Asâmak (Michif, Cree)

ʔah (Dëne)

Snowshoes

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A unit in the series:

Rekindling Traditions:
Cross-Cultural Science and Technology Units

Series Editor

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CURRICULUM CONNECTION

Grades 7-9: structure & design, force, pressure

OVERVIEW

Aboriginal science and technology is validated through learning about snowshoes (asâmak). This provides the context for learning concepts from Western science about structure and design, and about pressure. Both knowledge systems, Aboriginal and Western, are explicitly acknowledged. Experiential learning is highlighted in both domains in this unit. Duration: about 20 classes.

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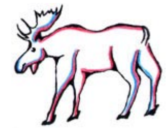
Morris Brizinski	Valley View School, Beauval Unit: *Nature's Hidden Gifts*	
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TABLE OF CONTENTS

PURPOSE

This unit is designed to enrich students' understanding and appreciation of Aboriginal science and technology, and to encourage students to continue their studies in school science in the future. The field "structure and design" is approached from two points of view, Aboriginal knowledge and Western knowledge, to augment students' own cultural identities, to motivate them toward success in all school subjects, and to demonstrate to them that they can achieve at Western science without setting aside their Aboriginal values and knowledge.

GOALS

1. To find that snowshoeing is an enjoyable activity.
2. To acquire background knowledge about snowshoes.
3. To think about snowshoes from a scientific point of view.
4. To identify Western science as having a particular point of view (abstract generalized, not concrete contextualized).
5. To construct an in-depth knowledge about one major aspect of snowshoes.
6. To develop confidence in talking with older people.
7. To role play in the culture of science.
8. To apply scientific and technological concepts and skills in new contexts.
9. To become aware of how one's ideas have changed over the course of the unit.
10. To get students to interact with their environment and their community.
11. To introduce students to career possibilities related to science and engineering.

OBJECTIVES

1. Students will think about and discuss the uses of snowshoes.
2. Students will recognize different types of snow and terrain, and the need to travel in each.
3. Students will become familiar with the history of snowshoes.
4. Students will become familiar with importance of snowshoes to Métis, Cree, and other Aboriginal peoples.
5. Students will become familiar with the need for snowshoes, given such factors as climate, length of winter, snowfall, and tundra snow vs. forest snow.
6. Students will become familiar with how snowshoes are made (materials, forming, lacing, bracing, surface area, and shape).
7. Students will construct the concepts of force, surface area and pressure (force per unit area)
8. Students will be able to calculate pressure in a number of different everyday situations, using scientific units appropriate to the abstract level of the students (g/cm^2 or Pa).
9. Students will treat scientific units as a protocol in the culture of science.
10. Students will increase their measuring and estimating skills.
11. Students will conduct research on a chosen topic.
12. Students will work effectively with other group members.
13. Students will develop interviewing skills.
14. Students will develop their listening and remembering skills.
15. Students will further understand three types of variables in a scientific experiment (manipulated, controlled, and responding).
16. Students will design and conduct their own experiment, and solve the conceptual, informational, and technical problems that arise along the way.
17. Students will determine the pressure exerted by two different types of snowshoes.
18. Students will consider the ingenuity of the people who invented the snowshoe, and understand how their knowledge was passed along from generation to generation.

BACKGROUND INFORMATION

The Michif and for Cree "snowshoes" is *asâmak*; the singular "snowshoe" is *asâm.* These original words are used in this unit. You should accumulate other indigenous words and expressions to incorporate into your lessons and student assessments, learning them yourself as you go along. The validity of Aboriginal knowledge and students' cultural identity is underscored by the non-trivial use of appropriate language.

Formozov (1946) refers to snow as the most important environmental feature of the boreal regions of the world. Snow covers the ground in much of the north for more than half of the year. This yearly snow cover changes the conditions of existence for all the creatures that live there, plants and animals. Organisms must adapt to this snowy period or not live in the region. He refers to animals that do not inhabit snowy regions in winter as "chionophobes" – snow haters (e.g. pigs, small migratory birds, quail, and other animals that either do not live in regions with much snow, or migrate out in winter). Formozov uses the term "chionophores" to classify animals that can withstand quite a bit of snow (e.g. moose, wolves, fox, voles, shrews, and mice). His term "chionophiles" – snow lovers – refers to animals that are specially adapted to life in snow (e.g. snowshoe hare, ptarmigan, and caribou).

Humans, it appears are born to be chionophobes. We have no physical adaptations to living in cold snowy regions. Movement on foot for people would be very difficult once the snow cover reached more than a few centimetres deep. People, however, are equipped with culture and the ability to make things (structures) out of materials in the environment (natural resources). People have adapted to life in the snow in a number of ways (apart from building jumbo jets to take them to Mexico in the winter). For North American Aboriginal peoples, one of the structures designed, manufactured and used, is the snowshoe (asâm).

Asâmak have been around for a very long time. It seems inconceivable that the ancestors of the Métis, Cree, or for that matter any Aboriginal group, could have lived in the boreal forest without some means of getting around in the winter. Deep snow, as anyone who has tried to walk in it knows, is very difficult to move in. Osgood and Hurley in *The Snowshoe Book* state that asâmak have been in use for at least 6000 years. These instruments are definitely Aboriginal in origin and use. They have been made by the people for many generations. The asâm offers an opportunity to investigate an Aboriginal technology that had been used in the past, with the local design variations and local materials. This technology has been passed down to us with little change; one of those "perfect" technologies from the past that modern methods and materials have done little to change. Asâmak can turn humans from chionophobes into chionophiles.

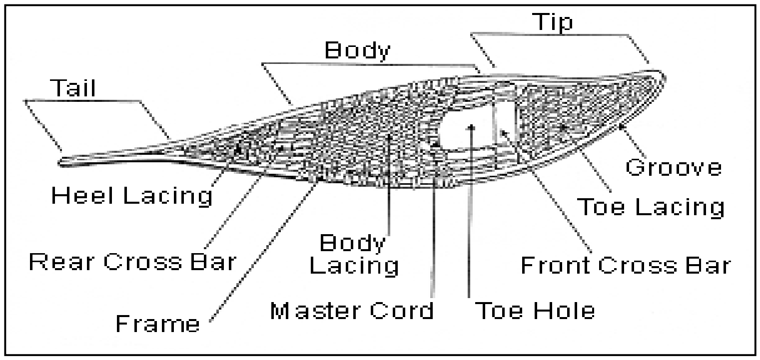
The asâm also gives us an opportunity to look at how people adapted to their environment. No one knows what went through the mind of the "inventors" but one can see them watching a wolf, hare, lynx or ptarmigan move easily over the surface of the winter forest. One can almost hear the gears working in their head! "What a good idea!"

