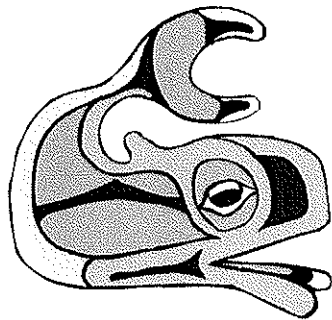




Integrating Aboriginal Culture with Mathematics

K - 12



Project by SD 70 (Alberni) staff
January 2007

Integrating Aboriginal Culture with Mathematics K - 12 Rationale

Using button blankets as a main focus, students were introduced to Aboriginal culture by integrating it with mathematics. The Button Blanket Math Unit from SD72 was used as a starting point. This unit focused on grade 2 math outcomes. Math topics addressed were: measuring, patterning, sorting and categorizing, counting and number operations, graphing and geometry. From this unit, it was easy to see how this unit could be expanded into all grade levels in mathematics. The same math topics will be used, but the degree of difficulty will depend on the grade level of the students. For example, patterning in the primary grades would lead to t-tables and algebra skills in the upper grades. Symmetry and transformational geometry could also be developed further.

In the grade 2 pilot project, Aboriginal resources and resource people were used to help implement the unit. For example, a local Aboriginal artist came to visit the class and showed the students the different shapes and forms used in Aboriginal art. The class worked with the artist to develop a crest, which later was made into a template and put onto a button blanket. Nuuchahnulth Education Workers (NEWs) helped the students sew the buttons and sequins on the button blanket following the patterns that the students chose.

With this pilot project in mind, it was decided that a district unit "Integrating Aboriginal Culture with Mathematics K - 12" would be developed. Teachers began getting together on April 19, 2005 (during a Numeracy Network meeting) to share ideas on ways to integrate math and Aboriginal culture. Any interested people were invited to participate and share their ideas. The First Nations Resource Teacher and some NEW workers also shared their ideas.

From this meeting, a draft was written up of all the ideas shared. The ideas were divided into four categories: Primary, Intermediate, Middle and Secondary. Another set of meetings were held in November/December 2006 to add another aspect to the unit looking at a variety of Aboriginal artifacts (not just button blankets and shawls) to enhance mathematical learning. All district schools would receive an "Integrating Aboriginal Culture with Mathematics K - 12" kit. The kit consists of a Button Blanket unit, pictures

of button blankets, FN stamps, cutouts and die cuts of the FN forms (ovoid, s, u and split u forms), samples of First Nations forms, pictures of these forms in artwork, and button samples as well as the teacher resources developed at the meetings. With the kit, it is hoped that students will develop an understanding of Aboriginal culture through learning mathematics in an integrated way.

Credit must be given to all the SD 70 employees involved in the creation of this project. These were:

Deb Atleo	Moina Currey	Brenda Heitland
Julia Atleo	Krista Dillon	Gavin MacLeod
Dennis Bill	Sheila Johannessen	Lenora Milliken
Tooie Casavant	Rosalie Harper	Vanessa Sjerven

Thanks also to Kathy Kendrick and Erin Koszegi for allowing the use of their classes to pilot the Button Blanket math unit that started this project off.

Integrating Aboriginal Culture with Mathematics K-12

- also the opportunity to work with buddies (sewing, threading needles, making a button blanket - measuring)

NUMBERS:

Number Concepts:

Primary:

- Count buttons on blanket or portions of the blanket
- Match buttons to picture (one-to-one correspondence)
- Count sets of buttons
- Build sets of buttons (more than, fewer than, same as, who has the same # as, ...)
- Arrange sets in different ways (4 big and 1 small = 5 buttons)
- Order by size of button
- Estimation (all grades)
- Make number books using FN shapes/forms or pictures of FN art

Intermediate/Middle:

- Drums - estimating how much deer hide it takes
- Estimate size, in square kilometers, of traditional territories
- Estimate and compare number of Aboriginal people in each territory; compare with non-aboriginal in each territory

Number Operations:

Primary:

- Use buttons as manipulatives
- Make the number of buttons; change to another number of buttons; how many buttons needed to extend patterns
- Number books with Aboriginal shapes/forms
- Importance of number 4 to aboriginal people; use to show different ways to make 4

Intermediate:

- Fractions, % - (i.e.) What fraction of the buttons are black?
- Calculating distances of travel of Aboriginal people

Middle:

- Rates of speeds of animals; harpoons

- Using historical information plot and calculate the distances that Aboriginal people had to travel from campsite to campsite in and around the Alberni Inlet throughout a yearly cycle.
- Order of operations - different ways to make 4 (importance of 4 in Aboriginal culture)

Secondary:

- Rates - physics - speed of harpoons; animals
- Trigonometry - angle of harpoon

PATTERNS AND RELATIONS:

Patterns:

Primary:

- Sorting buttons (by colour, size, holes, shiny/not shiny, etc)
- Sorting Aboriginal shapes/forms (on cards)
- Create and describe patterning with buttons; extending patterns on button blanket placemats
- Stamping patterns with rubber stamps in kit
- Patterns with die cuts of forms and shapes; extending these patterns
- Recording patterns
- Matching and copying patterns
- Beading patterns; patterns in friendship bracelets, basket weaving, dream catchers
- Basket weaving - counting the number of knots or twists you have to make on each line to create a figure or shape used to decorate a basket.
- Making headbands with Aboriginal patterns
- Fish printing - looking for patterns in the scales
- Patterns in Aboriginal music and drumming
- Classifying and sorting different Aboriginal animals (wolf, bear, deer, raven, eagle, whale).

Intermediate/Middle:

- Making paddles or drums with Aboriginal patterns
- Examine scales to determine the age of the fish. (This data could be graphed.) Also, the otoliths (ear bones) are used to determine age and measurement of these can be compared to fish length. There is a relationship between the two. The following formula can be used to determine fish weight: $(\text{Girth} \times \text{Girth}) \times \text{Length} / 800 = \text{weight in lbs}$ (girth and length are in inches)

Variables and Equations:

SHAPE AND SPACE:

Measurement:

Primary:

- Cooking Aboriginal foods; Aboriginal feast; potlatch - consumer project (see T. Calkins' Teachable Moments resource for project info.)

Intermediate/Middle:

- Proportional art (mural) - grid and string (scale drawings)
- Proportional Art in relation to Math. Take some Aboriginal designs (eg. eagle, raven, bear) that are copied on to standard 8.5 X 11" copy paper. Then take a plastic overlay (overhead sheet with photocopied 2cm X 2m grid on it) and place it on the design. This is then photocopied for the students. Students then number the horizontal and vertical axis on this page. Now, using a large poster size page - they draw a larger scale grid (depends on size of poster used) - probably a 5cm X 5cm grid will be in scale with the original page. The next step is to recreate the original in the larger scale. This has been very popular and students are amazed by their results - painting the final poster and then erasing the grid is the final step.
- Making drums - measuring deer hide
- Models of long houses; scale drawings (T. Calkins' House project)

Secondary:

- Scale drawings
- Proportion - family shawl - math for supplies

3-D Objects and 2-D Shapes:

Primary/Intermediate/Middle/Secondary:

- 3D angles in dream catchers
- Language of geometry in nature

Transformations (in Aboriginal art designs):

Primary:

- Symmetry

Intermediate:

- Lines of symmetry
- Slides, flips, turns

Middle:

- Translations, reflections, rotations, dilations
- Point of rotation
- Tessellations

STATISTICS AND PROBABILITY:

Data Analysis:

Primary:

- Graphing different kinds and types of buttons
- Pictographs
- Surveys

Intermediate/Middle:

- Tally animals in Aboriginal myths/legends - graph it; find measures of central tendency (mean, median, mode, range)
- Graphing territories (sq. km)
- Graphing distribution of language among Aboriginal peoples

Chance and Uncertainty:

Intermediate/Middle/Secondary:

- Game "Lahal" - probability; counting, guessing and prediction in the game

Researching a Nuu chah nulth Artifact from a Mathematical Perspective

Task: Choose an artifact from the nuu chah nulth culture, investigate and research it, report on it from a mathematical perspective.

Outline:

Before beginning this project, you need to submit an outline of your ideas.

This should include:

- Your name
- Artifact you chose
- Your plans (in point form) for each section of the project, including how it will be presented (displayed); timeline may be included (completion dates)
- Hand this in for teacher approval before continuing with further research

Your project must include the following:

Section 1:

- Name of the artifact
- Brief description of the artifact (include picture, if possible), purpose (use) or source; its significance or importance to nuu chah nulth culture
- Details about why you selected this particular artifact

Section 2:

Part A: Cultural Concept

- Protocol - BIG PICTURE - RESPECT
 - "What is the protocol if I were to use this artifact?"
 - "How do I go about getting permission to use artifact?"
 - History
 - How they are handled (what you traditionally do or do not do as you use them)
- Nuu chah nulth word for the artifact that you are studying
 - see resources section

Part B: Mathematical concept

- Provide a detailed description of the mathematics behind the artifact.
Be sure to include which mathematical strand it falls under.
Number: Concepts and Operations
Patterns and Relations
Shape and Space
Statistics and Probability

Section 3: Mathematical problem based on the artifact

Write a mathematical problem (at your grade/skill level) based on your chosen artifact

- Include problem and solution(s). Show all your thinking to solve it.

Section 4: English/Language Arts

Research and report on an existing legend/myth, published story that is centred around the artifact, or create your own (personal) story

- Include/focus on the significance of oral traditions
- Your writing should leave a lasting impression on the reader and give the impression that the artifact is important to the presenter
- Reader should learn key information about the artifact (refer to Section 1)
- Make some connections with the mathematics in the artifact

Section 5: Reflection

After completing your research part of the project, submit a reflection answering the following:

- How did the Aboriginal artifact enhance your understanding of the mathematical concepts and nuu chah nulth culture?
- How has your thinking changed from before starting the project?
- What surprised you?
- Support your ideas.

Display and presentation:

You will make a 10-15 minute in-class presentation about the artifact

- Include written and visual display; actual artifact is optional
- Display should clearly present all 5 sections

Assessment:

Assessment will be based on the criteria outline in a class generated rubric.

Nuu chah nulth Artifacts

Preface on protocol for ownership

Aboriginal cultures have distinct conceptions about cultural ownership and have strict protocols to observe these values. According to our teachings, cultural property such as songs, crest designs, dances, masks and headdresses or names belong to families. This means that the family has inherited the right to sing the song, dance the mask or use the crest design of their clan or family. Not only do they have the right to use these objects, but they are also responsible for preserving, for example, the songs and dance. We are taught that it is not acceptable to infringe upon another family's rights to a song. If you want to use that song, you are to obtain permission from the family. Therefore, it is improper for educators to use local cultural property in the classroom without permission from the appropriate sources.¹ This said, some cultural property is communal, which may be used by all nuu chah nulth, and others are fun songs that have been given to specific schools to use. In these cases, schools are entitled to use these songs or cultural property. The school's Nuuchah Nulth Education Worker (NEW) can help guide or connect you with the appropriate people to advise you on protocols that relate to your work in the classroom.

Resource:

From *Time Immemorial: The First Peoples of the Pacific Northwest Coast*. Diane Silvey. Pacific Edge Publishing: Gabriola, B.C, 2005.

¹ This does not include historical knowledge that is part of the collective memory or part of a published work.

Basketry

Basket-weaving was both functional and artistic. Baskets were used for a variety of purposes such as carrying fish and berries, carrying babies and gathering medicinal plants. Women took great pride in their basket-weaving. Cedar bark was one of two common materials used, the other being grass. The grass was collected and soaked for periods of time to help make it more pliable. Many baskets included elaborate designs of mythological creatures, people, and animals.

Bentwood Box

These are made from two planks of cedar, which are bent into shape through a long process of steaming the wood to soften it and then bending it into shape and binding it with ropes. Once formed, the box is then pegged or sewn together and often decorated with traditional designs belonging to the family. These boxes were used for storage of both food and ceremonial dress called regalia.

Canoes and Paddles

Canoes were central to the nuu chah nulth nations as travel on land was too difficult through the dense rainforest of the west coast. Canoe builders are highly trained and spiritual people. The craft combines the knowledge of a master carpenter with the guidance from a spirit helper. The carver takes a lone cedar tree, falls it, roughs out the frame, hollows it out and then goes through a process of steaming the wood to obtain the shape. It is a labourious process and is highly celebrated upon completion and launching of the canoe. There are numerous types of canoes depending on the intended purpose for the canoe. Paddles were crafted in different shapes and styles depending on their purpose.

Cedar Bark

Rich abundance of the cedar provided for most of the needs and goods of the nuu chah nulth nations. The cedar tree is very symbolic and meaningful for the nuu chah nulth (nuučaanut) people. It has served many purposes for Aboriginal people, from practical uses to ceremonial uses. Traditionally, cedar bark was used to make clothing, sleeping mats, baskets for gathering food, ropes for canoes/harpoons, etc.

There are strict teachings for gathering cedar. A specific method and certain ceremonial protocol are observed. During the spring people would go

to the forest in search of tall cedar trees with high branches. They wanted to be able to peel off long pieces of bark for ease in cleaning and preparing for weaving. The bark is first peeled from the bottom of the tree, (gently making a cut only through the outer layer of bark), to as high as the first branches. The strip of bark must then be cleaned and stripped again into thinner layers before it can be used for weaving. The bark is then folded into bundles and stored to dry until needed. When ready to use the cedar must be soaked so that it becomes soft and pliable to work with. It was considered the most suitable material for things such as clothing and blankets because of its water/rot resistance properties. Cedar bark boughs are often used ceremonially to cleanse a room, doorway or dance floor.

Drums and Songs

Drums most often are made from deer hide but other skins can be used successfully. The rim of the drum is made from cedar that has been steamed and shaped into a circle. In the past the sinew from the inside of a deer was used to tighten the hide around the rim of the drum. Making a traditional drum takes a very long time - from the time the deer is hunted, skinned and the hide is cleaned and tanned. Then the rim must be formed and steamed.

Drums have been used as a form of communication. Songs/chants always accompany drumbeats. Songs have been used to tell stories, pass on the history/legacy, show where a tribe/family is from, mark a significant event in one's life, etc. Songs can be used for celebration, mourning, gift giving, decoration, etc.

It is very important to know or to find out WHO owns a song BEFORE you can use it. It is very strict protocol to ensure you have permission from the owner of a song (whether individual or tribe) before you can sing it.

Masks and Headdresses

Masks and headdresses are individually or family owned. Masks are passed down to younger generations within families or can be made for specific occasions. Masks often depict an animal or person. All masks have the story the creator of the mask has given it.

There is a very strong protocol to the storing and use of masks and headdresses. It is said that when you wear a mask or headdress it comes

alive - you become the mask. Masks and headdresses are always treated with respect and gentle handling. When a mask is "sleeping" (stored away) it is normally wrapped in cloth and always facing EAST. East is the direction of new beginnings and a new day. Sometimes masks must be put away permanently or burned (sent to the spirit world) depending on the individual circumstances. Masks are a sacred part of aboriginal culture and demand the highest form of respect.

House Posts and Welcome Figures

The nuu chah nulth traditionally constructed poles, called house frontal posts, to identify clans or families in the village. The poles depicted events or stories that were part of the family's oral tradition. The crest design belonged to the family or recorded the family's history.

Welcome figures were often erected by chiefs to welcome travelers from other territories.

Salmon

The rich abundance of salmon provides a relative life of leisure for the nuu chah nulth. They fish salmon in the early summer and preserve it for the rest of the year by smoking or drying the salmon. Because salmon constitutes such a large part of the nuu chah nulth diet, it receives its due respect. This resource is carefully managed and highly valued. Other practices include returning the remains of the salmon after cleaning to the water.

Shawls and Button Blankets

The button blanket is a traditional piece of regalia worn by Aboriginal people on the west coast of British Columbia. Among the nuu chah nulth, this piece of regalia is commonly referred to as a shawl. The shawl is worn during dances and important ceremonies. The designs on the shawls are based on family history and stories. The designs are considered possessions and are not to be copied by other individuals or families. The shawl is carefully handled and never worn "for fun".

Whaling

Whales were a key component of all nuu chah nulth life, including, governmental, spiritual, economic, and dietary aspects. Whaling was a

hereditary right exercised by chiefs. It was the responsibility of the chief to share the whale with his community.

There were many spiritual activities that involved the chief and his crew. The preparations took many months of fasting and praying. The whale was believed to give itself freely to the chief if all the correct protocols were followed. The whale was cut up and distributed according to status and rank within the village with the best pieces going to the chief. There were many types of whales that were hunted from spring to late fall.

Note: Traditionally, the nuu chah nulth language does not include capitals or hyphens.

* For this project, we used the phonetics of nuu chah nulth (nuučaanut)

Assessment Rubric

Name _____ Date _____

Artifact _____

	Not Yet Within Expectations	Minimally Meets Expectations	Fully Meets Expectations	Exceeds Expectations
SNAPSHOT	<i>The work is insufficient. The student is unable to meet basic requirements of the task without close, ongoing assistance. No relevant extension.</i>	<i>The work satisfies most basic requirements but is flawed or incomplete. The student may provide an extension that varies slightly from the original task or by making minor revisions to the original task.</i>	<i>The work satisfies basic requirement of the task. If asked, the student can produce a relevant extension or illustration, and may be able to produce an alternative procedure.</i>	<i>The work is complete, accurate, insightful and efficient. The student may volunteer an alternative procedure, an extension, an application, or further illustration of the same mathematical idea.</i>
SECTION 1 Description and Purpose	Incomplete description; May not list purpose, significance or importance to nuu chah nulth culture; May not list details about why artifact was selected	Complete, accurate description; Lists purpose, significance or importance to nuu chah nulth culture; May or may not list details about why artifact was selected	Detailed description of artifact and reason for choosing it; Lists purpose, significance and its importance to nuu chah nulth culture	Creative and detailed description of artifact; Unique reason for choosing it
SECTION 2: Part A Cultural Concept	Incomplete; does not include all components	Lacking details or background information on artifact; Purpose and protocol may be incomplete or missing details; May not list nuu chah nulth word for artifact	Accurately identifies purpose and protocol of artifact; List nuu chah nulth word for artifact	Accurately identifies purpose and protocol of artifact; Lists variety of the artifacts (ie) types of paddles; Comparison to other types of the same artifact or comparison to other artifacts (ie) drums to songs; Pronunciation of nuu chah nulth word
SECTION 2: Part B Mathematical Concept	Incomplete description of the mathematics behind the artifact; Unable to identify concepts or procedures needed; Does not apply relevant concepts, skills, and strategies appropriately; major errors or omissions;	Identifies some of the mathematics behind the artifact; may oversimplify or miss some aspects; Applies most relevant concepts, skills, and strategies appropriately; some errors or omissions; With support, can recognize and use	Identifies the mathematics behind the artifact; Applies relevant concepts, skills, and strategies appropriately; may include minor errors or omissions; Recognizes and uses basic patterns and relationships	Thorough description of the mathematics behind the artifact; may offer alternative solutions to solving the problem mathematics from more than one math strand; Applies relevant concepts, skills, and

	Unable to recognize patterns and relationships	some patterns and relationships		strategies accurately, efficiently and thoroughly; Recognizes and uses patterns and relationships independently; may generalize to other problems
SECTION 3 Mathematical Problem	Poor effort; Strategy and approach is incomplete; Unable to follow appropriate strategies; answers or solutions are improbable ; Major recording or calculation errors; May not include charts or diagrams	Minimum use of mathematics when solving problem; Has a plan but is often inefficient and does not check or adjust the plan; May need reminders to check plan and strategies; may not follow through; Some errors in recording, calculations and diagrams or charts	Accurate use of mathematics to solve problem; Analyzes problem and develops a plan; shows steps and easy to follow; Can explain method when asked; Estimates are logical and can verify solutions; may include minor errors	Accurate use of mathematics to solve problem; Analyzes problem and develops an efficient plan; easy to follow; May offer alternative ways to solve the problem; Estimates are logical and verifies solutions; Calculations are accurate, including symbols or units; no errors in final solution
SECTION 4 Story	Inaccurate information; Unrealistic story; little or irrelevant detail on artifact	Story has some connection to artifact but may be incomplete	Story connects to artifact; includes detail and description	Story connects well to artifact; is entertaining and engages reader; includes detail and description
SECTION 5 Reflection and Effort	Little effort put into project; Constant encouragement is needed to complete task; Reflection is incomplete	Minimum effort and participation; Needs encouragement to participate and stay engaged; Needs teacher direction; Requires external motivation and assistance	Initiates self participation and willingly shares information; Engaged in research of artifact and asks questions	Researches on own and finds answers to own questions; May provide extra material and information on artifact
PRESENTATION	Incomplete presentation; Visuals and graphics do not clarify the information presented; May be difficult to follow; may be presented as a list of facts and information; Often does not have a conclusion	Presentation includes all sections but may not be well organized; Limited visuals or graphics; Information is logically organized but sequence may be difficult to follow; Has conclusion but may be abrupt	Organized and clear presentation; Visuals and graphics are clear and complete; Information is organized and sequence is easy to follow; Conclusion brings a sense of closure	Interactive and engaging presentation; Clearly defines purpose and focus; Effective visuals and graphics that clarify and elaborate on the information; Logical organization and sequence; Effective conclusion

Integrating Aboriginal Culture with Mathematics K - 12

List of Resources in kit:

SD 70 project unit booklet

"What is a Button Blanket" booklet and CD (SD 72)

Grade 2 Button Blanket Math Unit (SD 72) * **elementary kits only**

Four large posters of FN forms (U shape, Split U shape, ovoid and S shape); laminated

Six Large Button Blanket Posters - examples of different button blanket designs from Tony Hunt, Simon Dick, Carrie Weir, Dora Seward Cook, Dempsey Bob, Joe David; coloured, laminated

Seven small Button Blanket Posters showing details - coloured; laminated

4 shape die cuts (U shapes, Split U shapes, ovoids and S shapes)

2 Rubber stamps (eagle head and whale) * **elementary kits only**

Bag of buttons * **elementary kits only**

Our Words, Our Ways - Alberta Learning Resources #619166
(ISBN 0-7785-4313-7)

Nuu chah nulth Phrase and Dictionary * **district kit**

Nuu chah nulth Phrase and Dictionary CD * **district kit**

The Button Blanket A Northwest Coast Indian Art Activity Book - Nan McNutt, 1997, Nan McNutt and Associates, Sasquatch Books (ISBN 1-57061-118-1) * **district kit**

Robes of Power - Totem Poles on Cloth (ISBN 0774802642) * **district kit**

References

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Jensen, Doreen and Sargent, Polly. (1986). Robes of Power: Totem Poles on Cloth. UBC Press: Vancouver, BC.

McNutt, Nan. (1997). The Button Blanket: A Northwest Coast Indian Art Activity Book. Nan McNutt and Associates, Sasquatch Books: Seattle, WA.

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www.bced.gov.bc.ca/abed/shared.pdf

www.firstvoices.ca

www.nuuchahnulth.org

www.tseshaht.com


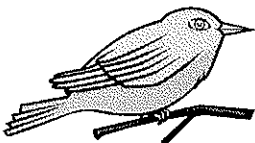
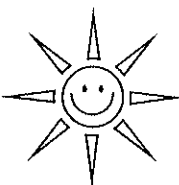



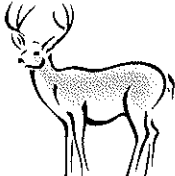


Numbers

1	c'awaak (saw walk)	
2	ʔaʔa (ũ k lă)	
3	qacc'a (cut sũh)	
4	muu (moo)	
5	suč'a (sue cha)	
6	n'upu (nuh poo)	
7	ʔaʔpu (ũ k poo)	
8	ʔaʔak ^w a> (ũk clũ quath)	
9	c'awaak ^w a> (sow wah quath)	
10	hayu (hi you)	

11	hayuʔiʃ c'awaak	<i>(hi you ish saw walk)</i>
12	hayuʔiʃ ʔaʎa	<i>(hi you ish ũ k lă)</i>
13	hayuʔiʃ qacc'a	<i>(hi you ish cut sŭh)</i>
14	hayuʔiʃ muu	<i>(hi you ish moo)</i>
15	hayuʔiʃ suč'a	<i>(hi you ish sue cha)</i>
16	hayuʔiʃ n'uru	<i>(hi you ish nuh poo)</i>
17	hayuʔiʃ ʔaʎru	<i>(hi you ish ũ k poo)</i>
18	hayuʔiʃ ʔaʎak ^w a>	<i>(hi you ish ũk clŭ quath)</i>
19	hayuʔiʃ c'awaak ^w a>	<i>(hi you ish sow wah quath)</i>
20	caqiic	<i>(suh kēēts)</i>
30	caqiic ʔiʃ hayu	<i>(suh kēēts ish hi you)</i>
40	ʔaʎiiq	<i>(uh thēēk)</i>
50	ʔaʎiiq ʔiʃ hayu	<i>(uh thēēk ish hi you)</i>
60	qacc'iiq	<i>(cuts seek)</i>
70	qacc'iiq ʔis hayu	<i>(cuts seek ish hi you)</i>
80	myyiiq	<i>(my yēēk)</i>
90	myyiiq ʔiʃ hayu	<i>(my yēēk ish hi you)</i>
100	č'iiw	<i>(sooch ee wa)</i>

**Pronunciations in italics*

COLOURS

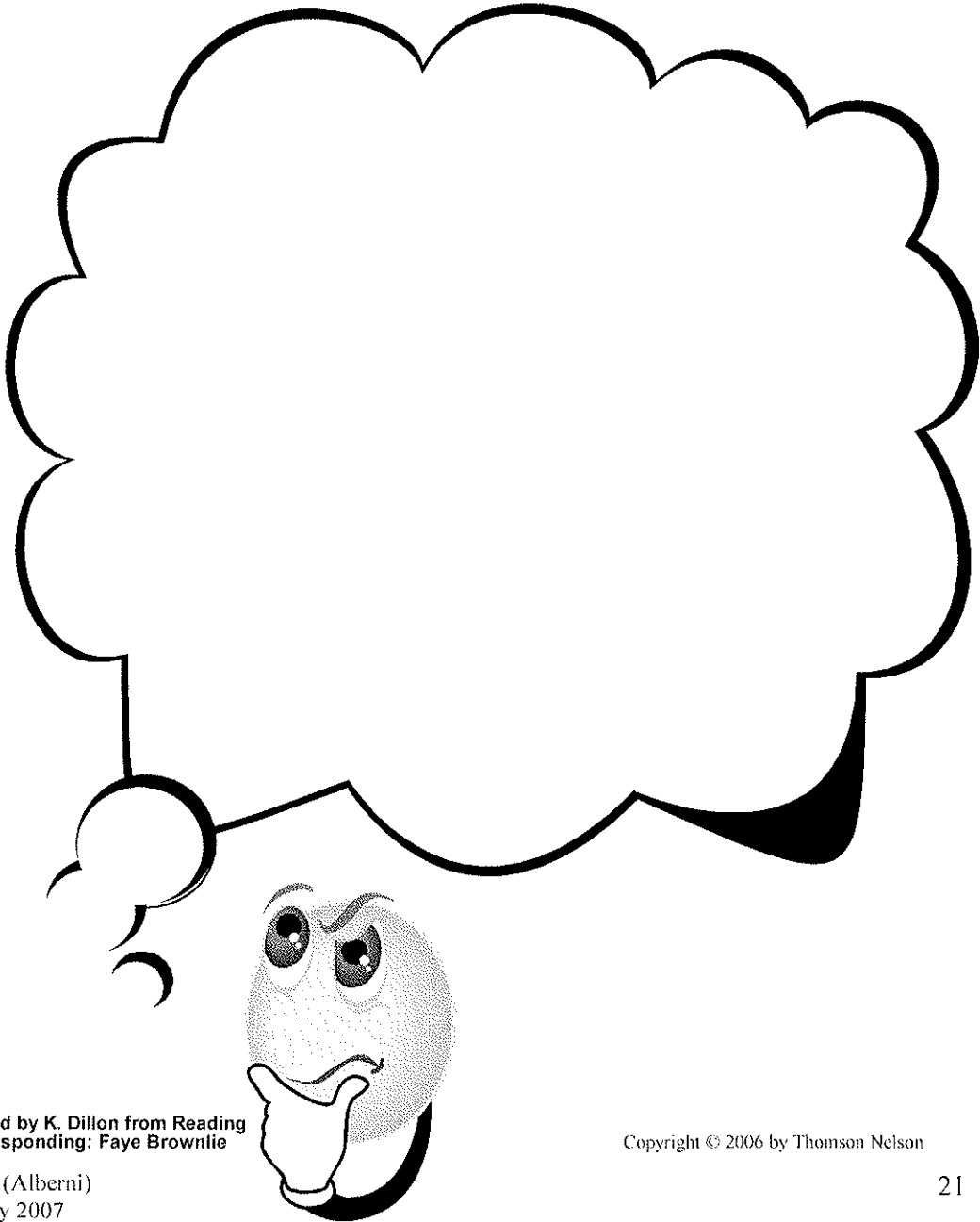
<p>λ'ihuk (cli hook)</p>  <p>red</p>	<p>kiničak (kinits ũk)</p>  <p>blue</p>	<p>ħicpiqak (hits pick ũk)</p> 
<p>pipickuk (dĩ pits kũk)</p>  <p>orange</p>	<p>Ŧumaaqak (oo mah kũk)</p>  <p>green</p>	<p>ŧamaŧiqak (yah mah pēē kũk)</p>  <p>purple</p>
<p>wařak (wash ũk)</p>  <p>brown</p>	<p>>iwahŧiqak (cli wah pēē kũk)</p>  <p>grey</p>	<p>λ'ihŧiqak (cli pēē kũk)</p>  <p>white</p>
<p>tupkuk (toop cook)</p>  <p>black</p>	<p>λisuk (clĩ sōřk)</p>  <p>white</p>	

**Pronunciations in italics*

Before You Start

Name _____ Date _____

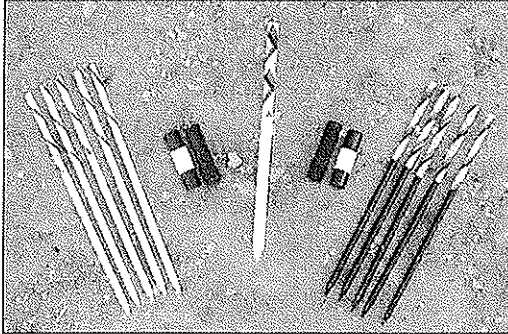
Think about what you know about nuu chah nulth culture. Show what goes on in your mind. You can use pictures and words.



Lahal Game

The lahal set:

- The king stick (extra stick)
- 10 sticks (5 on each side)
- 2 sets of lahal bones (so it would be 2 blank 2 stripe)



Above: sla'hal set

Players: 6 or more
1-3 Guessers

How to play the game:

Lahal is played with two teams of six or more players. The object of the game is to get all the sticks from the opposing team. There are six sticks on each side to start off the game.

Each team has what is called a Doctor. He calls the shots. For example, he decides who will be the “shooter” – the player who guesses where the white bones are. Doctors of the two teams play off for the King Stick (extra stick).

Four bones are used in the game. They are usually small enough to fit securely in the hand and not be noticeably different except in color. The bones are either white or marked with a stripe.

One team (Team A) starts with the two pairs of bones. Two players on Team A hide the bones in their hands and hold them out to Team B. The shooter on Team B, using special hand signals, guesses where the white bones are.

Sticks, and the right to hold the bones, are won or lost depending if the shooter’s guess is right or wrong. The game ends when one team has won all the sticks from the other team. Sometimes the games can go on-and-on; some games take up to a couple hours.

Rules will vary depending on what territory or Nation you are from.

Unit Plan: Researching a Nuu chah nulth Artifact from a Mathematical Perspective

Stage 1 – Desired Results	
<p>Established Goals:</p> <ul style="list-style-type: none"> • Develop an understanding of Aboriginal culture through mathematics • To enhance students' mathematical learning 	
<p>Understandings:</p> <ul style="list-style-type: none"> • Aboriginal cultures have distinct conceptions about cultural ownership and have strict protocols to observe these values • Aboriginal designs involve different shapes and patterns • Mathematics is involved in the creation of Nuu chah nulth artifacts. 	<p>Essential Questions:</p> <ul style="list-style-type: none"> • Why is the protocol important in Aboriginal culture? • Why do we need permission to use the artifact?
<p>Students will know ...</p> <ul style="list-style-type: none"> • The four forms (ovoid, s-form, u-form, split u-form) used in creating Aboriginal designs • The importance of family designs/crests • The importance of the number 4 to Aboriginal people • The importance of nature and the environment to Aboriginal people <p>Students will be able to ...</p> <ul style="list-style-type: none"> • List and describe examples of Nuu chah nulth artifacts • Describe the protocol for at least one artifact • Describe some mathematical terms relating to the artifact • Solve a mathematical problem about the artifact (showing all thinking/work, including examples) • Research local artifacts 	
Stage 2 – Assessment Evidence	
<p>Performance Tasks:</p> <ul style="list-style-type: none"> • Descriptive paragraph of artifact listing its purpose, significance and importance to Nuu chah nulth culture • Mathematical problem and solution: Accurate use of mathematics to solve the problem; analyzes problem and solves it showing all thinking • Oral Presentation 	<p>Other Evidence:</p> <ul style="list-style-type: none"> • Participation in class discussions
Stage 3 – Learning Plan	
<p>Learning Activities:</p> <ul style="list-style-type: none"> • Brainstorm – "Before you start" worksheet • Trip to local museum • Sharing of artifacts samples (NEWS) • Outline of ideas (for project) • Project including oral presentation and Reflection 	

Samples of Ideas for Project

ARTIFACT	MATHEMATICS
Basketry	<ul style="list-style-type: none"> • Length of cedar bark or grass • Time span of soaking of the grass • