new terminology)
7. “Lights in My Home” recording sheet
8. Letter to the children’s parent(s) or guardian that explains the recording sheet ”Lights in My Home” and asks that they help their child complete the sheet so that it can be used in science class the next day

What You Do

- Place the two hula-hoops or two string circles on the floor in front of you. They should be next to one another, but not overlapping.
- Have the children sit on the floor, forming a semicircle facing you and the hula-hoops or string circles.
- Invite one child to review, from yesterday’s class, the meaning of the phrase “sorting rule”. If necessary, encourage the child to call upon a classmate for help.
- Ask the children who have thought of a way to sort the sources of light in the classroom to raise their right hand. Quickly note the names of these children.
- Call upon one of the children (with a raised hand) to state their sorting rule or to say how the sources of light are similar (as one example, the light sources that have a switch and the light sources that don’t have a switch). Hand the child the labeled drawings/images of the light sources and ask him/her to sort them according to his/her rule by placing the drawings/images into one circle (has a switch) or the other (does not have a switch)
- Discuss the sorting and the rule with the children. Ask: “Do you think (name of child) able to use his rule to sort the classroom light sources?” “Do you think (name of the child) sorting rule was a good sorting rule?” “How do you know it was a good sorting rule?”
- Invite another child to share their sorting rule and continue as with the first child.
- End this phase of the lesson when there are no new sorting rules to present. If the children haven’t suggested a sorting rule that uses the function of the light source, provide an example and ask the children if they think such a

sorting rule would work. Encourage one child to try sorting the drawings/images using the function rule being discussed.

- Ask the children: “Can you give an example of other ways to sort the light sources using function (how the light sources are used)?”
- Before the children return to their table seats or desks, use guided questioning to reinforce the idea that light sources are not all used for the same purpose. Some lights let us know an appliance or tool is on or off, some light up a room while others light up one page in a book, and so on. Because there are so many different ways that people can use lights and that people depend on lights, many different sources (kinds) of light have been developed.
- Have the children quietly return to their seats to write and illustrate a sorting rule in their science notebook. Remind them to include a title and to write the date in the top right corner of the page.
- The children can either check their own work or have it checked by a classmate (peer editing).
- Several minutes before the end of the school day, suggest to the children that they tell a family member or older friend what they have learned about sources of light. Hand out the “Lights in My Home” recording sheet and if a letter to their parents or guardian that explains the home investigation and encourages family members to participate. Explain to the children that they are going to be making a list of the light sources in their home just as we made the “Light Sources in Our Classroom” list and that the letter to be given to their parent(s)/guardian, as soon as they get home from school, tells family members what you are doing and asks for their help. Model how to use the recording sheet to write a list of the light sources in their home that includes the kind of light and the number of each kind of light.
- As the children line up at the classroom door with their book bags, ask: “Is the recording sheet in your back pack/take-home bag?” What are you going to do with the letter as soon as you get home?” “What are you going to do with the recording sheet when you’re at home?” Wait for each child to respond. Finally ask”: “are you going to bring your recording sheet back to school in the morning?” Wait for the children’s “Yes” response before dismissing them.

What to Look For

The following questions should assist you in formatively assessing each student’s learning.

- Does the child have an understanding of a sorting rule?
- Can the child apply a sorting rule to the classroom sources of light?
- Does the child understand that objects, like the sources of light in the classroom, can be sorted in many different ways?
- Can the child distinguish between a sorting rule based on form (how the light source looks) and a sorting rule based on function (how the light source is used)?

- Does the child write and illustrate a sorting rule for the classroom sources of light in his/her science notebook.
- Can the child peer assess the written sorting rule and illustration of a classmate?

Reminder: Provide time during the school day for the children to practice their string figures.

Name _____ Date _____

My New Sorting Rule for the Lights in the Classroom

This is my new sorting rule:

_____

_____

_____

This is a drawing that shows how my sorting rule works:

_____	_____

Name _____ Date _____

Lights in My Home

Name of the Light Source	How Many?

Name _____ Date _____

String Figures I Can Make

My drawing of a string figure I can make

The string figure in my drawing is known as:

_____

_____

6. Sources and Functions of Lights in the Home
Identifying, Counting, Comparing, and Sorting

What You Need

1. List of “Light Sources in Our Classroom”
2. Each child’s completed recording sheet, “Lights in My Home” (It is suggested that you collect these sheets as the children arrive in the morning. If you, or a volunteer, has time before science, tape/glue each sheet in the appropriate child’s science notebook)
3. “Light” word wall (add new terminology)
4. Science notebook
5. Lined chart paper
6. Markers

What You Do

- Attach the “Light Sources in Our Classroom” to the wall/bulletin board behind where you and the children will be sitting to discuss the “Lights in My Home” recording sheets.
- Position a new piece of chart paper so that all of the children can see it well. This will be used for recording the names of the light sources in the homes of the children.
- Begin by having the children open their science notebook to the page with the “Lights in My Home” recording sheet.
- Have the children to quietly look over the information they gathered and recorded and to write two sentences on the next page in their journal. The first sentence is to that tell the number of different <u>kinds</u> of light sources they found in their home (e.g., electric lamps, candles, battery operated flashlights, oven light, night lights). The second sentence is to tell the total number of light sources they found in their home.
- When both sentences have been written, the children should quietly find someone who has also finished writing and exchange notebooks for editing (both the writing and the addition).
- As children complete their writing and editing (with their name under both sentences that they edited) have them quietly leave their seat with their science notebook and string for making string figures and sit on the floor facing the chart paper. They are to quietly practice making string figures until all of their classmates are sitting with them on the floor.
- If time permits, invite several children to show the string figures they have mastered. Congratulate all of the children on the string figures they have been making. If time is limited, begin by having the children sit on their strings and open their science notebooks to the pages with the “Lights in My Home” recording sheet and the two edited sentences.

- Focus the children's attention on the "Light Sources in Our Classroom" list. Using the information on the list, ask children to identify the number of different kinds of light sources found in the classroom. Then, have the children look at the sentence in their journal that tells the number of different kinds of light sources found in their home. Request a show of hands for those who identified more kinds of light sources in the home than the classroom. Write this information on the board. How many found the same number, or fewer? Write this information on the board.
- Have the children look at the names of the different light sources on the "Light Sources in Our Classroom" list, then at their list of light sources in the home. Ask, "On your list of light sources in the home have you recorded a source of light that does not appear on the list of lights in the classroom?" Raise your hand if you have. Call on a child to name those on his/her home recording sheet that don't appear on the classroom. Before each new source of light is written on the new sheep of lined chart paper, ask another child to verify that it is not on the list of classroom lights. Continue in this way until all of the sources of light found only in the home have been identified and listed.
- Place the new list on the wall/bulletin board next to the list, "Light Sources in Our Classroom".
- Ask the children to put on hand in the air if they can identify a source of light in the classroom that is not found in the home. Call on one of these children to name the source of light as he/she points it out on the "Sources of Light in Our Classroom" chart.
- Ask the children if they have been identifying similarities or differences between the two lists and to explain what makes finding examples of light sources that are on one list but not the other a difference (or "similarity" if this is what the children respond). In order to do this, the children will have to remember what these two words mean.
- Ask for a volunteer to define "similarity" and for a second volunteer to define "difference". Now, with these definitions in mind, do the children agree or disagree with their first answer.
- Ask if the children can identify additional differences. That is, are there sources of light that are in the classroom but not in the home.
- If a child suggests that "Light Sources in Our Classroom" has a title and the new list of sources of light in our homes does not have a title, invite the children to suggest and decide upon a title that will tell everyone what the items in the list represent. Write this title (e.g. Light Sources in Our Homes") across the top of the page.
- Draw the children's attention to both lists. Have them think of a sentence that compares the information in each list and tells something important (e.g., There are more kinds of light sources in homes than in the classroom. We found (<u>place number here</u>) different kinds of light sources in the classroom and (<u>place number here</u>) different kinds of light sources in our homes. There are (<u>place number here</u>) more different kinds of light sources in our homes than in our classroom.)

- Note: If this is too difficult for the children, begin by guiding. For example, you could tell the number of different sources of light in each list and ask the children, “How we can say put this information in one sentence?”
- Record the sentences that the children share (note the name and date). Give time for all of the children to write their own sentence. It should be written in their science notebooks, just below the two edited sentences.
- Have the children close their notebooks and look again at the kinds of light sources on the list (for the classroom) and on the list (for the home). Wonder out loud, “Why so you suppose there are so many more kinds of light in the home than the school? Why would we need so many light sources in homes? When do we use them? What are we using them to do?”
- Invite a child to pick one item from the “home” list of light sources and tell where it might be in a house, when it is used, and why it is used. When answers have been given, ask, “Do you think it can have more than one use? What might these uses be?” Continue in this way for several more items on the list.
- Say to the children: “It seems that we have light sources in the home because we need them for reading and sewing and repairing things that are broken (or other reasons given by the children). Do you think this helps us to explain why some sources of light in our homes are not in our classroom and why some sources of light in ours classroom are not in our homes?” Use the overhead projector (or emergency light) and the nightlight (or kerosene lamp) as examples in your discussion with the children.
- End the lesson by suggesting that the children ask their friends or relatives to play “What Is It” - a game that is focused on identifying a source of light based on given clues about its uses an/or physical appearance. Try one example with the children. It could be something like, “I’m thinking of something with numbers that I can see in the dark and that wakes up my father in the morning, but it would never be used in a school. What is it?” When children have an answer, they are to whisper it in your ear. If they’re correct, they can get ready for recess (or some other activity). If wrong, they should sit down, think a little longer, and try again. (It’s an alarm clock).

What to Look For

The following questions should assist you in formatively assessing each student’s learning.

- Does the child add and use the relevant information on their recording sheet, “Lights in My Home”, to write one sentence about the number of different kinds of light sources and one sentence about the total number of light sources in his/her home.
- Can the child count the number of different kinds of light sources and the total number of light sources recorded by a classmate and use this information to edit the two sentences written in the classmate’s science notebook.

- Does the child understand what is meant by more, same, or less when comparing the number of different kinds of light sources in the classroom with the number of different kinds of light sources recorded in their science journal.
- Can the child compare the items written in the classroom list and the items written on their recording sheet, “Lights in My Home”, and identify sources of light that are found in the classroom but not the home, and sources of light that are found in the home but no in the classroom?
- Does the child apply the labels similarity and difference appropriately when thinking about light sources that appear on one list but not on the other?
- Can the child generate and write a sentence that compares the information in each list and tells something important.
- Does the child understand that sources of light are used in many different ways, and that some light sources have only one special use/function while other have many uses/functions?
- Can the child describe the uses of a specific light source or provide a physical description of a specific light source that allows the source of light to be identified by others?

Reminder: Provide time during the school day for the children to practice their string figures.

Name _____ Date _____

Light Sources in Our Homes and Classroom

1. I counted _____ different **kinds** of light sources in **my** home.

2. All together I count a **total** of _____ light sources in **my** home.

3. Together, we made a list and counted _____ different **kinds** of light sources in all of our homes.

4. Together, we counted _____ different **kinds** of light sources in our classroom using the list "Light Sources in Our Classroom."