Several types of asâmak were developed by northern peoples. They were developed to meet the local conditions and requirements of local people.

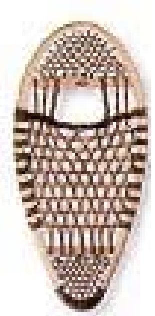
Modern asâmak have evolved into a number of designs. A look at the catalogue of Caribou Cry, a Toronto mail order house (**http://www.cariboucry.com/snowshoes/faber.htm**) shows the types of asâmak and the uses of each. This is the product line of only one asâm maker, Faber of Quebec. Four examples are shown below. Other internet sources are listed in the References & Resources section (page 7). Many of these show asâmak being used in Aboriginal settings.

Osgood and Hurley (1983) describe the uses of several types of asâmak. The bearpaw is a short roundish asâm, best for use in thick bush where moving around tree and brush obstacles is important. For trails and open areas, the Algonquin asâm is recommended. In deep snow the Ojibwa asâm is recommended.

Also from Caribou Cry we have a diagram of a basic sport asâm showing its parts and their names.



frame = asâmattik (Michif)
tail = osetuy (Michif)


Bearpaw


Sport (Huron, Algonquin)


Ojibwa (Cree)


Pickerel (Alaskan, Cross-Country Trail)

Source: http://www.cariboucry.com/snowshoes/faber.htm

Pruitt (1978) proposed several names for "snow," borrowed from the Kobuk Valley (north-west Alaska) Inuit, who have a rich vocabulary to describe the snow conditions in their local environment. The following is a list of some of the vocabulary as proposed by Pruitt:

Api (ah pee)	is snow sitting on the ground.
Pukak (poo kak)	is the loose, recrystalized snow next to the ground with deep snow above it.
Upsik (up sick)	is hard wind packed snow.
Qamaniq (corn an nik)	are the areas of shallow snow at the base of trees, caused by the branches intercepting some of the snowfall.
Siqoq (see cock)	is snow drifting on the wind and will often reform as upsik.
Siqoqtoaq (see cock tow ak)	is an icy layer (sun crust) on top of the snow.
Mapsuk (map suck)	is an overhanging drift.
Anjamana (un ya mun ya)	is the area where snow has been dug out by wind to form a drift.

Snowfall and snow cover on the ground occurs for a significant part of the year in much of Canada. The chart on the next page shows the monthly snowfall and the end of month snow cover in a number of communities around northern Saskatchewan, Alberta and Manitoba. One can easily see that snow cover on the ground is an important ecological factor for up to five months of the year. The information is from Environment Canada (http://www.cmc.ec.gc.ca/climate/normals/).

Also of use would be the Canada snowfall map available from the National Atlas of Canada. http://www-nais.ccm.nrcan.gc.ca/wwwnais/select/snow/english/html/esnow.html

CANADIAN CLIMATE NORMALS: SNOWFALL BY MONTH: FROM ENVIRONMENT CANADA
PLACE MONTH (SNOWFALL IN CM.)

	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
FORT CHIPEWYAN, AB	21	15	18.5	15.8	4.2	0	0	0	1.4	15.3	29.8	23.9	145
COLD LAKE, AB	23	17	19.7	11.9	3.6	0	0	0	2.6	7.1	21.7	25	131.5
FORT MCMURRAY, AB	27	21	23.2	15.8	3.6	0	0	0	3.3	14.1	33.3	30.5	172
SLAVE LAKE , AB	29	21	23	11.1	3	0	0	0	2.8	10	20.1	29.9	150.2
URANIUM CITY, SK	33	25	27.7	18.9	4.4	0	0	0.2	2	19.2	48.3	36.7	215.1
PRINCE ALBERT, SK	17	15	19.6	10.2	2.8	0	0	0	2.8	9.9	16.7	21.9	116.5
LARONGE, SK	21	18	20.7	17	3.1	0.2	0	0	2.5	13.9	31.9	25.8	154.6
CREE LAKE, SK	24	20	22	19.2	6	0.2	0	0	4.9	21	33.3	28.4	179.5
FLIN FLON, MN	20	15	20.3	20.9	3.4	0	0	0	2.3	11.2	26.6	24.1	143.9
THE PAS, MN	24	22	25.7	19.6	5.1	0.3	0	0	1.7	12.2	31.3	28.6	170.2
END MONTH SNOWCOVER IN CM													
COLD LAKE AB	25	25	14	0	0	0	0	0	1	1	10	19	
FORT MCMURRAY, AB	31	32	24	0	0	0	0	0	0	2	15	25	
URANIUM CITY, SK	49	51	51	8	0	0	0	0	0	4	25	36	
PRINCE ALBERT, SK	24	25	17	1	0	0	0	0	1	1	8	20	
LARONGE, SK	40	42	32	2	0	0	0	0	0	1	16	31	
CREE LAKE, SK	35	39	35	3	0	0	0	0	1	4	19	29	
THE PAS, MN	40	43	31	4	0	0	0	0	0	2	16	32	

References & Resources

Highly recommended:

Griffin, S.A. (1998). *Snowshoeing*. Mechanicsburg, PA, 17055: Stackpole Books. ISBN 0-8117-2928-1.

Others:

Conover, G., & Conover, A. (1995). *A Snow Walker's Companion: Winter Trail Skills from the Far North*. Camden, Maine: Ragged Mountain Press. ISBN 0-07-022892-2.

Dick, A. Village Science. Chapter 25/Snowshoes (DRAFT) [On-line]. Available: http://www/ankn.uaf.edu/vschap25.html

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Prater, G., & Felkley, D. (1997). *Snowshoeing* (4th edition). Seattle, WA 98134: The Mountaineers. ISBN 0-89886-497-6.

Pruitt, W.O. (1978). *Boreal Ecology. The Institute of Biology's Studies in Biology 9*. ISBN: 0-7131-2686-8.

Rutstrum, C. (1968). *Paradise Below Zero*. Collier Books. (LC 68-23643).

Internet:

http://www.nwttravel.nt.ca/html/crafts.htm
The Crafts section of the Northwest Territories Explorers' Guide.
http://www.arctic-can.nt.ca/achodene/pages/footwear-htm Acho Dene Native Crafts
http://pwnhc.leamnet.nt.caJprograms/search.htm
Prince of Wales Northern Heritage Centre in Yellowknife is a searchable collection of pictures that contain some images of asâmak in the North West Territories.
http://www.innu.caJ Web site of the Innu Nation (Labrador)
http://www.protocom.corrdprotomall/wandw/snowshoes/index.html
Web site of an American Manufacture of asâmak. Descriptions of several types and where they are used.
http://www.ucalgary.ca/GEOG/Virtual/animals.html
Web site on animals, some of which have asâmak.
http://www.cprc.uregina.caJccea/ecozones/index.html
Ecozones of Canada. Information on climate (snow) animals, etc in the various areas of Canada.
http://www.carlheilman.com/snowshoe10.html Commercial information about snowshoes.
http://www.widerview.com/indxsnow.html Commercial information about "Moose's Recreational Snowshoes."

ACKNOWLEDGEMENTS

I would like to thank the many people who have assisted me in preparing this unit. First, thanks to Mr. Stan Chomey, retired principal of Rossignol School, for his help in connecting me with the Cameco Access Program for Engineering and Science (CAPES); and also thanks to Mr. Dave Dornstauder, Principal, and Dr. W. Duffee, Director of Education for Île-à-la-Crosse School Division #112. Both Mr. Dornstauder and Dr. Duffee have provided abundant support during this process.

The School Board of Île-à-la-Crosse School Division deserves thanks for their useful suggestions in the preparation of the unit, and for their support of the entire project.

A number of community Elders, including Mr. Nap Johnson, Mr. Ovide Desjarlais, and Mrs. Marie Favel, have assisted with ideas and have given moral support. I wish to thank them as well.

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Lastly, I wish to think Dr. Glen Aikenhead, our project leader, for his tireless effort in bringing this project together, his helpful suggestions and guidance, and his good humour in getting us through the hard parts.

Thank you all.

Lesson 1: *An Afternoon on Asâmak*

Timing
1 to 2 hours. It would be best if this activity could be done on a nice day.

Goals
1. Snowshoeing is an enjoyable activity.
2. Students will be open to thinking about asâmak and snowshoeing.

Objectives
1. Students will become familiar with snowshoeing (kikasâmewin).
2. Students will think about and discuss the uses of asâmak.
3. Students will recognize different types of snow and terrain, and the need to travel in each.

Aboriginal Values to be Conveyed
happiness

Instructional Strategies
experiential

Lesson Outline
1. Take the class out on asâmak, walking in a variety of snow types and terrain; for example, open lake, deep drifts, willows along shore, tall grass and trees.

2. Discuss in a casual manner:
   a. Where is it easiest to walk?
   b. Would a different type of asâm help in different places? different terrain? different snow conditions?
   c. What would it be like to walk around in these conditions without asâmak?

CELs / Subject Integration: Outdoor Education

Resources
A pair of asâmak per student.
Optional: a camera to record memorable or teachable moments.

Teacher Notes
- Be sure the primary focus on the event is enjoyment of the activity.

Lesson 2: *Asâmak: A Culturally Important Tool*

Timing
½ to 1 hour, soon after Lesson 1

Goals
1. To debrief Lesson 1.
2. To acquaint students with a general background knowledge about asâmak.

Objectives
1. Students will become familiar with the history of asâmak.
2. Students will become familiar with importance of asâmak to Métis, Cree, and other Aboriginal peoples.
3. Students will become familiar with the need for asâmak, given such factors as climate, length of winter, snowfall, tundra snow vs. forest snow.
4. Students will become familiar with how asâmak are made (materials, forming, lacing, bracing, surface area, and shape).

Aboriginal Value to be Conveyed
strength

Instructional Strategies
student-centred and teacher-centred discussions

Lesson Outline
After an afternoon on asâmak, a student-centred discussion:
- Was snowshoeing fun? why? (or why not?)
- We did this for fun, but was there a "use" besides fun that our grandparents had for asâmak?

Direct the discussion towards the following ideas, with an eye to making general class notes:
1. Snow conditions in the local area: How long does snow cover the ground in Île-à-la-Crosse? How deep is the snow? Would this snow keep people from moving around in the bush?
2. What was the life style of the people? (hunting, fishing, trapping)
   All of these activities required people to get out on the land, often (especially trapping) in the winter because that was when fur was prime.
   People needed a technology (a "manufactured structure") that allowed them to move across the deep snow and become adapted to the land.

At this time, the students should turn to sources of information that are both available and useful. The students should discuss where they can find information about asâmak. Have them generate ideas about sources of information on this topic, such as the internet, encyclopaedias, books, etc. Hopefully they may include the names of people in the community. This should lead to a discussion of "people who know" as a source of scientific information (Aboriginal science and Western science). In this case the people who know are the elders and other people of Île-à-la-Crosse who have experience in making and using asâmak. Then introduce students to the idea of interviewing a person to obtain information. In Lesson 3, they will interview various members of the community to find information about asâmak.

CELs / Subject Integration: critical and creative thinking, Language Arts

Resources

See "References & Resources" in the "Background Information section;" for example:

Griffin, S.A. (1998). *Snowshoeing*. Mechanicsburg, PA, 17055: Stackpole Books. ISBN 0-8117-2928-1.Osgood, W. & Hurley, L. (1983).

The Snowshoe Book (3rd Edition). Brattleboro, VT: The Stephen Greene Press. (ISBN 0-8289-0432-4).

http://ww.nwttravel.nt.ca/html/crafts.htm
The Crafts section of the Northwest Territories Explorers' Guide.
http://www.arctic-can.nt.ca/achodene/pages/footwear-htm Acho Dene Native Crafts
http://pwnhc.leamnet.nt.caJprograms/search.htm
Prince of Wales Northern Heritage Centre in Yellowknife is a searchable collection of pictures that contain some images of asâmak in the North West Territories.
http://www.innu.caJ Web site of the Innu Nation (Labrador)
http://www.protocom.corrdprotomall/wandw/snowshoes/index.html
Web site of an American Manufacture of asâmak. Descriptions of several types and where they are used.
http://www.ucalgary.ca/GEOG/Virtual/animals.html
Web site on animals, some of which have asâmak.
http://www.cprc.uregina.caJccea/ecozones/index.html
Ecozones of Canada. Information on climate (snow) animals, etc in the various areas of Canada.
http://www.carlheilman.com/snowshoe10.html Commercial information about snowshoes.
http://www.widerview.com/indxsnow.html Commercial information about "Moose's Recreational Snowshoes."

Teacher Notes

- Extension activity: Write a creative legend on how snowshoes were invented. Co-ordinate this activity with a Language Arts person.

Lesson 3: *Interview With an Adult*

Timing
1 class for an Elder to talk to the class about snowshoes (part I)
1 class for interview preparation (part II);
time spent outside of class for the interview;
1 class debriefing interviews (part III).

Nap Johnson

Goal
To develop confidence in talking to older people and Elders.

Objectives
1. Students will acquire knowledge of asâmak of long ago.
2. Students will become familiar with importance of asâmak to Métis, Cree, and other Aboriginal peoples.
3. Students will develop interviewing skills.
4. Students will develop their listening and remembering skills.
5. Students will become familiar with how asâmak are made (materials, forming, lacing, bracing, surface area, and shape).

Aboriginal Value to be Conveyed
obedience, respect for traditional knowledge

Instructional Strategies
independent learning, interactive, experiential

Lesson Outline – I. (Elder Presentation)
1. Invite an Elder who is a good story teller to talk to your class about snowshoes and snowshoeing, thereby making an authentic connection between the science class content and the community's Aboriginal culture, from the perspective of someone who understands that culture.

Lesson Outline – II. (Interview Preparation)
1. Discuss with the class appropriate ways to approach and interview people, some of whom may be Elders, giving special attention to show respect for their knowledge.
   Discuss the protocol of giving gifts to Elders. In Île-à-la-Crosse, a basket of treats is appropriate. The baskets can be purchased or made by the students. [Patterns for birch bark containers, willow baskets, and other baskets, can be found in Richard Schneider's (1972), *Crafts of the North American Indian*: *A Craftsman's Manual*.]
2. Assign students into groups so they know whom they will be working with.

3. Discuss the most appropriate method the class should use to organize the interview, paying attention to how we show respect for the people interviewed. Here are several organizational suggestions:
   a. Send students to the person's home, by appointment, during the school day.
   b. Let students choose an old person (an Elder possibly) and interview them.
   c. Invite old people (including Elders) for a special afternoon at the school organized by the students. Snacks and activities, in addition to interviewing, should be provided.
   d. Attend Friendship Day, held regularly at the Île-à-la-Crosse Friendship Centre, by home care. Students would contribute to the event and interview appropriate people.
4. Develop an example of an interview schedule (set of questions). Here is an example:
   a. Did you use asâmak?
   b. Did the people purchase their asâmak or make their own?
   c. If they made their own:
      How were they made?
      What tree (wood) did they use?
      Why was this wood chosen?
      How did they choose the tree?
      How did they bend the wood into the shape of a frame?
      What was the webbing made of?
      What animal did the hide come from?
      Was any particular part of the hide better for webbing?
      How was the webbing cut?
      How was the webbing treated before it was put on the frame?
      How were the holes cut into the frame of the asâm?
      What was used when drills weren't available?
      How was the webbing put onto the frame?
      Was it strung differently on different parts of the frame?
      How long did it take to make a pair of asâmak?
   d. What shape were the asâmak? (Get a drawing.)
   e. How big were the asâmak? If the elder does not have an idea here, have them demonstrate how big they were. Make a record of what they say try to translate that into centimetres.
   f. What kind of footwear did you use?
   g. What did you use for bindings?
   h. How were they put onto the asâmak? How were they shaped?
   i. How long did they last?
   j. How did you care for them to make them last longer?
   k. Did you ever make asâmak to sell to others? (What did you sell them for? Did you trade or use cash? Who did you sell them to?)

   If the interviewee did not make their own asâmak, have them answer the following questions:
   - How much did asâmak cost?
   - Whom did you buy them from?
   - Attempt to have the elder answer any of the questions asked above.

   More general questions for all interviewees:
   l. Did men, women, and children use asâmak the same?

m. Was there a difference in asâmak between Île-à-la-Crosse and other places?
n. Did people use asâmak for long distance travel? If not, what other technology was used?

5. Consider conducting interviews in Michif, as much as possible, if feasible.
6. Decide how to record the information. Will photographs be taken during the interview?
7. Students should be given time to go over their notes from their interviews. They should transcribe their answers for easier reading.

Lesson Outline – III. (Interview Debriefing)

Let students share the materials they brought back from the interviews. Hold a general class discussion going over the interview questions (above), comparing data. General patterns and conclusions should be drawn from the interview data. Look for "common" ground among the interviews.

Now that we have talked to the experts, let's look at the information we have gathered on asâmak. Students should be prepared to go back to their interview notes to come up with the answers. Some of the questions to be answered below will not have been covered in the interviews.

1. How are asâmak made? Elicit ideas from the students. Place their ideas on board or flip chart. Materials?
   Wood: What part of asâm? frame, crossbars.
   What type? (birch)
   What type of birch?
   Pukagegon: What part of asâm? (webbing).
   What animal?
   What part of animal?
2. What are the characteristics of wood that allow it to be used to make the frames of asâmak?
   - strong
   - hard
   - bendable: How is wood treated to make it bendable? (steaming)
   - able to be carved
   - one can drill holes in it without splitting it
   - durable
   - able to be split

   It would be useful to demonstrate these qualities of wood. Pieces of birch or willow could be steamed in the classroom and its malleability compared to that of un-steamed birch. Pieces can be carved, drilled, and split right in the room.

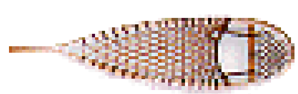
   Different **strengths** of wood can be associated with the role of strength in Aboriginal cultures.
3. What are the characteristics of pukagegon that allow it to be made into asâm webbing?
   - high tensile strength, stretches when wet. (Pukagegon is a protein as studied in biology on the characteristics of living things. This protein is very "plastic" in that it can be moulded into many shapes and then retain that shape until altered again by wetting.)
4. Tools needed to make a pair of asâmak?
   - axe, knife, and steamer (What could have been used before steamers were available?)
5. Are the materials (appropriate wood and pukagegon) locally available?

6. Parts of an asâm. (Use diagrams from "Background" notes and reference books from your library, and examples of asâmak brought into class.) Go over the parts and the function of each part.
   - Why is master cord made of pukagegon and not wood?
7. What other characteristics of asâmak are important to their usefulness?
   - strong and light. How are they made strong and light? (materials and design)
   - comfortable
   - easy to put on and take off
   - will not dig into snow
   - shape
     - Why do asâmak have an upturned toe?
     - Why are they shaped like teardrops and not more circular?
     - Why are they not much longer, like cross-country skis?
8. Conclude about uses of asâmak in Île-à-la-Crosse both in the past and present.
9. In what ways have you (the student) acted as a scientist in this activity? (List the processes of science students have engaged in; e.g. observing, inferring, classifying, etc.)
10. Get students to write notes of thanks and appreciation to the persons interviewed.

CELs / Subject Integration: communication, personal and social values and skills, technological literacy, Art

Resources
Local people who know something about asâmak.
Wood to demonstrate its properties.
A variety of asâm types.

Teacher Notes
- Make appropriate contacts with older people in the community who have knowledge of asâmak.
- Many of the details that arise in this lesson will be the focus of future lessons. Thus, only a general familiarity with the domain of background knowledge is expected.
- Send thank-you notes (written by students) to all who helped.



Racing style – Faber

Lesson 4: *Staying on Top of the Snow: A Scientific Point of View*

Timing
2 classes

Goals
1. To think about asâmak from a scientific point of view.
2. To identify science as having a particular point of view (abstract generalized, not concrete contextual).

Objectives
1. Students will identify *weight* and *area* as important factors for staying on top of the snow.
2. Students will construct the concepts of surface area and pressure (weight per unit area)
3. Students will be able to calculate pressure in a number of different everyday situations, using scientific units appropriate to the abstract level of the students (g/cm^2 or Pascals).
4. Students will treat scientific units as a protocol in the culture of science.
5. Students will increase their measuring and estimating skills.

Scientific Values to be Conveyed
Scientific ideas should be abstract, general, and mathematical

Instructional Strategies
student-centred and teacher-directed discussions, experiential, inquiry

Lesson Outline
1. Student-centred discussion: elicitation of students' common-sense ideas.
   What is it about asâmak, compared to running shoes, that keeps you from sinking into snow?
   - the size of the area touching the snow is much larger.

- or, the person's weight is spread out over a larger area and so he/she doesn't push as hard on the snow. (This second idea is developed later in the lesson.)

2. Activity: Groups of 2 to 4.
   Put math formulas for areas on the board (circles, rectangles, triangles).
   a. Figure out (estimate) the area on the underside of an asâm. (See photographs below.)
      Several methods can work: (i) find the length and width, and calculate the area, subtracting the parts that have been "cut out" of the original shape used in the calculation; (ii) make a cut out of the asâm shape on paper and reshape the cut out into a figure that students can apply a formula to, or use 1000 cm^2 paper to make a comparison; or (iii) any method that has promise.

   b. Figure out (estimate) the area on the underside of a student's running shoe.
   c. Puzzle to solve: (Have this printed out ahead of time for students to work on.)
      Suppose that student weighs 50 kg. Think of the student's weight from the point of view of the snow. As far as the snow is concerned, the student will *seem* lighter when wearing asâmak than running shoes. **How many times lighter?**

      Answer = the answer to (a) divided by the answer to (b).

      (Some students may want to calculate the *difference* between the two: (a) - (b). But the comparison here is "how many *times* lighter," which is proportional reasoning. Monitor the groups to make sure this idea is clear to all students. Otherwise the concept of pressure will not make sense to them. Draw on the terminology familiar in the students' math lessons.) (Students may want to multiple their answers to (a) and (b) by 2 – because there are 2 shoes – but the 2's divide out in the comparison and you get the same answer. Either way works.)

d. Place the results for your group onto a class chart (e.g. overhead transparency, blackboard)

3a. Teacher-centred discussion:

From the *snow's point of view*, the "push-on-the-snow" is "(a) divided by (b)" times lighter with asâmak. The student has the same weight but his/her weight is spread out over a greater area. (This idea may have come up earlier in the elicitation discussion. If so, review it here. If not, clearly introduce it here.) Discuss the students' results to make sure that surface area and the proportional reasoning is well understood. They are important in the culture of science.

The term "push-on-the-snow" is important here because it is a common-sense view of the scientific concept of pressure that will be introduced shortly. Students construct the concept "push-on-the-snow" then label it "pressure" after they understand the concept.

Get students to think of the push-on-the-snow as a combination of two things: the weight of a person, and the area in contact with the snow. Go over the following two relationships so they make intuitive sense to all students.

The *greater* the person's weight the _______ (greater) the push-on-the-snow.

The *greater* the area in contact with the snow, the _______ (less) the push-on-the-snow.

Scientists like to think about things in very general (abstract) ways, using the language of math. That's an important value that guides scientific thinking. Here's how a scientist or engineer thinks about asâmak, from a scientific point of view.

The "push-on-the-snow" is called "pressure" and is defined by the math sentence:

$$\text{pressure} = \frac{\text{weight of object}}{\text{area touching}}$$

Using the data from the earlier examples:

Calculate the pressure of the 50 kg student (use 50,000 g in the calculation) standing on one *asâm* which has an underneath surface area of 4,000 cm^2.

Calculate the pressure of the 50 kg student (use 50,000 g in the calculation) standing on one *running shoe* which has a surface area of 200 cm^2.

Answer:

$$\text{pressure with asâmak} = \frac{50{,}000 \text{ g}}{4{,}000 \text{ cm}^2} = 12.5 \text{ g/cm}^2$$

$$\text{pressure with running shoes} = \frac{50{,}000 \text{ g}}{200 \text{ cm}^2} = 250 \text{ g/cm}^2$$

The pressure *is* much less with asâmak compared to running shoes!

The main point here is for students to be successful at using the scientific concept of pressure in a quantitative way.

Students might want to calculate the pressure using *2* asâmak and *2* running shoes, i.e. assuming the person is standing still (rather than walking, *one* foot after the other). Decide as a class which calculation the class will use. This discussion may bring up the comparison between "ideal abstract" and "concrete common sense." Using 2 asâmak in the calculation is more ideal abstract (scientific), while using 1 asâm is more concrete common sense (engineering).

One or two students may also realize that not only does their body weight push on the asâm, but their foot exerts a further force to propel them forward (Newton's third law of motion: the force to move forward equals the added force pushing on the snow). Do *not* bring this additional factor up yourself. If a student raises it, praise her/him and treat it as an engineering problem to be figured out at some other time (e.g. it may be the topic of the student's report/investigation in Lesson 5).

ENRICHMENT:
This lesson on the science of pressure can continue logically on to step 4 of the Lesson Outline using the units "g/cm^2." These units may make more common sense to students than the more abstract SI units called "Pascals," found in academic textbooks (but not necessarily found in industrial settings). If you want to introduce your students to the SI units, the following enrichment is suggested, before moving on to step 4 of the Lesson Outline.

3b. Teacher-centred discussion (introducing SI units):

Protocol in the culture of science asks us to use different units for pressure, different than g/cm^2.

Instead of grams, the unit of weight is named after Isaac Newton who, about 300 years ago, figured out the force of gravity. One Newton is the force of gravity on about a 100 gram object.
1N = 100 g (about).

The conventional unit of area used for pressure is the square metre. $1 \text{ m}^2 = 10{,}000 \text{ cm}^2$

The conventional way engineers and scientists would calculate the pressure that the 50 kg student exerted on the snow with 1 asâm is:

First of all:

$$50{,}000 \text{ g} = \frac{50{,}000}{100} \text{ Newtons} = 500 \text{ N}$$

$$4{,}000 \text{ cm}^2 = \frac{4{,}000}{10{,}000} \text{ square metres} = 0.4 \text{ m}^2$$

$$\text{So, pressure} = \frac{\text{weight of object}}{\text{area touching}} = \frac{500 \text{ N}}{0.4 \text{ m}^2} = 1{,}250 \text{ N/m}^2$$

Protocol in the culture of science further asks us to name "N/m^2" after a scientist who, about 300 years ago, helped figure out the scientific idea of pressure. The person was Blaise Pascal who lived in France at the same time Newton did his work in England. The unit N/m^2 is called a Pascal (Pa).

Therefore: pressure = 1,250 N/m^2 = 1,250 Pascals = 1,250 Pa

(End of enrichment.)

---

4. Practice using the scientific concept of pressure numerically by calculating the pressure on snow and other things familiar or interesting to students. Use objects in the classroom, for instance. Treat math as a language used in the culture of science. Students can make up a question and then give it to a classmate to answer. The following are examples.

   a. Short activity: Using the same student, calculate the pressure exerted by that student on 3 different sized snowshoes.

   b. Short activity (out of doors, perhaps): Use different sized squares of plywood (conveniently sized for easy calculations) to observe the pressure effect of the same student standing on the different plywood squares. When done on top of snow, you may observe the effect with your eyes.

   c. Suppose a paw of a grown wolf has an area of 36 cm^2. How much pressure does a 30 kg wolf have when standing still on lake ice? (Remember wolves have 4 paws!)

   d. Get students to make up similar problems with other animals (e.g. snowshoe hare). Be sure they logically estimate the quantitative information.

snowshoe hare

   e. Estimate the pressure on the road by a bicycle weighing 15 kg ridden by a 50 kg student. You'll need to measure the area of the tire that makes contact with the road.

CELs / Subject Integration: Math, Native Studies

Resources
Large graph paper for measuring the surface area underneath an asâm
Sheets of square centimetre paper for cutting out area of a shoe
Metre sticks
Asâmak
Calculators
A bicycle (step 4.e.)

Teacher Notes
- Be prepared to discuss that scientists abstract “weight” and “area” from asâmak to explain how they work, and scientists ignore other factors (such as the space between the body lacing and the force of pushing forward) which some of your students might think of. Praise them for their ideas, and use those teachable moments to get students to see this limitation to science – it abstracts things out of context to idealized situations. This helps to identify a value that underlies science (e.g. science ideas should be abstract, general, and mathematical), which is itself content in the Saskatchewan science curriculum.
- Students can be very sensitive about their personal weight, so the calculations using student weights are hypothetical here. Use individual student weights in your class for students who would be happy doing so. Respect is paramount here.
- The unit Pascals is challenging for younger students to understand. The key point of the lesson is to have the students use the idea of weight spread over an area, no matter what units you use. However, by introducing students to Pascals, you sensitize students to refinements that will appear in their future study of science.
- An extension: as a project (science fair?) get students to make a toy model of a snowshoe. Willow would be an appropriate wood to use. String and other materials would substitute for the other parts of a snowshoe.

Lesson 5: *Producing Group Reports on Asâmak*

Timing
2 to 3 days (preparation, some out of class time),
2 or 3 days (presentations)

Goal
To construct an in-depth knowledge about one major aspect of asâmak.

Objectives
1. Students will conduct research on a chosen topic.
2. Students will work effectively with other group members.
3. Students will help compose the report for both oral and written presentations.

Instructional Strategies
co-operative and independent study

Lesson Outline
1. Divide class into groups, with student roles clearly defined.
2. Each group chooses a topic (or comes up with their own topic) about asâmak. The following topics are suggested:
   a. Aboriginal uses of asâmak. Which peoples used asâmak and what types did they use. Why did they use these types?
   b. Asâm construction. How are asâmak made locally? What materials are used? Who makes/supplies the materials?
   c. Types of asâmak. Different designs of asâmak and what use is recommended for each type. Try to create one of your own novel designs.
   d. Modern materials asâmak. What are the modern sport asâmak made of? How are the like and unlike traditional asâmak?
   e. Describe the advantages, disadvantages, and uses of several types of Asâm harnesses.
   f. Animals' paws as asâmak.
   g. Blaise Pascal. Who was he? or How did he help invent the scientific idea of pressure?
   h. Draw a poster that would teach someone the scientific idea of pressure. Try it out to make sure it works well.
   i Investigate other factors than weight that may affect the pressure of an asâm on snow.

CELs / Subject Integration: communication, personal and social values and skills

Resources
1. See the "Background" section in this unit for resources listed.
2. Names of local people who might help students.

Teacher Notes
- Presentations could be made outside of class to other students, to the community, etc.
- Be prepared to coach students a lot on developing their presentation and good communication.

Lesson 6: *A Scientific Experiment: Comparing Different Asâmak*

Timing

1class for preparation	(part I)
1or 2 afternoons to collect data in the field	(part II)
1class to debrief	(part III)

Goal

To role play in the culture of science.

Objectives

1. Students will further understand three types of variables in a scientific experiment (manipulated, controlled, responding).
2. Students will design and conduct their own experiment, and solve the conceptual, informational, and technical problems that arise along the way. This will entail such processes as: forming an hypothesis, predicting from that hypothesis, searching for data, measuring, organizing data, analysing data, and reaching a conclusion about the hypothesis.

Scientific Values to be Conveyed

Measurements are preferred types of observations. Graphing is a preferred method to communicate data. Science manipulates (distorts) reality to study it experimentally.

Instructional Strategies

experiential, inquiry

Background Information

Various snow conditions present difficulties for a person walking on asâmak. Aboriginal peoples developed different designs that worked well in the different snow conditions they encountered. The students will try to discover what asâmak work best in what conditions.

Lesson Outline – I. (Preparation)

1. Review what a scientific experiment is – making fair comparisons between situations by keeping everything the same except for one thing that could affect the outcome. You should use a concrete example familiar to students as you go through this review. Here are some basic steps to review:
   a. Consider some observations (e.g. size and shape of different types of asâmak.)
   b. Imagine (infer) a possible explanation or general idea. This is a hypothesis. For instance, you might infer that one type of asâm is better in certain snow conditions than another type.
   c. Identify the *manipulated* variable (the condition, identified in the hypothesis, that you change to see what effect that condition has), the *controlled* variables (all the conditions that should stay the same in all the situations so comparisons can be fair), and the *responding* variable (the outcome or effect; the variable you measure to find your data). [See the Saskatchewan Curriculum Guide for further details.] If you have a class set of sport asâmak, then this will be one of the controlled conditions for all the groups because everyone will compare another type of asâm to the sports asâm.
   d. Design your experiment according to the variables you've identified.
   e. Do the experiment, measuring, recording, organizing, and analysing your data.

f. Discuss your data in terms of whether the data support your hypothesis or not.
Designs can be more complex due to multiple comparisons. Let students work at the level of complexity appropriate to them.

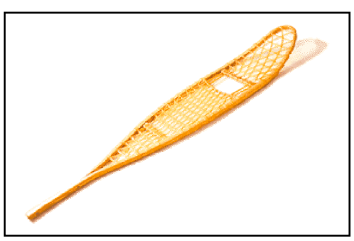
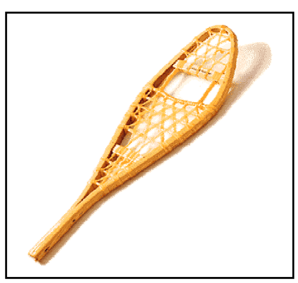
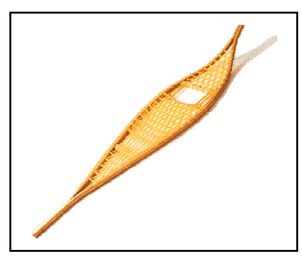
2. Bring out the asâmak and let the students examine them.
   Name the asâmak.
   What Aboriginal group are they identified with?
3. Discuss and name the various snow conditions they will encounter in the local area:
   - hard packed snow on the lake, altered by the wind;
   - deep snow in lake shore willows (willows interact with the wind and thus protect the snow);
   - deep hard drifts;
   - deep snow in grass in fields;
   - deep snow in forested areas.

   Allocate a different condition to each group, or ask them to test out any number, or all, of the conditions. One fairly elaborate procedure is suggested below, in item 6.
4. Provide class time for groups to formulate an hypothesis and design an experiment based on their hypothesis. As you monitor the groups, encourage students to use the language of scientists; for instance, refer to each student as “Dr. <last name>.” Explicitly identify this language with the culture of science.
5. Make sure each group designs a data table ahead of time. Here is an example:

DATA TABLE

Type of Asâm

	type of snow	Sport	Bearpaw	Ojibwa	Pickerel	Other
1	hard, on lake					
2	soft bush snow					
3	in willows					
4	drifts					
5	in grass					
6	other types					

6. In order for groups to logically compare their results, all groups need to agree on how they'll measure the responding variable. The method will depend on what you want your students to do. Here is one way to do it when the students are carrying out a fairly elaborate experiment. Simplify this suggestion to suit your situation.

   Students are told to walk in each of the types of snow using standard (sport) asâmak. The ease of walking on these standard shoes in each area will be designated a "5" on an arbitrary scale (below). Also students will take turns walking in each snow condition (listed in their table). They will quantify the ease of walking in each area. Scientists and engineers highly value observations are quantified. The "ease-of-walking" scale is relative to the sport asâmak, as shown in the table that follows.

Quantification of "ease of walking"

10	Extremely difficult compared to sport asâmak
9	Very much harder
8	Much harder
7	Harder
6	A little harder than sport asâmak
5	**Same as sport asâmak**
4	A little easier than sport asâmak
3	Easier
2	Much easier
1	Very much easier
0	Extremely easy compared to sport asâmak

7. Remind students to write down their data immediately. Each student will have a set of data at the conclusion. Pocket-sized booklets can be constructed ahead of time with a fairly hard cover (e.g. Bristol board).

8. After going over the procedure with the students (or verifying that they have designed their own procedure), they are ready to go out and conduct the experiment.

9. Send permission slips home to parents/guardians.

Lesson Outline – II. (In the Field)

1. Monitor the progress of the groups, helping them standardize their ease-of-walking scale, etc. Remind them that their data must be recorded immediately, not later.

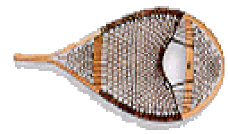
Lesson Outline – III. (Debriefing)

1. Arrange a method to collate the data from each group and make a classroom set (overhead transparency, blackboard, etc.). For each cell in the Data Table (type of snow / type of asâm), record the raw data from each group and calculate the average ease-of-walking. If "out-liers" cause a problem, ensure that the class reaches a consensus on what data should be included and what data should be deleted. (This consensus-making procedure mimics how scientists decide such matters. Subjective elements enter into the decision, to be sure. Treat such situations as teachable moments about the culture of science. Students are expected to criticize ideas, not people.)
2. Have the students design graphical representations of the class averaged data (e.g. a bar graph). Some groups will come up with excellent creative ways of communicating the results. Some computer software might be highly appropriate (see the example below).
3. Discuss the advantages of the various graphical representations produced by the groups. Make sure to address the value of collecting quantitative data in tables and communicating the data in the best graphical form, so that arguments can be made to support certain trends or conclusions.
4. Have students write up (individually or in groups) a public communication of the class results (a classical report or a science fair type of presentation). A report could be copied and sent to people in the community who helped in this unit.

CELs / Subject Integration:
Language Arts

Resources

class set of standard "sport" asâmak (sometimes called Huron or Algonquin),
1 pair of: Bearpaw,
Ojibwa,
Pickerel, and
asâmak with modern material, such as magnesium frames.
graphing materials (including software packages)
Bristol board
adult volunteers to help
web site: http://www.cariboucry.com/snowshoes/faber.htm



Montagnay style — Faber

Teacher Notes

- Pick 3 or more locations with different snow conditions; e.g. an area by a lake with open lake snow, willows with deep snow, grassy area with deep snow, and pine bush.
- Arrange for permission slips to be signed by parents/guardians. Describe the activity and the clothing that must be worn (e.g. winter boots, etc.).
- If needed, arrange for help supervising the students.

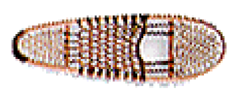
Lesson 7: *Review*

Timing
1 and a half classes

Goals
1. To apply concepts and skills in new contexts.
2. To become aware of how one's ideas have changed over the course of the unit.

Objectives
1. Students will determine the pressure exerted by 2 different types of asâmak that a student has used in Lesson 6.
2. Students will consider the ingenuity of the people who invented the asâm, and understand how their knowledge was passed along from generation to generation.

Aboriginal Value to be Conveyed
obedience



elongated bearpaw – Faber

Instructional Strategies
experiential, interactive

Lesson Outline
Group Work
1. Divide students into groups according to friends (so personal information, such as body weight, will not interfere).
2. Hand out the "Reflection Questions" sheet (or your revision of those questions – see Teacher Notes below), and explain the purpose of each group talking about the answers and recording the key ideas that come up. Students will hand in these records by the end of the class.
3. Hand out to each group an asâm from two different types (sizes), with the instruction to figure out the actual pressure that one of the students exerted on the snow when walking with that asâm. (Remind them of their skills developed in Lesson 4.) If feasible, do the pressure calculations with two students of different weights within a group to see what sort of difference their weights make.
4. Monitor the groups to ensure the talk is about the pressure calculations or thinking of answers to the Reflection Questions.
5. Take in written answers to see the types of ideas the groups have come up with.

Full Class Discussion
6. The following day, hold a free wheeling student-centred discussion on what we have learned about asâmak. Emphasize the importance and validity of Aboriginal knowledge, how it is passed on from generation to generation, and the role of Elders. Western science and technology have not changed the design of asâmak very much at all. The design was "perfect" before contact with Europeans and their science.
   Emphasize the different values that guide, on the one hand, Aboriginal science and technology, and on the other hand, Western science and technology. What are the limitations to Western science and its way of abstracting general mathematical ideas from things, and ignoring ideas that can't be treated this way?

CELs / Subject Integration: personal and social values and skills, communication, Language Arts, Native Studies

Resources
weigh scales for a person
the materials from Lesson 4
Reflection Questions sheet (example, below)
a variety of asâmak

Teacher Notes

- One main point behind this lesson is this: students learn better not only by learning through personal involvement, but by also expressing what they have learned. This is the reason for the Reflection Questions.
- Modify the general Reflection Questions (below) to be more specific questions related to concrete events that have occurred with your class. One way to approach the more general questions, questions that require more abstraction by students, is to walk students through them and work on them as a whole class. This makes an excellent "closure" activity for the unit.

Reflection Questions

---

1. In what specific ways have your (a) ideas and (b) feelings changed (if at all) about asâmak during this unit?

2. You have learned about asâmak from two different points of view: (i) Aboriginal peoples' knowledge, and (ii) scientists' knowledge. (Some people call these two points of view "Aboriginal science" and "Western science" – representing two different cultures each with its own way of looking at the world.)

   a. Make a list of similarities between an *Aboriginal* view of asâmak and a *scientific* view of asâmak. In other words: What do they share in common?
   b. Make a list of differences, between an *Aboriginal* view of asâmak and a *scientific* view of asâmak. In other words: What are their important differences?

3. Give one example of how a value influences what we know about asâmak.

Lesson 8: *Wrap Up*

Timing
1 class

Goal
To conduct summative assessment.

Objective
Students will do well on the end-of-unit exam.

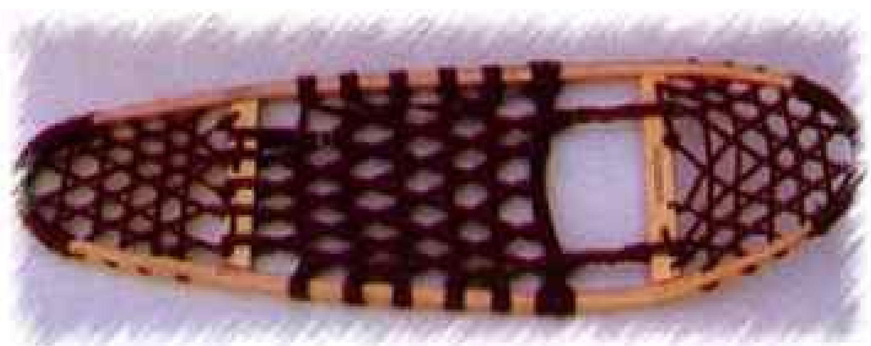
Instructional Strategies
summative assessment

Lesson Outline
1. Arrange students for writing the exam.

Resources
Here are some suggestions for exam questions:

---

1. Asâmak are designed with certain functions in mind. For each of the following design structures, explain their function:
   a. frame
   b. master cord
   c. toe hole
   d. front cross bar
   e. rear cross bar
   f. heal lacing
   g. body lacing
   h. toe lacing
   i. tail



2. Name **three** (3) types of designs for asâmak, AND for each one:
   a. sketch its shape,
   b. explain where it is most useful.

3. Name the two major materials used in the construction of asâmak AND describe the properties that make each material so useful in making asâmak.

4. Name the tools needed to construct asâmak at home.

5. Name three animals that have paws like asâmak, AND explain how such paws are useful to the animals.

6. Describe in detail how a **scientist** would explain how an animal's paws would keep the animal from falling through a crust of snow.

7. Explain the importance of asâmak in the culture of the Métis and Cree peoples. (1 paragraph answer)

8. Describe, in a short paragraph, the behaviour a young person should display when approaching and gaining information from an Elder.

9. In a sentence, describe what or who the following are:

a. hypothesis	b. experiment	c. Newton	d. Pascal
e. controlled variable	f. manipulated variable	g. data	

Teacher Notes

- Some students may be able to demonstrate their understanding of the unit's content by taking an exam orally. A teacher's choice between a written and oral exam depends on a teacher's goals for the students. We can't ignore the fact that written exams are a central part to Euro-Canadian culture, and so students should develop the skill to take written exams. On the other hand, for some students their marks from written exams do not validly indicate what they actually know. Many circumstances, such as the grade level, will influence a teacher's decision.