5. Here is a subtraction problem that shows show many more kinds of light sources there are in all of our homes that in our classroom:

_____	-	_____	=	_____
Number of different kinds of light sources in all of our homes		Number of different kinds of light sources in our classroom		The greater number of different kinds of light sources in our homes

6. Using subtraction, we found that there are _____ more **kinds** of light sources in our homes than in our classroom.

7. Here is a drawing of the light source I use more than any other light source in my home.

8.Here is a list of the things I do when this light source is switched on:

_____ _____

_____ _____

_____ _____

7. Sources of Light in the Community
Today and Long Ago

What You Need

1. Science notebooks
2. A new sheet of lined chart paper for recording “Light Sources in Our Community”
3. “Light Sources in Our Classroom” pinned/taped to the board/bulletin board (from Lesson 4)
4. “Light Sources in Our Home” pinned/taped to the board/bulletin board (from Lesson 6)
5. Name tags for the children so that the elder can call each child by name
6. “Light” word wall (add new terminology)
7. Invited guest (an elder who has spent many years of her life in the community)
8. Qulliq, with wick and oil, that is able to be lit
9. Digital camera (video or still) to record the elder’s visit

What You Do

- Begin the school day with a game of “What Is It”. When the children have identified the source of light you’ve hidden in clues, invite them to initiate a couple of rounds of the game by sharing the clues they used when playing the game at home. End by reinforcing the idea that sources of light have many uses and that some light sources have more than one use. (For those that weren’t able to initiate a round, but wished to do so, mention that there will be other opportunities.)
- Use a few minutes after the game to tell the children about the guest you’ve invited for science. Some of the children may know her when you say the elder’s name. Encourage them to share what they want to say about the elder now, as the time she is in the classroom will be spent discussing sources of light in the community and sources of light that would have been used long ago.
- Begin the science lesson 10 minutes before the arrival of the elder.
- Invite the children to sit on the floor, forming a semi-circle in front of you (and the empty chair for the elder to sit). Distribute the nametags. Ask the children to wear them so that the elder will know everyone’s name.
- Call on several of the children to remind everyone of the way guests in the classroom are to be treated.
- Draw the children’s attention to the chart “Light Sources in Our School” and the list “Light Sources in Our Homes” and tell them that today they are to think only about sources of light that they have seen in the community. You might

begin by saying something like, “Let’s start a list of Light Sources in Our Community.” T

- Ask the children: “Can anyone on think of a light that they’ve seen in the community, that isn’t inside the classroom (point to the list, “Light Sources in Our Classroom”) and isn’t inside our homes (point to the list, “Light Sources in Our Homes)?”
- As you call upon children to name a source of light in the community, ask a different child to make certain it isn’t on either the classroom or home list before you write it under the new heading, “Light Sources in Our Community”. (You hope children will mention street lights, lights on vehicles (e.g., cars, trucks, four-wheelers, snowmobiles, boats), security lights around buildings, runway lights at the airport, and objects in the sky (e.g., Sun, Moon, stars, Aurora borealis, lightning).
- When the source of light has been written on the chart paper, ask the child what the light is used for in the community, and why it’s necessary.
- Close this part of the lesson by asking the children if they think the uses of lights in the community are similar to the uses of lights in our classroom and our homes or are these uses different.
- Encourage the children to use examples of light sources in explaining their answer (e.g., The uses are different because the headlights on my father’s truck are to light the road so he knows were to drive, they are not for reading or sewing. I think the Sun and Moon and streetlights are like the ceiling lights in the school and in my home because they light up things I can’t see when it’s dark.
- Continue this discussion until the elder arrives.
- **Link to Inuit Knowledge -** Have the children join you in welcoming the elder to the classroom.
- Remember to document the visit using the digital camera.
- When the elder is seated, invite four children to present the work everyone in the class has been doing on sources of light.
- The first child is to show and talk about the information on the pictograph.
- The second child is to show and talk about the information on the “Light Sources in Our Classroom” list.
- The third child is to show and talk about the Light Sources in Our Homes” list.
- The fourth child is to show the list of “Light Sources in Our Community” that was just begun.
- At this point, invite the elder to speak with the children about the work they are doing and to share what she knows of (1) life long ago and (2) the kinds of light sources people would have had, (3) what they would have been used for, and (4) whose responsibility it was to maintain the only source of light other than the light from the Sun and the light from the Moon – the qulliq.
- Allow time for describing the soapstone qulliq, the source of the oil used in the past and how the blubber was processed, and the materials for the wick and how the wick was made.
- If possible, light the qulliq and turn off the ceiling lights. Encourage the Elder to talk about the importance of the qulliq to survival in a time without electricity

and stores and what would happen if the flame died out and there was no oil or wick material.

- As the elder speaks to the children, write down the sources of light that are mentioned (e.g., qulliq, full Moon). Add these to the word wall at the end of the visit.
- Assist the elder in extinguishing the flame as she answers the children's questions before preparing to leave.
- Along with the children, thank the elder for visiting and sharing some of what she knows about Inuit life in the past. (A thank you letter to the Elder will be written during Language Arts.)
- Select two children (boy and girl) to walk the elder to the school's office.
- Have the children return their nametags to you and quietly sit down at their desk/table and open their science notebooks to a new page.
- Have the children illustrate and write five or more complete sentences about the elders visit.
- Encourage the children to do their best work as their illustrated pages will be shown during a "gallery walk" next day.
- Remind the children to look at the word wall for the proper spelling of light words or to ask a neighbour if a word isn't on the wall.
- Those who finish early, and who have no unfinished work to complete, can quietly look at some of the books and magazines in the classroom that tell about and show how Arctic people once lived on the ice and land and depended upon animals and plants for many of their needs, including the oil from sea mammals and Arctic cotton for light and warmth.
- Remember to set aside time during Language Arts for the children to design and create a thank you card or letter that will be delivered to the elder.

What to Look For

The following questions should assist you in formatively assessing each student's learning.

- While playing "What is It?" does the child offer reasonable suggestions for what the light source may be based on the given information about use and physical description?
- Can the child describe the uses of a specific light source or provide a physical description of a specific light source that allows the source of light to be identified by others when playing the game "What is It"?
- Does the child identify light sources in the community that are not on the lists of light sources for the classroom or the home?
- Can the child explain the function (uses) of light sources in the community?
- Does the child attentively and respectfully listen to the elder as she shares her knowledge an experiences of light sources available to Inuit living long ago?

- Can the child ask questions that are based upon the information and experiences the elder has shared?
- Does the child write five sentences about the elder's visit to the classroom that includes the information she shared about the qulliq and other sources of light in Inuit communities long ago.
- Can the child illustrate the information that he/she writes about?

Name _____ Date _____

An Elder Visits Our Classroom

What I Learned about Sources of Light in Communities Long Ago

Name _____

8. The Qulliq
A Source of Light and Heat

What You Need

1. Science notebooks
2. The pictograph (from Lesson 2)
2. "Light Sources in Our Classroom" list taped or pinned to the board/bulletin board (from Lesson 4)
3. "Light Sources in Our Homes" list taped or pinned to the board/bulletin board (from Lesson 6)
4. "Light Sources in Our Community" list taped or pinned to the board/bulletin board (from Lesson 7)
5. New sheet of lined chart paper, divided into two columns with space at the top for column headings and a title
6. Markers
7. "Light" word wall (add new terminology)

What You Do

- During language Arts, have the children open their science notebooks and read the description they wrote about the elder's visit with an neighboring classmate and then listen to the description written by their neighbour. Allow time for the pairs of children to talk about what was drawn and written. Sentences that are incomplete or confusing are lightly underlined, orally edited, and re-written when the child meets with you and receives your feedback.
- Before science begins, have the children open their science notebooks to the illustrated page, lay them out for viewing, and prepare for a gallery walk.
- Organize the direction children will move from desk to desk or table to table so that every child sees all other children's work. Call upon several of the children to remind everyone how they are to conduct themselves when viewing art on a gallery walk.
- When each child observes the last journal in the "gallery", he/she is to find a place to sit on the floor and think (not talk) about the similarities and differences in which the visit by the elder was represented in the journal illustrations.
- As the last child takes a seat on the floor, have the children raise a hand if they included the qulliq in their illustration. Count out loud the number of hands.
- Now ask how many of the (<u>place the number here</u>) children who drew the qulliq also drew the flame? Count out loud the number of hands.

- **Link to Inuit Knowledge** - Ask the children if they remember what (place elder's name here) said the qulliq and its flame were used for.
- Invite responses. List each use on the chart paper, but only after it has been confirmed by all of the children that this is a use mentioned by (place elder's name here).
- As you write each used mentioned and confirmed, ask the children what we use today, in place of the qulliq, for (name the use, for example: cooking meat, drying wet clothing, heating our homes, lighting our homes). Write the contemporary appliance or object in a second column on the chart paper. Invite the children to suggest a label for each column that helps us to remember what we're recording.
- Paraphrase or read sections of the 1987 interview of Rachael Ujarasuk and Rebecca Irngaut and excerpts from interviews of Elizabeth S. Natarakittuq and Jayko Peterloosie in the "Materials and Resources section that follows the activity/lesson). The information in these interviews will help the children to remember information presented by the elder.
- To help children understand how important for survival the qulliq once was, invite them to imagine life without the modern appliances and objects written on the chart (e.g., no furnace, no electric or oil heater, no indoor or outdoor lighting, no water from a tap or faucet or shower head, no gas or electric stove or oven or microwave, no toaster, no clothes dryer…).
- Wonder out loud about how fortunate it was that the method of producing light also produced heat. Even if it was difficult for the hunters to always return with a walrus or seal or bearded seal, the Inuit who lived long ago always knew that if they had a supply of blubber, they had heat and light.
- Close this part of the lesson by having the children look over the drawings on the pictograph, and the light sources identified in our classroom, homes, and community for sources of light, similar to the qulliq, that produce heat that is great enough to boil water and cook meat.
- Place an H-L by those that are identified and agreed upon by the children.
- If the only light sources with an H-L are those that produce a flame, ask: "Do you think this is the only sorting rule we should be using be using?" "Are there sources of light that don't have a flame that also get very hot?"
- For those light sources that the children fail to reach a consensus, determine why there is uncertainty, and invite the children to suggest ways that we can find a solution.
- Of the suggestions, encourage the children to choose the one helps us decide most quickly (e.g., a visit with the principal or a telephone call to local expert that two of the children can place in the office).
- Select two children who will leave the classroom to make the telephone call or to visit to the principal's office.
- Have children quietly return to their desks/tables to make a list in their science notebook of the sources of light that also produce heat. As they set up their page, ask, "What title should we give to our list?" Have the children vote on the title that tells everyone how the items in the list are similar.

- When the children return from the office with the information from the principal or local expert, have them share what they were told. Place H-L next to those sources of light and heat on the chart paper for which we now have supporting evidence.
- Have the children add these sources of heat and light to the list in their science notebooks.

Prior to dismissal at the end of the school day, ask the children, “If the qulliq was the most important source of light and heat for our people many years ago, what do you think would be the most important source today?” “Would it be important for every living thing on Earth?” “Think about this and ask members of your family when you’re at home. We’ll discuss your ideas in the morning.”

Encourage the children to portray the stories about the quilliq through dramatic play.

What You Look For

The following questions should assist you in formatively assessing each student’s learning.

- Does the child listen respectfully and understand the constructive feedback he/she receives from a classmate on his/her writing and illustrations prompted by the elder’s visit?
- Can the child identify and orally express the changes in spelling and sentence structure that will help to improve what a classmate has written?
- Does the child make the changes suggested by the classmate (peer editor) and approved by you, the teacher?
- Can the child identify and discuss with his/her classmates the similarities and differences he/she identified in the notebook illustrations?
- Does the child recall and state a use of the qulliq mentioned during the elder’s presentation, or the name of the tool or appliance that has replaced the qulliq in our lives today?
- Is the child developing an understanding of the importance of the qulliq in providing both light and heat to Inuit who lived long ago?
- Can the child distinguish between sources of light that produce only light and sources of light, like the qulliq, that produce both light and heat?
- Does the child make an accurate list of the sources of light that produce both light and heat in his/her science notebook?

MATERIALS AND RESOURCES FOR ACTIVITY/LESSON 8

EXCERPT OF INTERVIEW WITH ELIZABETH S. NATARAKITTUO, IE125

Q. You were always chipping ice and snow for water and pounding blubber for fuel non stop, were you?

A. *Yes, we were living in an Inuit way then. Even now if there was an igloo outside, we would still be able to keep at it the same way we did in the past - those of us who were living the old ways before. When we just got up, the igloo was quite cold but we started to light the qulliq right away.* ***Once it was lit, the igloo would start warming up gradually and then it became quite warm****. If we overslept a bit the qulliq flames died out and the igloo became quite cold. Once we got up, it was very cold, but we had to go outside right away because we were taught that way, and only after we would be lighting the qulliq to get the igloo warn again.* ***Once the qulliq was lit, we would start to heat up the pot, to make tea*** *with. Even if we were out of tea, we would have to stop whatever we were doing and we would go out and pound blubber when we were running out of fuel. If we ran out of water, we would go out and chip ice to melt for water as well. We were always on the go, never stopping at all.* ***We would have to keep the qulliq lit all the time****. If there was another igloo who needed us to keep their qulliq lit, we would go there to make sure it was lit. We took only a few minutes sometimes to take a rest for awhile then.*

EXCERPT OF INTERVIEW WITH JAYKO PETERLOOSIE, TUNUNIRMIUT, PC-PI

A qulliq was] ***all we used for heat****. We* ***drank water*** *with that and [ate]* ***cooked meat****. Also* ***my mits and kamiik would dry over it*** *when I was out hunting. That's how useful these things were…* ***If my hands were too cold then I could warm my hands over it****. That was all we used.*

As cited in Bennett and Rowley, 2004, p. 299.

EXCERPT OF INTERVIEW WITH RACHAEL UJARASUK AND REBECCA IRNGAUT, IE1012

Our qulliq was our only form of instrument that contained fire, which in turn was the ***source of light and heat.*** *Early in the morning the men that wanted to go out hunting would wake their wife asking them to attend to the qulliq. By this time the flames on the qulliq had blurred during the course of the night which lowers the temperature so that the Igloo gets cold as a result. We then would tend to the qulliq to kindle the flames so that they hunters can get ready to go our hunting. This is early in the morning before the break of dawn. As we attend to the qulliq to kindle the flames we would get something to eat ready*

with our qulliq in ***cooking meat****. The hunters would eat as fast as they could and would get ready before the break of dawn. When a sign of dawn started to show, sometimes even before the dawn, they will leave. This is in the winter when the temperatures are severe. They will be gone the whole day right to night time. This was the daily routine no matter what the weather condition was, it might have blowing snow condition but they would get ready nevertheless and leave for their hunting grounds. Some hunters might find the conditions miserable so they would not go out this day while others continue to hunt no matter what the conditions may be. That was what I remembered.*

In particular for those that depended totally on game animals they would work hard to secure game animals as the dogs too needed food to survive. As for ourselves ***we needed fuel for our qulliq*** *as it was* ***the only means of making water and the only means to cook our meat****. In the days when there was scarcity the hunters would try even harder no matter what the weather conditions may be, there might be a blizzard out so one would think that no one could go out hunting this day but they will go out to hunt. In their absence we would have very little of fuel to burn so we would try and melt snow for water with the meager fire that we may be burning in our qulliq. The only qulliq, in these times, that was burning would belong to the adults, as a matter of fact there would be those that no longer had fire in their qulliq. The only qulliq that was lit was mainly to have hot water to drink. The fuel in the qulliq would be the only fuel available.*

Name _____ Date _____

The Qulliq and Sources of Light that also Produce Heat

1. These are the sources of light in our **classroom** that give off light and heat like the qulliq:

_____ _____

_____ _____

2. These are the sources of light in our **homes** that give off light and heat like the qulliq:

_____ _____

_____ _____

3. These are the sources of light in our <u>community</u> that give off light and heat like the qulliq:

_____ _____

_____ _____

_____ _____

Name _____
(My revised copy)

(*Title*)

9. The Sun
A Source of Light and Heat

What You Need

1. Science notebooks
2. Paper ballots (16 can be cut from one 8.5 x 11 sheet of scrap paper with one blank side)
3. Image of the Coat of Arms of Nunavut
4. Description of the Coat of Arms of Nunavut
5. Germaine Arnaktauyok's drawing, *When There Was No Light* (on display)
6. Pictograph from Lesson 2 (on display)
7. Small photocopied images of Nunavut's coat of arms for the children to take home
7. A copy of Germaine Arnaktauyok's print, *The Sun and The Moon*
8. A child-sensitive version of the Inuit legend, The Sun and Moon
9. "Light" word wall (add new terminology)

What You Do

- When the children have arrived in the morning and taken their seats, pass out paper ballots.
- Remind the children that today is the day to write the name of the source of light that they think is now as important to us today as the qulliq was to Inuit in the past, and, since we are considering all people living on Earth not just people living in the Arctic, it may be that the source you are planning to write is even be more important than the qulliq.
- Once each child has written a light source on his/her ballot, have the children fold their ballot in half and in half again so that no one can see what is written except for the three children who will receive the ballots for counting.
- Collect the ballots in an opaque container.
- Call on three children to tally and record the results, which will be reported during science.

- When it's time for science, sit with your copy of the Nunavut Coat of Arms behind your back and hidden from view. Have the children sit on the floor, forming a semi-circle in front of you.
- Invite the three children who read the ballots to present the recorded results.
- Encourage discussion of the sources of light the children chose as most important, and the reasons for their selecting a particular source.
- Inquire about discussions with family members if this is not mentioned.
- Show the image of the Nunavut Coat of Arms. Without naming or explaining what it is, say, "Take a few minutes and study this "picture" with your eyes. Try to identify as many of the objects and living things drawn by the artist as

you can. Don't say anything. I want everyone to have time to look before we share.

- When two or three minutes have passed, ask the child to your right to stand up, name one item in the "picture", and point out where it is. Continue with the child on your left and move back-and forth around the semi-circle until all items have been named. If a child can't name an object that hasn't already been named, he or she should simply say, "Pass".
- When each child has had a turn, ask the children if they have seen the "picture" before today.
- Ask: "Does anyone know what it is or what it is called?"
- Explain that it's a coat of arms, and that a coat of arms is used to identify families, cities, nations, or governments. Each province and each territory in Canada has a coat of arms, and the one we're looking at is the Coat of Arms of Nunavut. It shows all that is important to the people living in Nunavut.
- Then say something like, "You've already found the qulliq and the igloo and the caribou and narwhal and inuksuk. How many of you identified the four gold circles and the one golden half-circle as the Sun? Ask for a show of hands.
- Tell the children that the Sun is what the artist drew, and he drew it as we see it in Nunavut, sometimes low in the sky, sometimes high in the sky, and sometimes peaking above the horizon. The Sun provides light and heat, just like the qulliq, and it's the Sun that makes all life on Earth possible.
- Remind the children of the part in yesterday's lesson when they were to imagine life without furnaces and running water and electric lights and appliances for cooking food or drying clothing. Ask, "What do you think life would be like if we woke up one day and the light from the Sun began to slowly dim, like a light with a rheostat/dimmer switch, until it was gone? Gone forever.
- Encourage children's thinking and conversation, one speaker at a time. What you want them to realize is that each day would be like frigid winter nights when we have a power outage and darkness is everywhere.
- Have them look carefully at Germaine Arnaktauyok's drawing, *When There Was No Light.* Ask: "How many of you remember drawing the Sun as the object the lit finger reminded you of?" (The answer will be on the pictograph.) "If you don't remember what you drew, or aren't sure, where can we look to find out?"
- Allow time for children to see what they drew then ask: "What if the hunter's finger was like our own fingers and made no light when when it was licked? Remember when we talked about what Ms Arnaktauyok's drawing would have looked like to us if the hunter's finger wasn't a source of light? Without light, we decided that everything in the drawing would be like the drawing around the edges of the paper where no light is portrayed. It would be black, and it would be black to represent darkness and the total absence of light."
- Remind the children of their studies of living things in Grade 1. When they cared for plants and explored to determine the need of plants, do they remember learning that green plants, wherever they are found (in water or on

land) need light to grow. When they studied animals and the needs of animals, do they remember learning that all animals must eat to survive? Remind them that some animals eat only plants (caribou), other animals eat plants and animals (Arctic fox), and some animals eat only animals (narwhal). Without the plants, there would be no food for any animal, and without the Sun there would be no plants. So, it is the Sun that makes possible all life on Earth.

- Ask the children, “Do you think the Sun our most important source of light on Earth?” “How do you know this?”
- Provide time for the children to think and discuss their answers to the question.
- Close this part of the activity/lesson by having the children quietly walk to their seats.
- Tell the children that you would like them to share two things that they learned in science with their family. To help them remember these two pieces of information, they are to open their science notebooks to a new page and write several sentences that include this information.

Link to Inuit Knowledge – Take time during the school day today to show the copy of Germaine Arnaktauyok’s print, *The Sun and The Moon*, and to tell the Inuit legend, “The Sun and Moon”, about the origins of both.

- At the end of the school day, distribute small photocopies (in colour, if possible) of the coat of arms while reminding the children to share their knowledge about the Sun and Nunavut’s coat of arms with members of their family.

What to Look For

The following questions should assist you in formatively assessing each student’s learning.

- Does the child “vote” for a source of light (and heat) that is as important to us today as the qulliq was to the Inuit in the past?
- Can the child explain the reason(s) he/she selected the source of light that he/she wrote on the paper ballot?
- Does the child recognize and name an item on the Nunavut coat of arms?
- Can the child use his/her knowledge of the needs of plants and animals, including humans, to contribute thoughtful and valid comments to the discussion of a world without the Sun?
- Is the child developing an understanding of the importance of the Sun to life on Earth?
- Can the child drawn upon the activities to write two sentences that express information and ideas what he/she has learned?

Reminder: Provide time during the school day for the children to practice their string figures.

MATERIALS AND RESOURCES FOR ACTIVITY/LESSON 9

THE COAT OF ARMS OF NUNAVUT

The dominant colours, blue and gold symbolize the riches of the land, sea and sky.

In the base of the shield, the inuksuk symbolizes the stone monuments which guide the people on the land and mark sacred and other special places. **The qulliq, or Inuit stone lamp, represents light and the warmth of family and the community**.

Above, **the concave arc of five gold circles refers to the life-giving properties of the sun arching above and below the horizon, the unique part of the Nunavut year.** The star is the Niqirtsuituq, the North Star and the traditional guide for navigation and more broadly, forever remains unchanged as the leadership of the elders in the community.

In the crest, the igluit (igloo) represents the traditional life of the people and the means of survival. It also symbolizes the assembled members of the Legislature meeting together for the good of Nunavut; with the Royal Crown symbolizing public government for all the people of Nunavut and the equivalent status of Nunavut with other territories and provinces in Canadian Confederation.

The tuktu (caribou) and qilalugaq tugaalik (narwhal) refer to land and sea animals which are part of the rich natural heritage of Nunavut and provide sustenance for people.

The compartment at the base is composed of land and sea and features three important species of Arctic wild flowers.

The motto, NUNAVUT SANGINIVUT, means Nunavut, our strength.

Legistative Assembly of Nunavut, The Coat of Arms of Nunavut. (n.d.).
Retrieved April 2, 2007, from www.assembly.nu.ca/english/about/coat.html

The coat of arms was designed in collaboration with Inuit elders, leaders, artists, groups, and the general population of the territory. Each symbol was chosen individually from the 800 submissions for the Nunavut flag and coat of arms the were received. Five draft designs were created in collaboration between the heraldic artist at the Canadian Heraldic Authority and Andrew Qappik, an Inuit artist from Pangnirtung, Nunavut.

Wikipedia, "Coat of Arms of Nunavut"
Retrieved April 2, 2007, from
http://en.wikipedia.org/wiki/Coat_of_arms_of_Nunavut

GERMAINE ARNAKTAUYOK'S *THE SUN AND THE MOON* (2003)
Etching and aquatint print, 24" x 29.5"

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

THE SUN AND MOON: AN INUIT LEGEND

This is an Inuit legend regarding the creation of the sun and moon.

There was a brother and sister who lived in a camp. The sister lived alone in her igloo. Each night an unknown visitor would come to her home and put out the flame of her kulliq (stone lamp), which provided her both heat and light in the igloo. She could not see who the intruder was and she suffered beating as his hand.

Because she had no fire, she would visit her neighbours with her stick to get fire from them so that she could relight her kulliq again. This was happening all the time, until she decided to find out who was doing this. So one evening when the mysterious visitor arrived to put out the fire, she took the black soot from the kulliq and marked his face with it.

Later when she was returning home after collecting more fire on her stick, she met her brother. She was so surprised and angry to see the black markings on his face that she chased him with her fire stick. Her brother in turn picked up a stick of fire from the nearest place, but in his hurry he tripped so that his flame became very small. His sister's flame was shining brightly. As she chased him they were both suddenly lifted up into the sky. She became the sun and her weak brother became the moon.

A version of the legend accompanying Ms Arnaktauypk's print at Canada House Gallery, 201 Bear Street, Banff, Alberta, July 2006.

Name _____ Date _____

What I Learned about the Sun

1.

_____

_____

_____

2.

_____

_____

_____

10. The Effect of Light on the Pupil of the Eye

Identifying and Applying a Pattern

What You Need

1. Science notebooks
2. Coloured pencil crayons
3. A calm and clear sunlit sky with little chance of frostbite (not too close to the start of the dark period
4. A parent of office staff volunteer
5. Small, pocket-sized mirrors for the children to use in the classroom (polished metal or glass in a protective case)
6. 2 mirrors (one for you and one for the volunteer)
7. “Light” word wall (add new terminology)

What You Do

- When the children arrive in the morning and are seated at their desks/tables, say: “I’ve been wondering all morning how many of you were able to talk with members of your family about Nunavut’s coat of arms and the Sun.
- Ask for a show of hands of those who did, and call upon several children to share some of the questions or comments from their family. (It’s likely science will occur later in the day.)

Note: It may be necessary to review the parts of the eye before you begin this activity/lesson.

- Begin science so that the children are dressed and in line 5-10 minutes before recess is scheduled to begin. While they put on their outerwear and boots, turn off the lights in the classroom.
- Ask for a review of the rules for studying on the school grounds and the consequences if the rules are not followed as the children line up at the classroom door.
- Mention that they are going to be exploring how light affects their eyes, especially their pupils, and remind/caution the children never to look directly at the Sun.
- Have the children waiting in line look at the size of the pupils in the eyes of the children standing directly in front and directly behind them.
- Stand by the door with your mirror. As the children pass one-by-one out the door, have them look at, and remember, the size of the pupil relative to the iris of their eyes.
- As each child follows the volunteer outside the school building and stands in a circle around the flag pole (in direct sunlight, not shadow), he/she is to decide if it’s a bright or dull day.

- Take the mirror with you and supply your volunteer with a mirror.
- Once outside, ask each child to look at the face of a neighbouring classmate and determine (1) are they facing or facing away from the Sun and (2) are they squinting or are their eyelids as open as they were when they looked in the mirror?
- Have those children who aren't squinting should turn to face the Sun. Do they squint?
- Have those children who are squinting should turn so their back is to the Sun. Do they stop squinting and open their eye lids?
- Ask the children if they have identified a pattern (of behaviour)? If "yes", what is the pattern that has been observed? Allow time for the children to think and respond orally.
- Then ask, "Did you think it was a bright or dull day when you walked out of the school?" How did you know? Which of your five senses give you the information you needed to determine bright from dull?" Allow time for children to think and respond.
- Assess their developing understanding of the eye's response to bright and dim light by asking: "If we saw a photograph of just your eyes, could we know by looking at your eyes in the photograph that it was a bright or a dull day? What would the eyes look like if it was a bright day when the photograph was taken? What would the eyes look like if it had been a dull day? Why do you think we squint? What actually happens when we do squint?
- Move into a shaded area with your mirror in hand (your volunteer too) and have the children standing in the Sun come one-by-one to look at the size of the pupil relative to the iris of their eye.
- Ask, "Is the pupil smaller or larger than it was when we were standing in the classroom with the lights off? What's happening to the size of your pupils as you stand in the shade looking into the mirror? Why do you suppose the size of the pupil changes? Do you think it has something to do with the light?"
- Your questions guide the children's thinking and lead them to the realization that squinting reduces the amount of light entering the eye so that we aren't "blinded" by the brightness when we walk from an area of low light (and a large pupil) into an area of bright light (where we need a small pupil). The change in pupil size is not instantaneous.
- As the children play in the sunshine during recess, ask them to think about the likely changes to the size of their pupil when recess ends and they enter the school. Will it increase in size, decrease, or remain the same? Why? Do they see as clearly when they first enter the school, or does this take a few seconds? Why might this be?
- When the children have removed their outdoor clothing and are sitting at their desk/tables, engage them in a discussion of the relationship between bright light, squinting, and pupil size and dull light, open eyelids, and pupil size.
- Have each child draw two pictures of an eye in their science notebook (new page with date to be written at the top). The first should show how the eye would look in bright light and this drawing may require a drawing of the eye and eyelid and a separate drawing of the eye if we could see the pupil and iris

(almost obscured when squinting). The second should show how the eye would look in dull or very low light levels.

- Distribute mirrors to the children who would like to look at their eyes while drawing.
- Remind the children to (1) give each drawing a label so that readers who don't have their knowledge of the effect of light on pupil size will know what they are looking at, and (2) to explain in two or more sentences why the pupil of the eye isn't always the same size.
- Collect the science notebooks as each child completes their entry.
- Scan to check each child's work, and help with any grammatical or spelling errors.

- Before the children leave for the day, ask that they spend a few minutes at home thinking about the following question: "What would have happened long ago if the hunters in families lost their ability to see and were blind?" Encourage the children to talk about the question and their answer with members of their family.

What You Look For

The following questions should assist you in formatively assessing each student's learning.

- Can the child identify and name the pupil and the iris of the eye?
- Can the child identify and name bright light and dim (not bright) light?
- Can the child explain, orally and in writing, what happens to the size of the pupil of the eye in dim light and in bring light?
- Did the child recognize the pattern of the relationship between the quality of the light and the size of the pupil?
- Can the child explain why eyelids begin to close and he/she squints when moving from the light of the classroom and school into the bright sunlight on the playground?
- Can the child infer the brightness/dullness of the light when looking at a photograph of a person's eyes?
- Did the child illustrate and correctly label the eye, iris, and pupil in bright light?
- Did the child illustrate and correctly label the eyes, iris, and pupil in dim light?
- Did the child correctly explain in writing why the pupil of the eye is not always the same size?

Name _____ Date _____

The Pupil of My Eye Isn't Always the Same Size

A Labeled Drawing of My Eyes in When There is Bright Light

A Labeled Drawing of My Eyes When the Light is Not Bright

Name _____ Date _____

Why the Pupil of My Eye Isn't Always the Same Size

1. I think my pupils get smaller because

_____

_____

_____

_____

_____

2. I think my pupils get bigger because

_____

_____

_____

_____

_____

11. Protecting Our Eyes from Bright Sunlight

Snow Goggles: Traditional and Modern

What You Need

1. A pair of Inuit snow goggles
2. A pair of modern sunglasses
3. A pair of modern snow goggles
4. The drawing from one child's notebook that illustrates well the squinting of eyes in bright sunlight
5. Template and directions for making snow goggles
6. Crayons or coloured pencil crayons
7. Images of Inuit snow goggles
8. Information on snow blindness and cures for snow blindness
9. "Light" word wall (add new terminology)
10. Volunteer for helping children make box board replicas of snow goggles (if the goggles are made as school)

What You Do

- Invite the children to sit on the floor, forming a semi-circle in front of you.
- Have the children pretend that the light in the classroom is very, very bright. Invite them to show you what their eyes would look like. When they have, suggest that the light is no longer bright. Would they still need to squint? If not, have the children show you what their eyes would look like.
- Ask the children: "Do you remember why we tend to squint our eyes with the light is very bright?" " Is it because our eyes are tired?" Is it because we're tired?" Call upon one student to answer the first question. Find out if all other children are in agreement.
- Inquire to determine if any of the children remember a time when it was so bright that they almost closed their eyes completely?
- Encourage responses that include a description of where the child was when this happened to him/her.
- Share an experience of your own, particularly if the experience was one in bright sunlight in the spring when snow covered the ground, or snow covered the ice, in every direction.
- **Link to Inuit Knowledge** - Show a pair of Inuit snow goggles (or copies of the photographs of snow goggles in the "Materials and Resources" section).
- Ask the children to raise their hand if they can describe, not name or make comments about, what they looking at.
- Call on a child to provide a description.
- If there is more that can be described, continue to call on children with raised hands.

- If you find that no one compares the opening in the snow goggles to the narrow opening in a squinting eye, use one of the children's drawings that illustrates this well and encourage a discussion of the similarities and differences.
- Knowing what the children have learned about the effect of bright light on the eye, invite them to suggest or explain why they think the snow goggles were designed and made to look as they do.
- Read or paraphrase excerpts from the writing of Ian Dyck, from the writing of John Bennett and Susan Rowley, from the writing of J.C.H. King, and from the interview of George Agiaq Kappianaq (included in the "Materials and Resources" section).
- Show the children how to hold their fingers together and place their hands so that their finger tips touch and make the shape of an upside-down V. Keeping their hands in this position, they should cover their eyes as if their fingers are a pair of snow goggles. A small space between the ring finger and middle finger of each hand will simulate the narrow slit. Tell them to look at a ceiling light or out the window. Can they see clearly what they are looking at? Do they have to squint?
- The snow goggles helped to protect the eyes of the Inuit long ago by allowing sunlight to only pass through the narrow slit. Ask the children what we now use instead of snow goggles to protect our eyes.
- Place a pair of modern snow goggles and a pair of modern sunglasses on either side of the Inuit snow goggles. Invite the children to share the differences and similarities that they observe.
- Help the children to notice that many of the differences are the result of materials.
- The Inuit who lived long ago could make snow goggles out of bone and ivory and antlers or wood, the materials available to them. They did not have the manufactured glass, plastic, vinyl, and metal materials that are common today. Using materials from plants and animals they were able to fabricate eyewear that protected their eyes and enhanced their ability to survive.
- Determine the number of the children who remember the question posed at the end of day yesterday by asking the children to raise their hands if they thought about an answer and talked about their answer with someone in their family.
- Encourage these children to share.

Note: What you want to help all of the children to understand is that a blind hunter of seals, bearded seals, and caribou in the past would have been unable to feed and care for himself and his family. Loosing his vision temporarily from snow blindness, or permanently, from sunlight burning the part of the eye that covers the pupil, would have put many people at risk of starvation. They absolutely had to protect their eyes.

- Tell the children that many non-Inuit explorers, like William Parry, and whaler fishermen from Europe who worked in the Arctic almost 200 years ago were saved from snow blindness as a result of the technology of the Inuit.

- Show student the pair of snow goggles commissioned by Parry (in “Materials and Resources” section).
- Ask the children to return to their seats, to open their science notebooks to the next clean page and to draw a picture of an Inuit hunter wearing snow goggles. They are also to draw what the pupil of the hunter’s eye your look like, if we could see it, when he wears the snow goggles.
- If time permits, show the boxboard template for making replicas of snow goggle and have the children decorate the snow goggles using the kind of decorative marks their ancestors would have used.
- If time is limited, invite the children to take a template home.
- Caution the children not to cut the slits, but to have an adult do this.
- Caution children who make the snow goggles to never look directly at the Sun when wearing them.

- At the end of the school day, encourage the children to talk with their parents, guardians, or grandparents about snow blindness (if they had experienced snow blindness and could describe what it was like for them) and snow goggles (if they ever made, or were given, a pair of snow goggles that they wore, and whether they will let you try them on if they still possess a pair).

What You Look For

The following questions should assist you in formatively assessing each student’s learning.

- Does the child understand the relationship between squinting (almost closing the eyelids in bright sunlight and the slit in the traditional Inuit snow goggles?
- Can the child explain why the narrow slit in the snow goggles helped his/her Inuit ancestors to see on bright sunlit days?
- Did the child understand how the traditional Inuit snow goggles would help to prevent snow blindness?
- Did the child identify and name similarities and/or difference between the traditional Inuit snow goggles and the modern snow goggles and sunglasses?
- Is the child developing an understanding of the materials that would have been available for his/her ancestors to use in making snow goggles and why the traditional snow goggles look so unlike the modern snow goggles and sun glasses?

Reminder: Provide time during the school day for the children to practice their string figures.

INUIT SNOW GOGGLES FROM THE EASTERN ARCTIC

Canadian Museum of Civilization catalogue number IX-C-2846
Canadian Museum of Civilization slide number S89-1832

INUIT SNOW GOGGLES FROM THE CENTRAL ARCTIC (EXTERIOR VIEW)

Canadian Museum of Civilization catalogue number IV-D-505
Canadian Museum of Civilization slide number S91-8364

INUIT SNOW GOGGLES FROM THE CENTRAL ARCTIC (INTERIOR VIEW)

Canadian Museum of Civilization catalogue number IV-D-505
Canadian Museum of Civilization slide number S91-8365

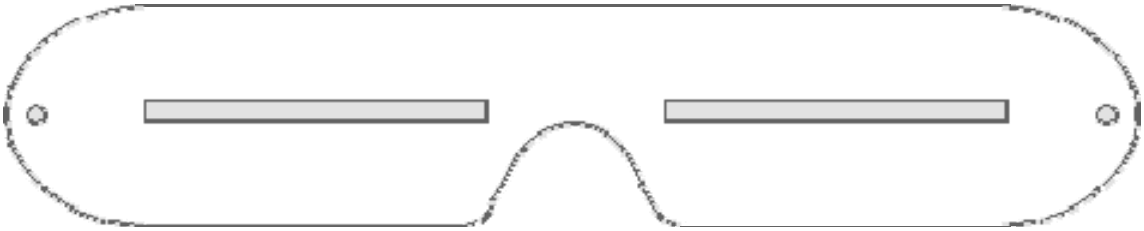
SNOW GOGGLES MADE BY IGLULNGMUIT FOR EXPLORER WILLIAM PARRY, EARLY 1980S (LOWER PAIR ONLY)

Gift of John Barrow
British Museum, London England
Ethno 1855,11-26.458 Room 26, North America, case 10, panel 7
Ethno 1824,4-10.12 Room 26, North America, Case 10, panel7

COUPLE WITH SNOW GOGGLES

Helen Kalvak
Holman Island 1982, Stencil Print
Helen Kalvak (n.d.). Houston North Gallery.
Retrieved April 10, 2007,
from http://www.houston-north-gallery.ns.ca/Kalvak.html

TEMPLATE AND INSTRUCTIONS FOR MAKING INUIT SNOW GOGGLES



Materials:

- Lightweight cardboard (an old file folder or cereal box)
- Scissors
- Craft knife
- Ruler
- Pencil crayons or crayons (optional, for decorating)
- Hole punch
- String or yarn to tie around head

Directions:

- Trace the goggle pattern on to the file folder or cereal box
- Cut out the eye slits using a craft knife and ruler *** ADULT MUST DO THE CUTTING***
- Cut around the outside of the snow goggles with a pair of scissors
- Decorate with pencil crayons or crayons (if desired)
- Punch two holes at the sides of the goggles where shown
- Poke one end of a string, yarn or braided sinew through the first hole and tie leaving a long free end
- Repeat with the other side.
- Wear your snow goggles by tying together the free ends of two pieces of string, yarn, or braided sinew.

Adapted from Iggaak (Snow Goggles).
Northwest Territories & Nunavut Girl Guides.
Retrieved April 10, 2007,
from http://www.ntguides.com/crafts/iggaak.htm

SNOW BLINDNESS

IAN DYCK, CANADIAN MUSEUM OF CIVILIZATION

Another problem associated with winter travel was, and still is, a condition known as snow blindness. This occurs when the combination of direct sunlight and glare from snow is too intense for the human eye. It is a condition, which may be very painful, may last for days, and which hinders travel.

The most ancient and widespread method for avoiding snow blindness was the use of snow goggles, a device known in northern Europe, northern Asia and northern North America. Snow goggles were made in many different styles. In general, they consisted of an opaque eye-covering made of a material such as wood, leather, bone or ivory. Narrow slits or small holes were cut into them to allow a limited range of vision. A string or thong was attached to each end and could be tied around the head to keep the goggles in place. Snow goggles reduced harmful light and actually improved visibility.

Ian Dyck. (n.d.). Snow Travel in Ancient Canada.
Canadian Museum of Civilization – Oracle.
Retrieved April 9, 2007, from
http://www.civilization.ca/educat/oracle/modules/iandyck/page01_e.html

J.C.H. KING

Snow goggles were probably first made at the time of the Old Bering Sea Culture in Siberia, up to two thousand years ago, and perhaps a thousand years before medieval Europeans began to use spectacles. Historic Arctic peoples across the North American Arctic from Alaska to Greenland used goggles when hunting and travelling. They helped them to avoid snow-blindness in bright spring conditions. They also protect the eyes from the cold. The main disadvantage of snow goggles is that the wearer cannot see the ground properly, a serious drawback when travelling on rough or rotten sea ice.

Early European explorers recognized their usefulness and commissioned goggles for their crew. William Parry, who collected the lower pair on his second voyage in search for the Northwest Passage in 1822, recorded that, while wintering in the Arctic during the 1820s, he employed Iglulingmiut to make some snow goggles:

'... as the time was fast approaching when some such precaution would become necessary to guard the eyes from the excessive glare of reflected light.'

Snow Goggles of Caribou Antler. (n.d.).
Excerpt from J.C.H. King (1999). First Peoples, First Contacts: Native People of North America, p. 90. London: The British Museum Press.
The British Museum - Compass Collections Online. Retrieved 09 April 2007, from http://www.thebritishmuseum.ac.uk/compass/obj4899.html

JOHN BENNETT AND SUSAN ROWLEY

The arctic sun is very hard on the eyes. While traveling in bright sun on the snow or on the sea, people commonly suffered from snow blindness. Snow goggles (iggaak) made from wood, antler, or ivory protected the eyes. The only light that could enter was by means of a narrow, thin slit. In addition, the interior of the goggles was usually blackened with soot from the qulliq. Nevertheless, the Inuit did suffer from snow blindness (p. 217-218).

EXCERPT FROM LORSON 1968: 14-16, AS CITED IN BENNETT AND ROWLEY, 2004, P. 218.

A few drops of oil were administered in cases of snow blindness caused in the spring by the reflection of the sun on the snow. When first poured on the eye, the oil produced a very acute burning sensation, but afterwards brought relief to the patient. One would also smear one's face with seal oil. A taboo concerning food was imposed in such a cure: one could not eat the contents of a [caribou] stomach…

Sometimes a whitish substance formed on the globe on the eye. One would permit a louse, tied by a hair, to turn in the substance. With a little patience, one was soon rid of the discomfort.

EXCERPT FROM AN INTERVIEW WITH GEORGE AGIAQ KAPPIANAQ, IE454

Q. *Before they started to use sunglasses, surely they must have had snow blindness?*
A. *Very much so, snow blindness has always been around, from the time of my childhood I always experienced snow blindness once in a while. In those days they use to make snow goggles made from wood. My father use to have wooden snow goggles, with slit for opening.*

Q. *Are they effective?*
A. *They are very effective as it cuts the light, the shade over the eyes are hollowed, these slits are the only one that are bright the rest is dark. The*

openings which are slits are only light, they really do cut the light from the snow. Inside the hollow would be darkened with soot. These are where the eyes are which are hollowed; these then are blackened with soot.

Q. *Would they have to remove their goggles when they are going to shoot?*
A. *No, they do not, because you have a good viewpoint through the slits.*

Name _____ Date _____

Snow Goggles Protect the Eyes from Bright Light

My Drawing of a Hunter Wearing Snow Goggles

If We Could See the Hunter's Pupils, This is What They Would Look Like

12. Exploring Sun Shadows
and
Protecting Our Skin from Sunlight

What You Need

1. A calm clear sunlit sky with little chance of frostbite (not too close to the start of the dark period
2. Hypoallergenic sunscreen
3. Science notebooks
4. Crayon pencils
5. “Light” word wall (add new terminology)

What You Do

- If you sent the children home with the sun goggles template, start the day by asking the children if they had an opportunity to make a pair of snow goggles. Perhaps some of the children who did, have brought theirs to school.
- Invite the children who came to school with their box board snow goggles to share what they have made, but only the child they belong to should wear the goggles (safety issue).
- When everyone who made goggles has presented, ask the children to share the new information about snow blindness that they were told by members of their family.
- Finally, inquire about those who actually saw, and perhaps tried on, the goggles of family members. Ask if and how they were similar or different than the snow goggles shown in class.
- Thank the children for bringing the expertise of their families into our discussions.

- Begin the science activity/lesson so that the children are dressed and in line 5-10 minutes before recess is scheduled.
- A few minutes before this, quickly review the consequences of bright light and the danger this poses for eyes if unprotected by asking the children, “If the Sun’s light can cause snow blindness and if the snow blindness is so severe (bad) that total blindness results, what might sunlight do to our skin, especially the skin that isn’t covered by our clothing?”
- If children aren’t sure, ask if any of them have seen their skin changing colour, or tanning, when they’ve spent time out of doors. Allow time for the children to respond.
- Explain to the children that this is the body trying to protect the skin from the Sun’s light. Tell them that they can help their body do a better job of protecting their skin by using a sunscreen. Sunscreen is a lotion that blocks a part of the Sun’s light that can do damage to skin. Sunscreen should be put on skin that is uncovered and exposed to the Sun. So in a way it’s like the

snow goggles. Snow goggles are worn to protect the eyes. Sunscreen lotion is put on the face and the neck, and the ears and other parts of the body to protect the skin.

- Decide if you want to place a dap of sunscreen lotion in children's hand and have them put it on their nose and cheeks and chin before dressing to go outside.
- While the children are putting on their outerwear and boots, review the rules for studying on the school grounds and the consequences if the rules are not followed. Mention that they are going to be investigating shadows and remind all of the children not to look directly at the Sun. Now, they should be able to tell you why.
- Walk the children to a part of the school grounds that is in sunlight and ask them to look at their shadows and tell you what they see.
- To guide their observations, ask questions like the following: If you stand still and look at your shadow, do you think your shadow looks like you? Is it a shadow of your whole body? Where does it make contact with your body? What will happen if you lift one leg off the ground or jump into the air? Will your shadow still be in contact with your body? If you want to be able to see your shadow, where is the Sun? Is it in front of you? Is it behind you? Can you see your shadow if it is beside you? What colour is your shadow? Is it the same colour on the edges as it is in the middle?
- Now that the children are thinking scientifically about shadows, organize shadow games and shadow activities like those listed below:

    1. What do you have to so to make a thin shadow? (Where is the Sun? In front of you? Behind you? To your right? To your left?)
    2. What do you have to do to make a wide shadow? (Where is the Sun?)
    3. Shake hands with a friend? What do your shadows look like when you do this? Can your shadows shake hands without your real hands touching?
    4. Can you enclose an object (a mitten perhaps) in a shadow cast by your arms?
    5. Is it possible to hide your shadow? How many ways can you find to do this?
    6. Can you hide your shadow if you stay in the sunlight?
    7. What is the biggest shadow you can see?
    8. What is the smallest shadow you can see?
    9. If the snow is not packed down, make a snow angel. Stand up carefully and place the tips of your boots at the heels of your snow angel. Is your shadow taller than the length of your snow angel? Where is the Sun in the sky?
    10. Can you and your classmates make a shadow with six arms? Eight arms? Nine arms?
    11. Can you make a totem pole shadow?

12. If time permits, play a game of shadow tag where children stand on each other's shadows and "home" is a place out of the Sun (in the "shade").

- After recess, when children are seated in the classroom, have them open their science notebooks to a new page, write the date at the top of the page and draw a picture of themselves and their shadow on the playground during one of the shadow activities.
- They are to draw the light source (Sun), themselves, and their shadow, and they are to write two or three sentences that explain why we see shadows.
- Before anyone begins to write or draw, invite the children to describe what the shadow activities were. Then ask, "What are you supposed to do in your science journal?" When the journal entry is understood by all of the children, they may begin.
- As the children are working, add new words, like shadow, shade, sunscreen, and skin to the word wall
- End the lesson by asking the children two questions: (1) "How is the ice on which a seal hunter stands different from the ground we stood upon today while we were making shadows?" (2) "If you were a seal, do you think you could see the shadow of a hunter with a harpoon or gun who is standing on the ice near an air hole above your head?
- Encourage the children to talk with members of their family about these questions and to come to school in the morning with their ideas.

What You Look For

The following questions should assist you in formatively assessing each student's learning.

- Is the child beginning to understand that a source of light and an object (like his/her body) are needed for a shadow to occur.
- Does the child understand the relationship between the location of the Sun in the sky and the location of the shadow made by his/her body?
- If the child knows where the Sun is located in the sky, can he/she position his/her body so that his/her shadow is in front, behind, to the right, or to the left?
- Is the child developing an understanding of the relationship between shadow and a shady location on the school grounds.
- Does the child know how to stand in relation to the Sun in order to avoid being tagged?
- Does the child's drawing accurately represent the location of the shadow given the positions of the Sun and object (his/her body)?
- Does the child offer an explanation for why we see shadows?

Note: Consider having the children note the location (left, right, front, back, underfoot) and size (length) of their shadow while they are collecting the observational and measurement data for the location of the Sun in the sky during morning, noon, and afternoon recesses.

Name _____ Date _____

Me and My Shadow

13. Exploring Shadows Cast on Different Surfaces

Justifying with Evidence, Interpreting Data, and Prediction Testing,

What You Need

1. Bright, sunny day
2. Lined chart paper with three columns labeled “Yes”, “No”, and “Sometimes” and space at the top of the page for a title
3. Marker for writing
4. Bubble wrap (long enough to bridge a gap, to be made between two desks or the backs of two chairs, that children can fit beneath)
5. Corrugated plastic, translucent, not coloured and long enough to bridge a gap that children can fit beneath
6. Duct or masking tape
7. A doll dressed as a seal hunter
8. Seal cut-outs (templates in the “Materials and Resources” section) attached to wire (or thin pencils if it is difficult to acquire wire that is of a heavier gauge)
9. Pairs of kamik/boot sole cut-outs made of Bristol board and attached to leg like tongue depressors or Popsicle sticks
10. Water that has frozen in a thin layer in a pan
11. Chunk of sea ice, approximately 30 cm in thickness
12. One electric desk lamp or electric goose neck lamp or bright battery operated flashlight
13. Excerpts from interviews with Jose Angutingurniq and George Kappianaq
14. Science notebooks and pencil crayons
14. “Light” word wall (add new terminology)

What You Do

- Invite the children to join you on the carpet where you have set up the chart paper with the 3 labeled columns.
- Show Germaine Arnaktauyok’s print, *Cycle of Life*, and provide time for child to talk about what they see (a hunter with a harpoon standing near an air hole in the ice that a seal swims below).
- If no one recognizes the name, remind the children that Ms Arnaktauyok is the artist from Igloolik who also did the drawing, *When There Was No Light*, and the print, *The Sun and The Moon* that we have studied in previous classes.
- Ask the children if they had an opportunity to think about the questions asked at the end of yesterday’s science lesson and to talk about the questions with members of their family.

1. “If you were a seal, do you think you could see the shadow of a hunter with a harpoon or gun who is standing on the ice near an air hole above your head?
2. “How is the ice on which a seal hunter stands different from the ground we stood upon yesterday while we were making shadows?”

- Invite the children to share their response to Question 1.
- Call upon those who raise their hands.
- Each child that responds to the question must also decide where to enter their “data” on the chart (“Yes”, “No”, or “Sometimes”) and justify the chosen column.
- Before the child enters his or her data, ask the children in the class if they agree with the child’s decision for where to enter his/her answer on the chart?
- The children must also decide how the response will be entered on the chart. Tally marks and the name of the child, are two possibilities. The method that is decided will be the method all of the children will use.
- Continue in this manner until all of the children who want to answer Question 1 have done so.
- Thank the children for their answers.
- Have all of the children to count with you as the total number of tally marks or names is determined for each column.
- Write the sum at the bottom of each column.
- Using guided questions, engage the children in a discussion of the results. For example:
    1. What question were we trying to answer?
    2. Using the information in the table, how many children believe the seal can see the hunter’s shadow through the ice?
    3. Using the information in the table, how many children believe the seal cannot see the hunter’s shadow through the ice?
    4. Using the information in the table, how many children believe the seal can sometimes see the hunter’s shadow through the ice, but sometimes cannot see the hunter’s shadow?
    5. Using the information in the table, which column has the most (largest number) of tally marks or names? What does this tell us?
       Do most of us think the seal can see the hunter’s shadow?
       Do most of us think the seal cannot see the hunter’s shadow?
       Do most of us think the seal sometimes can but sometimes can’t see the hunter’s shadow?
- At this point in the lesson, engage the children in a discussion of why seals might sometimes see the shadow of the hunter and yet not see the hunter’s shadow at other times. When can the shadow be seen? When can the hunter’s shadow not be seen?
- NOTE: You may need to guide the discussion and help the children to think about the difference between the surface their shadows fell upon when they were on the playground the day before and the ice the hunter stands upon while seal hunting.

Link to Inuit Knowledge

- Continue with a the following comment and story:

  Before we test these ideas about seals and whether they can see the shadows of men hunting on the ice, I would like to tell you about a seal hunter. His name is George Kappianaq. For more than thirty years Mr. Kappianaq hunted for seals on the ice. He also knows about men who hunted for seals before there were guns and snowmobiles. These hunters used harpoons and moved across the land and ice with kamotiqs pulled by dogs. As a young man, Mr. Kappianaq was told that the seals would usually stay away from breathing holes (or nalataq, the conical shaped breathing hole) that had a hunter positioned near them, because the seals swimming below the ice the hunter was standing on could see the shadow of the hunter. The hunter's shadow actually passed right through the ice. Because of this, the seals hardly ever went up a breathing hole being watched by a hunter.

- Have the children look at the chart, "Can Seals See a Hunter's Shadow?", and ask, "In which column do you think Mr. Kappianaq would place his tally mark (or name)?" Continue with, "What information made you decide to put his name (tally mark) in the (<u>name of the column</u>) column?
- When consensus is reached, draw the children's attention back to Mr. Kappianaq. They should listen carefully to what Mr. Kappianaq also said:

  When the ice is too thin, shadows tend to pass right through the ice. In addition, your feet will show through the ice from below. This is what we used to be told when the ice was too thin for seal hunting. They would tell us that the seals can see the feet of the hunter and the hunter's shadow from below. So the seals would not come up the breathing hole. The hunters would wait until the ice got thicker before they would go out on the ice again. When the ice was thick, they would have good luck hunting seals when they stood near a nalataq.

- Encourage the children to again look at the chart, "Can Seals See a Hunter's Shadow?" and ask, "In which column do you now know Mr. Kappianaq would place his tally mark (or name)?"
- Ask the children what the ice was like when the seals could see Mr. Kappianaq's kamiks/boots and Mr. Kappianaq's shadow through the ice?
- Ask: "What was the ice like when it was impossible for the seals to see Mr. Kappianaq's kamiks/boots and shadow through the ice?"
- Show children the thick piece of sea ice (from the sea) and the thin piece of ice (made from water that was frozen in a pan).
- Ask if one is easier to see through than the other? Have the children look through each piece of ice before answering.
- Ask: "If we stood on a large piece of each kind of ice, which one could the bottom of our shoes/boots/ kamiks be seen through?" "Do you think the

bottoms of our shoes, boots, kamiks would show through the thin piece of ice?" "The thick piece of ice?"

- Demonstrate this for them by holding each one of the pieces of ice (one at a time) against the sole of a shoe worn by a child who is sitting on a chair with their right or left leg raised so that it is parallel to the floor.
- Encourage the children to discuss what they see.
- Show the children the seal cut-outs, the doll dressed as a hunter, the bubble wrap, and corrugated plastic and ask how they think these materials could be used to show what happens when shadows that fall upon thin ice and when shadows that fall upon thick ice and whether these shadows can be seen by seals in the water beneath the ice. Allow time for thinking and discussion.
- Invite the children to help you to position the bubble wrap between several chairs and tape it in place.
- Provide each child with a seal cut-out attached to a Popsicle stick.
- Before you switch off the classroom lights and turn on the lamp or flashlight, ask the children if the bubble wrap looks more like (has the properties of) the thin ice or the thick ice.
- When the children have answered, ask if they will be able to see the hunter's kamiks and the hunter's shadow? [This is a prediction test.]
- Request a show of hands for those who believe the answer is "yes".
- Request a show of hands for those who believe the answer is "no".
- Write these numbers on the board.
- If the are seals, where to they think they should be – above the ice (bubble wrap) or under the ice (bubble wrap)?
- When all the children are sitting/lying on the floor under the bubble wrap, switch off the classroom lights and switch on the lamp/flashlight.
- Ask: "What do you see?"
- Now, hold the doll dressed as a hunter on the bubble wrap.
- Ask: "What do you see?"
- Aim the lamp so that the doll casts a shadow on the bubble wrap. Ask the children what they see? Do they see the soles of the hunter's kamiks? Do they see the hunter's shadow? Finally, If we think the bubble wrap is most like the thin layers of ice, was Mr. Kappianaq correct?
- Replace the bubble wrap with the 1-8 layers of translucent corrugated plastic and repeat the previous three steps.
- Focus your questions on the children's observations and the similarities and differences between the corrugated plastic (thick ice) and the bubble wrap (thin ice).
- Ask the children what a hunter could place on the ice to stand on that would make it impossible for a seal to see the soles of his kamiks and his shadow?
- What do they think hunters long ago would have used?
- Before dismissing the children, each child is to whisper in your ear the material they believe could have been used to block the hunter's shadow. As you listen, write down the item mentioned by each child along with the child's name.

- When seated at their table or desk, have the children open their science notebook to a new page and (1) draw a seal hunter hunting for seals on thin ice, (2) draw a seal hunter hunting for seals on thick ice, and (3) show (by drawing) or describe (by writing) what the seal in the water will be able to see when it looks up through the water at the ice.

At a convenient time during the remainder of the school day, retell Jose Angutingurniq's very interesting story about seal hunting on the ice and building an igluagaq that is made to be dark yet is lit by the Sun's light in the water, not a qulliq. Use Ms Arnaktauyok's print of the seal hunter and seal which shows the light passing trough the air hole and entering the water below the ice. Encourage the children to discuss how Ms. Arnaktauyok would have to represent what Mr. Angutingurniq talks about.

Encourage the children to tell the story of seal hunting on thick and thin ice through dramatic play.

What You Look For

The following questions should assist you in formatively assessing each student's learning.

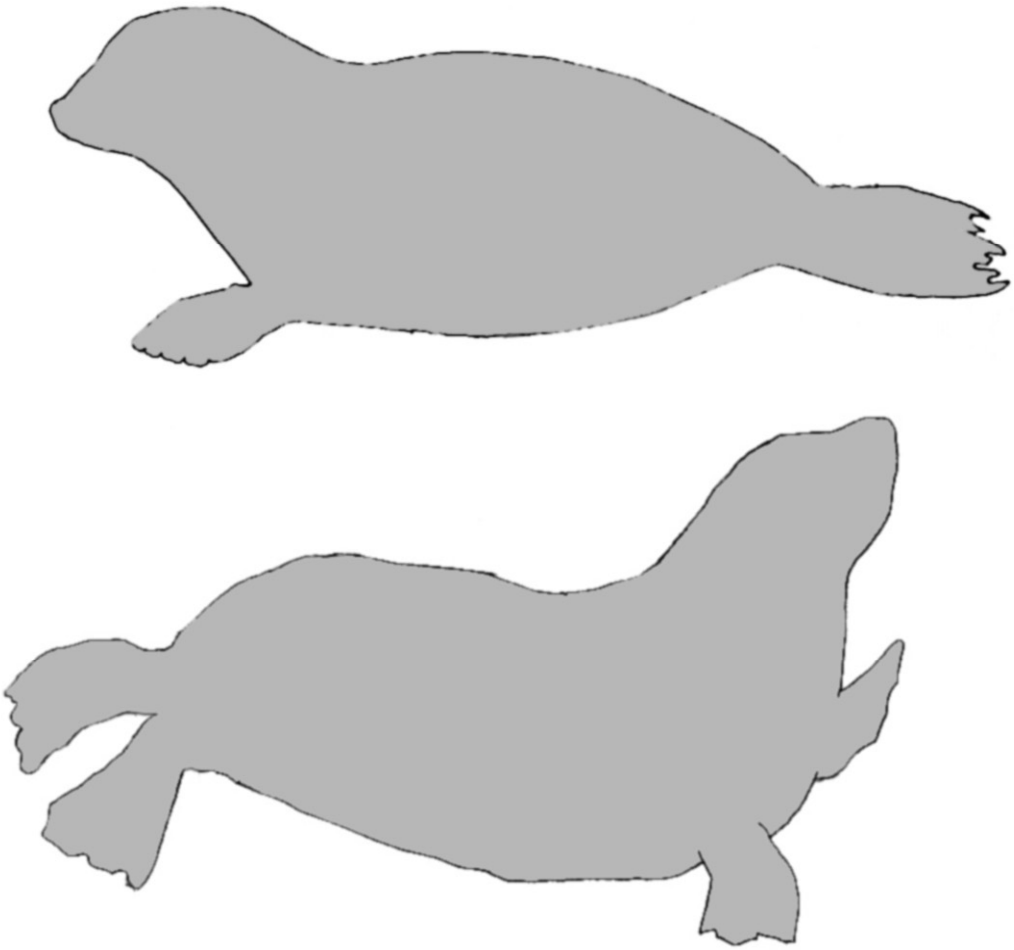
- Does the child know in which column to place their name or tally mark on the "Can Seals See the Hunters Shadow" chart?
- Does the child offer a good explanation for believing the seal can (or cannot or sometimes can) see the hunter's shadow through the ice?
- Does the child help his classmates to evaluate the evidence they use in justifying the column they've selected on the "Can Seals See the Hunter's Shadow" chart?
- Does the child participate meaningfully in the interpretation of the data recorded on the "Can Seals See the Hunter's Shadow" chart?
- Does the child listen to the story of George Kappianaq and correctly interpret what he is saying about the thinness and thickness of the ice and the seal's ability to see the hunter's shadow that the bottom of the hunter's feet/kamiks?
- Does the child observe to determine what he/she can see of the child's boot through the thin piece of ice and through the thick sea ice?
- Does the child use their observations (and developing understanding of the relationship between the thickness of ice and it's transparency-opacity) to predict what the seal could see through the simulated thin and thick ice surfaces?
- Does the child suggest a material that is opaque for the seal hunter to stand upon?
- Does the child accurately represent, pictorially and in writing, the results of the real and simulated ice activities in his/her explanation of what the seal would see if looking up through thin ice and thick ice?

MATERIALS AND RESOURCES FOR ACTIVITY/LESSON 13

IMAGE OF HUNTER AT THE BREATHING HOLE (NULATAQ)

Cycle of Life, Germaine Arnaktauyok (etching and aquatint)

SILHOUETTE OF SEALS (REQUIRED FOR ACTIVITY/LESSON 13)



EXCERPT OF INTERVIEW WITH GEORGE KAPPIANAQ, IE327

Shadows on Ice While Hunting

When the ice is too thin shadows tend to pass through the ice. In addition, your feet will show through the ice from below. This is what we use to be told when the ice was too thin. They would tell us, when there were not too many seals, that the seals usually try and stay away from the breathing holes that have a hunter positioned near them. The seals can see shadows from below when the ice is too thin.

When you were positioned in a NULATAQ (conical shaped breathing hole) when the ice was too thin, the feet could be seen right through the ice, so the seals seldom went up to the manned breathing hole. We used to be told that we should wait until the ice was a bit thicker. It was said that the seals seldom came up for air when the ice was too thin because they could see the feet of the hunter through the ice. So the hunters would wait until the ice got thicker before they go the field again. That is what I have heard.

EXCERPT OF INTERVIEW WITH JOSE ANGUTINGURNIQ

Seal Hunting on Transparent/Translucent Ice

A hunter makes a hole in the ice. He then puts down earth to try to darken that area around it … he builds a snow house over it, and then puts a lot of earth around it. Every attempt is made to darken it, to shade it from the sun. They also used sealskins to cut out the light. The house and the sod surrounding it are called igluagaq.

As there is no qulliq [lamp], the darkness is nearly complete in those places; but once you close the doorway the interior is lit from the water instead – from the sun's glare filtering back up through the ocean. The water is not that deep, and it's very bright. Thought it is dark inside the snow house, you can see right down through the bright ice. You can see the water.

The actual hole is called angmiutaq. It's quite wide, but its mostly covered over with ice. There is just enough room for the harpoon to go through.

Once the hunter harpoons the seal he takes it outside and kills it there [so that the smell of the blood does not stay in the hole, warning other seals]. Then he covers the hole up with ice again.

Jose Angutingurniq, JB, as cited in Bennett and Lowrey, 2004, pp. 369-370.

Name _____ Date _____

A Seal Hunter on Thin Ice

I think the seal under the ice would see

_____

_____

_____

Name _____ Date _____

A Seal Hunter on Thick Ice

I think the seal under the ice would see

_____

_____

_____

14. Exploring Hand Shadows

Observing and Identifying Relationships

What You Need

1. Books about hand shadows

   Albert Almoznino. (2002). *The Art of Hand Shadows*. Dover Publications.
   Henry Bursill. (1997). *Hand Shadows and More Hand Shadows*. Dover Publications.
   Frank Jacobs. (1996). *Fun with Hand Shadows*: Dover Game and Puzzle Activity Books. Dover Publications.
   Sati Achath. (1996). *Fun with Hand Shadows*. McGraw-hill Companies.
   Phila Webb. (1990). *The Little Book of Hand Shadows* (Miniature Edition). Running Press Book Publishers.

2. Copies of "Shadow Creatures" (one fore every two children) from Bosak, S.V. (1991). *Science Is…* Markham, ON: Scholastic Canada Ltd. (in "Materials and Resources" section)
3. Bright light sources (Sunlight shining through a classroom window, overhead projector, 6V battery powered lamp) – the number depends on the number of children that you know can work well in a small group with a volunteer
4. White walls or screens – the number depends on the number of children that you know can work well in a small group with a volunteer
5. Science notebooks
6. Pencils
7. Marker /chalk for writing on the board
8. Volunteers (if possible, parents, guardians, grandparents and/ or community members who are know to make hand shadows) – one volunteer for each small group of children
9. "Light" word wall (add new terminology)

What You Do

Note: Two days may be required to complete this activity/lesson as written.

- Before science is scheduled to begin, set up several light sources so that they are focused on a white wall/screen/board in several places in the classroom (preferably a location in the classroom where it is possible to limit the ambient light from windows or light sources other than the ones you are using for the hand shadow creatures). If it's a sunny day, use the sunlight coming through a window as one of these locations (with a white board on the floor).
- With the classroom lights switched off, test to determine that it will be possible for the children to clearly see the shadow creatures they will be making.

- When the time for science arrives, have the children sit on the floor facing the white wall/screen/board. Make sure no child sits where their view of the white wall is obscured by the light source.
- Begin by asking, with a show of hands, if the children have ever seen or created or tried to create shadows of animals with their hands.
- Inquire to determine the shadow animals (or other "things") they saw or made and what was needed to create these hand shadows.
- Allow sufficient time for the children to orally share their experience with hand shadows.
- If time of day wasn't mentioned by the children, ask: "Is it possible to create hand shadows at any time during a 24 hour day – in the morning, at noon, in the afternoon, in the evening, and at night?"
- Determine if the same things are needed to create hand shadows, whatever the time of day. (If necessary, remind the children of yesterday's activity with the seal under the ice and the hunter above the ice.)
- Make a list of these items on the board. These items should be a bright light source, an object (most often opaque), a wall or surface, and low ambient light when inside.
- Ask the children: "Do we have the items that we need to create hand shadows in the classroom? Call upon children to name and identify these items in the classroom and in the area where they are sitting.
- Invite two or more of the children who earlier mentioned creating specific animal hand shadows to show the children a few of these shadow animals and how their hands have to be folded and held in the light of the overhead projector to create the animal shadow on the wall.
- Ask the children why they think a shadow is created when someone's hand is placed in front of the source of light. Provide time for the children to think and respond.
- On the basis of what they say, you may need to guide their thinking with questions such as the following:

    Why do you think the shadow is the shape of the of the creature the hand and fingers have made?
    What do you think happens to the beam of light when a hand is placed in the beam?
    How does the wall look when the light beam shines on it?
    Why is there no shadow on the wall?
    How does the wall look when the hand is placed in the light beam?"
    What do you think the hand doing?
    With the hand still held in the beam of light, switch off the light source, and ask the children, "Why do you think that is no shadow on the wall?"
- You want children to come to realize, without telling them, that the hand blocks the beam of light and that the shadow is the shape of the hand because it is an area on the wall that the light beam does not illuminate. Moreover, the wall around the shadow hand is illuminated because it was not blocked by the child's hand while in the light beam.

- Turn off the overhead projector and thank the children for their good ideas and explanations.
- Place the children into groups. (The number of groups being determined by the number of hand shadow locations you have been able to set up and the number of volunteers present.)
- Show the children Boask's page of shadow creatures and suggest that they begin by making shadows with their hand(s) and other objects, and then attempt to create several of the shadow animals on the "Shadow Creatures" handout.
- Distribute copies of Bosak's "Shadow Creatures", one for every two children in a group, before introducing the children in a group and their volunteer, and sending the children and their volunteer to one of the hand shadow locations in the classroom.
- Each volunteer is to have the children in their group set up the light source and the screen or wall.
- The volunteer is to ask the children to show where they will be placing their hand or hands to make the shadow creatures.
- The children are to take turns making shadow creatures. Those watching can guess the name of the shadow creatures created by the members of their group, and practice arranging their fingers and hands to create a shadow creature.
- As the children find the position that creates the best shadow creature, have them observe what happens to the shadow creature when
    (1) they move their hand(s) closer to the light source (by doing this, you increase the distance between your hand and the wall)
    (2) they move their hand(s) closer to the wall (by doing this, you increase the distance between the light source and your hand).
- As you and the volunteer with each group watch the children, ask questions like the following:
    (1) Using the same hand(s) position, what is the largest shadow creature you can create? Where is/are your hands? Are they close to the wall or closer to the light source?
    (2) Were will your hand(s) have to be to create the smallest shadow creature possible? Are you closer to the wall or closer to the light source?
- Have the children test to determine how make their shadow creatures thin (without changing the arrangement of their hand(s) and fingers).
- Have the children test to determine how to make their shadow creatures wide (without changing the arrangement of their hand(s) and fingers).
- The children should now be able to predict where their hand(s) will have to be in order to create the biggest (and smallest) thin shadow creature and biggest (and smallest) wide shadow creature.
- Provide adequate time for each child to test his/her predictions.
- Challenge children to find a way to create a shadow creature appear to grow and then appear to shrink.
- Encourage the children to work together to create a shadow scene were one

creature looks far away and other creatures look closer?

- Bring the children and volunteers together as a group for a “sharing what we’ve learned” session.
- Question and guide aspects of the sharing that focus on the relation of the hand to the light source. Do children understand that when the hand (or any object that light can not pass through – it stops the light) is closer to the source of light (and further from the wall/surface the shadow falls upon), the shadow created will be large. When the hand (object) is further from the light source (and closer to the wall/surface the shadow falls upon), the shadow created by the will be small.
- Save time for the volunteers to show and talk with the children, perhaps telling a story, about several of the hand shadows they learned to make or to show the children how to create hand shadow creatures that are the animals the children have been making as string figures.
- After you and the children thank the volunteers (A thank you letter to the volunteers will be written during Language Arts.) have the children return to their seats and open their science notebooks to the next page without work.
- The children are to write about the shadow creature or creatures that they made. They are to explain what they had to do to create a shadow creature large and then small, and they are to illustrate their thinking (including the object, the source of light, the size of the shadow on the wall, and the position of the object with respect to the lights source and the wall).
- Explain to the children that their writing and illustrations should allow anyone reading the directions in their science notebooks to position their hands between the wall and light sources and create a shadow that is large and to create a shadow that is small.

As the children are preparing to leave at the end of the school day, encourage them to demonstrate their shadow creatures to the members of their family and to ask their family members if they know how to make a shadow big or small (or to grow and shrink). If the children learn that their parents, guardians, grandparents, brothers and sisters can make hand shadows that are different from the rabbit, bear, dog, wolf and bird on the copy of Bosak’s sheet, suggest that they try to learn and practice how to make these new creatures. This way they can teach interested classmates during the next school day.

What You Look For

The following questions should assist you in formatively assessing each student’s learning.

- Does the child associate the shape of an object with the shape of its shadow?
- Does the child understand that the shape of an object determines the shape of its shadow?
- Does the child understand that a light source is necessary to create a shadow?

- Does the child know to place the object between the light source and the screen or wall or surface to create a shadow?
- Does the child understand that an object, like his/her hand, blocks the light from falling on the screen/wall/surface?
- Does the child understand that a shadow is the absence of light?
- Can the child answer the question, “What is a shadow?”
- Does the child understand how the distance of the object from the source of light affects the size of the shadow on the screen, wall, or surface?
- Does the child place the object near the light source to create a large shadow?
- Does the child reduce the size of an object’s shadow by moving the object away from the source of light toward the surface on which the shadow falls?
- Does the child accurately represent, pictorially and in writing, the results of the hand shadow activities in his/her explanations of how to create hand shadows, both large and small?

HAND SHADOWS FROM SUSAN BOASK'S *SCIENCE IS…* (1991)

QuickTime™ and a
decompressor
are needed to see this picture.

Markhan, ON: Scholastic Canada Ltd., p. 175.

Name _____ Date _____

I Can Make Hand Shadow Creatures

A Drawing of a Hand Shadow Creature That I Made

Name _____ Date _____

This is what I needed to do to make a large hand shadow creature:

This is what I needed to do to make a small hand shadow creature:

15. Shadow Puppets

Applying Knowledge of Shadows and Investigating Further

What You Need

1. Books about shadow puppets

   Elizabeth Adams and Bud Banis (2000). *Me and My Shadows – Shadow Puppet Fun for Kids of All Ages*, revised edition. Beachhouse Books.
   Jill Bryant. (2002). *Making Shadow Puppets* (Kids Can Do It). Kids Can Press.
   Bill Mayer (Illustrator) and Peter Foy (Photographer). (1995). *Shadow Games: A Book of Hand & Puppet Shadows*. Klutz Press.
   Elizabeth Cleaver's *The Enchanted Caribou* (1985). Don Mills, ON: Oxford University Press. *The Enchanted Caribou* is an Inuit story, illustrated with shadow puppets, about a young girl who is turned into a white caribou by an evil shaman. The book includes instructions for building a shadow theatre and directions (plus masters) for creating the Bristol board characters used to tell the story.
   David Wisniewski and Donna Wisniewski. (1996). *Worlds of Shadow: Teaching with Shadow Puppetry*. Teacher Ideas Press.

2. Seal cut-outs attached to the wire or thin pencil from the previous lesson
3. Pre-formed shadow puppets from *The Enchanted Caribou* (to tell the story), or Inuit legends or stories that the children in small groups would like to present as a shadow puppet show (in which case, they draw the people, animals or objects needed).
4. Shadow theatre (can be Cleaver's box with tracing paper screen or a sheet hung from the ceiling)
5. Bright light source (can be the Sun light that shines through a classroom window)
6. Bristol board (white and black)
7. Scissors
8. Tape
9. Clear straws
10. Paper fasteners or thin wire
11. A variety of materials that are **not** opaque (e.g., fabric, cellophane, tissue paper, packing foam)
12. Science notebooks
13. Pencils
14. Chart paper and marker
15. Digital camera

What You Do

Note: Several days may be required to complete this activity/lesson as written. Consider having the children present their shadow puppet plays and illustrated books to their parents, guardians and grandparents or to family members, the volunteers who helped the children with the hand shadow creatures, and community elders. If this is done, set aside time for creating invitations and consider a date during the dark period.

- As you began the previous activity/lesson, have the children sit on the floor facing the white wall/screen/board. Make sure no child sits where their view of the white wall is obscured by the light source.
- Invite the children who have learned new hand shadow creatures to raise their hand.
- Note these children, and call on each child to create the hand shadow creature for their classmates, who will be asked to identify and name the animal when its shadow appears on the screen.
- When the shadow animal has been identified and named, have the child say who helped him/her learn how to make it and ask if he/she would teach it to other interested children in the class.
- Continue in this manner until all of the children who had shadow creatures to show have done so.
- Turn off the overhead projector and show the children the cover of Elizabeth Cleaver's book, *The Enchanted Caribou*.
- **Link to Inuit Knowledge** - Determine how many children know the Inuit legend the book is based upon, and how many children can identify how the cover illustration was made. If it's not clear that shadow puppets were used, this will become obvious as the story is read and the illustrations of the story are shown.
- Guide the discussion of the legend before showing Cleaver's directions for making a shadow theatre and shadow figures.
- Help the children to realize that the shadow play using shadow puppets was not only a retelling of the Inuit legend, but that photographs taken of particular scenes in the puppet play became the illustrations for the legend the book was written to tell.
- Invite the children to do what Cleaver has done, namely:

    1. select an Inuit legend;
    2. identify the characters in the legend;
    3. select the scenes in the legend that are to be to adapted for the shadow play;
    4. draw (on paper) how each of the characters is to look;
    5. use the character drawings as patterns cut out a shadow puppet for each character appearing in the selected scenes;
    6. practice presenting the shadow play using the shadow theatre;
    7. carry out the shadow in front of an audience;
    8. take digital photographs of important shadow scenes; and

9. use the digital images to illustrate the written version of the legend (in book form).

- Write this as a list on chart paper as each task is mentioned. You may need to guide this, as some tasks must be completed before others can begin, and you want a list that children can follow in sequence.
- Have children determine the classmates they will be working with on the basis of the Inuit legend they are most interested in reproducing as a shadow play.
- When the groups are established, remind the children that each member of a group is responsible for creating and presenting the group's legend.
- Discuss timelines and help the children to know the duration of the project and when you expect specific items in the list to be completed.
- Remind the children to use what they have learned about shadows, first-hand, and what they have learned about shadow puppets and shadow plans from Cleaver's book.

What You Look For

This is a small group project that will extend over a number of days. As such, it is suggested that you assess the children's collaborative skills and attitudes and process skills.

- Does the child work in cooperative partnerships?
- Does the child listen respectfully to the ideas of others?
- Does the child willingly consider the views of others?
- Does the child respond to the ideas and actions of others in building their own understanding?
- Does the child respond to and acknowledge the ideas and actions of others?
- Does the child identify problems that arise, and work with others to find solutions?
- Does the child assume roles, and share responsibilities as a group member?
- Does the child communicate questions, ideas and intentions effectively during group work?
- Does the child connect new experiences, ideas, and information with prior knowledge and experiences?

Name _____ Date _____

My Group's Shadow Puppet Legend

We decided to make shadow puppets to tell the legend of:

_____

My Drawing of the Shadow Puppet That I Made and the Materials I Used

Classmates in my group	The shadow puppet each made
_____	_____
_____	_____
_____	_____
_____	_____

The Legend that we told was about

_____

_____

_____

_____

_____

_____

_____

Stories to Tell Immediately Before the Return of The Sun

1. String Games Could No Longer be Played

In his book, *The Arctic Sky*, John MacDonald points to the Inuit's "almost obsessive attraction of string games and the constant desire to increase ones repertoire of figures" (p. 125). He quotes Aipilik Innuksuk who mentions playing "a lot of string games during the period of Tauvikjuak" [winter's sunless period], and Niviattian Aqatsiaq who remembered playing string games when there was not sun and trying "to complete a predetermined figure before the next person did it". These games, however, were generally forbidden when the Sun's light began to show on the horizon. It was thought that the strings would impede the speed at which it returned.
Consider having the children put away their strings as the dark period ends. Ball and cup games can replace the string figures and string games they have been practicing, for ball and cup games are though to assist the progress of the Sun's increasing altitude.

Q. Is there truth in the fact that when the sun was returning they would stop playing the string games?

A. *Yes, that was what the people before us did. As for our time, we no longer paid too much attention to this. What I have heard about the people before us, is that when the sun appeared, they would cut their (VOC) AJARAAT [strings for string games] to pieces. That was the way they used to do it. At this time, the game of (VOC) AJAGAQ [a game similar to cup and ball game] would take its place. The whole motive behind that had some connections to a legend. The sun was treated as if it was a being, in this legend. Which really did not have that much significance. Nevertheless, they pictured it as a being. It is said that when it is trying to make its round, it gets lacerated when someone plays string games. Of course there is no truth to it, as it is only a legend. Indeed it is only a legend. It is told that the sun once said, "It is exhausting when one keeps tripping over the strings".*

Aipilik Inuksuk, IE164,
interviewed by Louis Tapardjuk, 13 December 1990

Q. When the sun was just coming back in the wintertime, do you know what special things were done?

A. *What I have heard is that when the sun was just returning, they use to play a lot of AJAGAQ. The reason is that when this game is played - one has to through the bone up and try to poke the stick through one of the holes in the bone. So the idea was that by throwing the bone* [up in the air] *they would appear to try and get the sun higher in the same manner as throwing the bone up. That was when the sun had just started to come out. At the same time, string game AJARAAQ was*

discouraged, otherwise the sun might get tangled up [in the strings] *and keep falling down, making its progress much slower.*

Francois Quassa, IE156,
interviewed by Louis Tapardjuk, 18 October 1990

Before the sun had starts to leave the horizon…when it only shows on the horizon, …then the string games were no longer allowed as they might lacerate the sun. Once the sun has started to go higher and could be seen in its entirety, string games could be resumed, if one so wished. So the restriction on string games was only applicable during the period between the sun's return and its rising fully above the horizon (p. 125).

Michel Kupaaq, IE135 (1990),
as quoted in John MacDonald, 1998, 2000,
The Arctic Sky: Inuit Astronomy, Star Lore, and Legend.
Toronto,ON: Royal Ontario Museum and Iqaluit, NU: Nunavut Research Institute.

2. **Smiling at the Sun with Half a Face** and **Extinguishing the Flames of the Qulliqs**

Become familiar with both of these traditions and tell the children about each one on different occasions. Encourage children to attempt and practice smiling at the Sun with half a face. Consider having the children reenact, through dramatic play, the first sighting of the Sun that led to the flames of the qulliqs in the camp/community being blown out. Perhaps this drama can be performed in front of an audience of younger or older children in the school.

The return of the sun above the horizon marked the beginning of a new year. This was a joyous occasion. People knew the worst period of the year would soon be over. Children greeted the sun by smiling with half their face. They then extinguished all the qulliit in the camp. One person kindled a new fire. From this single flame all the lamps in the camp were relit. This ceremony strengthened community ties through the sharing of the new flame (p. 387).

Bennett, J. and Rowley, S. (2004).
Iqalurait: An Oral History of Nunavut.
Montreal QC and Kingston, ON: McGill-Queens University Press.

Q. Did you get to do the things that the people in the past did when they first saw the sun for the first time after the dark period?

A. *I remembered when I heard and indeed* [what] *I did and still do is to smile at the sun when we see it for the first time with only half of your face, while the other side of the face must be straight. The reason was that it was going to get warmer once again, on one side of the face that smiles welcomes the warmer temperature to come, while the other still faces the reality that it is going to be cold for some*

time longer. I still do that when I see the sun out in the horizon, I pretend to smile at the sun.

Mark Ijjangiaq, IE184,
interviewed by Louis Tapardjuk on 11 February 1991

When those who had kept observing the skies for the sign of the sun finally saw the sun, [they] *would tell everyone … that the sun had been seen. At this time all the qulliit would be extinguished by blowing. By this time the person who [started the new fire] would have the fire already … Once the fires in the qulliit had been blown out, each qulliq would be refueled and a new wick would replace the one … The camp would come a get the fire to light their qulliq. So people were renewed and it was said that the sun would be warmer [in the] coming spring.*

Suzanne Niviattian Aqatsiaq, IE249
as cited in Bennett and Lowrey, 2004, p. 387.

Q. When the sun was just returning after the dark period, what special events were held to mark the occasion?

A. *…the first day that the sun came out was marked by the relief that the whole community must at this day start a new life. So the children of the camp would go to each household to low out the flames of the qulliq; they would visit each of the dwellings. After the flames had been extinguished the wick from the old flame was removed. Then a new wick was laid and a new fire lit. In order to start a new life, children of the camp, including myself, would run to each of the dwellings hoping that we would be the first to blow out the flames on this day before the other children. This was how the first day of the sun was observed.*

Noah Piugaattuk, IE148,
interviewed by John MacDonald on 15 June 1990

Q. When the sun was just coming back in the wintertime, do you know what special things were done?

A. *We also use to be told that when we saw the sun for the first time we should smile at it with only half of our face. I have also heard about the time when the lamps were blown out at the first sign of the sun. In those days they did not have anything like matches to light up a fire with, some people did not like to loose the fire they had as there was no way that they could light up easily, so when their fires were extinguished they were not too pleased about it. Someone would make a fast entrance and immediately blow out the flame and leave again immediately. Of course some of the inhabitants of the Igloo were not too pleased but as it was the custom in those days they had to put up with it.*

Francois Quassa, IE156,
interviewed by Louis Tapardjuk, 18 October 1990

3. Joy and Celebrations of the Sun's Return

Help children to understand how important the Sun's return must have been after the cold period without sunlight, when hunting was more difficult and everything the Inuit depended upon for life came from the land and water.

Q. What about the return of the sun, was this observed in your time?

A. *Most likely, I did not know anything about it being observed. It was met with joy, knowing that the days were now going to get longer, which meant that hunting was going to be easier. These were the things that would have been felt. In addition, we were usually living separately from others. It is said that when there was a large camp, the return of the sun was celebrated, especially by the people before us, at least from what I have heard.*

Q. How much have you heard about it?

A. *I have bits and pieces how it was observed. It is said that it was met with joy, as it will now be easier to hunt. The past winter has been bad for hinting, especially when it was dark, which was now finally over, we would think that we had been able to pass the dark period, hunting is going to be much easier, and the days were no longer getting to get shorter anymore, this was mainly the reason for the jubilation of the return of the sun.*

Nathan Qamaniq, IE494,
interviewed by Louis Tapardiuk, 14 December 2001

They used to be happy to see the light coming back. There is a song about Akuttujuuk [the stars Bellatrix and Betelgeuse] *expressing the feeling that life will go on. I use to hear it. It was a sign that life will start again and the hunters will have an easier time in their hunting. The dark period must have been so hard.*

'Akuttujuuk' appear!
There is still the day,
It is a joyous feeling that
I will go on living.
Again in the broad daylight
Will I sleep!

Martha Nasook, IE151 (1990),
as quoted in John MacDonald, 1998, 2000,
The Arctic Sky: Inuit Astronomy, Star Lore, and Legend, p. 119.
Toronto, ON: Royal Ontario Museum and Iqaluit, NU: Nunavut Research Institute.

Q. So they started to hold festivities in QAGGI afterwards, or when did they actually hold QAGGI?

A. *It was when the sun was now higher. The temperatures were still cold, but the ability to catch the animals was now easier.* [Festivities were held] *in order to show their appreciation for having food available to them, as the sun will now continue to get higher. In addition, they were thankful for having passed the dark period without too much hardship. In a time when it was necessary to subsist on wildlife, and fuel from marine animal blubber, the future would look promising with the increased sunlight coming making it much easier to catch wildlife. So the celebrations were used for the purpose of appreciation for having made it through the dark period and that the hunting would now be much easier with the warming of temperatures.*

As they were confidant that the future looked promising and the fact that they were able to pass the dark period without too much adversity they started to hold festivities. First someone made a drum that would be used in the QAGGIQ, so the festivities were held at that time. For those who had spent the summer and part of winter around ALARNAARJUK to hunt for caribou, and those that had spent the winter around SANIRAJAK gathered with the rest in that central location. They started to hold festivities for having passed the dark period without too much adversity including illnesses. They would gather to the largest Igloo of the camp, which was usually already occupied by a family. They did not have to build a new QAGGI as there already was an Igloo that was already big enough to hold one in.

Noah Piugaattik, IE148,
interviewed by John MacDonald, 15 June 1990

Supplementary Materials

How Day and Night Were Made: A Legend

The raven and the fox were not good friends; they were always fighting about something. When it was very dark the fox was happy because he could hunt without anyone seeing him. The raven, however, was always unhappy when it was dark because he could see nothing. It was then that the raven first had the idea of stealing the sun from the south.

While the raven was always trying to find the sun, the fox was very happy. It was dark all the time because the Indians who kept the sun hidden in a bag would not let it out even for a short time. They knew the raven was flying near their houses. They were taking no chances. During this time the fox was very happy and he found plenty of food for his family.

At last by a trick the raven was able to get the sun. When he brought it back with him all the men and animals were very happy. Now, if they wanted, it could be light all the time.

For many days the raven kept the sun shining in the sky and he and his family soon had plenty of food to eat. But not the poor fox. Every day he went out hunting too but, because it was light all the time, the small animals could see him coming and quickly hid themselves. Every day the fox got thinner and thinner and his fights with the raven became longer and longer. At last the fox had a meeting with the raven.

“Look,” said the fox. “Let’s be friends. You have the sun. Why can’t we have a night and a day one after the other? If you do that we won’t fight as much. When I am hunting, you and your family can sleep. When I am sleeping, you can do your hunting.”

“All right,” said the raven, “From now on we’ll have night and day one after the other.”

Brian W. Lewis. 1968. *Eskimo Myths*. Arctic Reading Series, Reader Thirteen. Ottawa: Curriculum Section, Education Division, Northern Administration Branch, Department of Indian and Northern Development, pp. 1-2.

Shadow Poem

My Shadow

I have a little shadow that goes in and out with me,
And what can be the use of him is more than I can see.
He is very, very like me from the heels up to the head;
And I see him jump before me, when I jump into my bed.

The funniest thing about him is the way he likes to grow –
Not at all like proper children, which is always very slow;
For he sometimes shoots up taller like an India-rubber ball,
And he sometimes gets so little that there's none of him at all.

He hasn't got a notion of how children ought to play,
And can only make a fool of me in every sort of way.
He stays so close beside me, he;\s a coward you can see;
I'd think shame to stick to nursie as that shadow sticks to me!

One morning very early, before the sun was up,
I rose and found the shining dew on every buttercup;
But my lazy little shadow, like an arrant sleepy-head,
Had stayed at home behind me and was fast asleep in bed.

Robert Louis Stevenson. 1916. *A Child's Garden of Verses*. Chicago, IL: M.A. Donohue & Co.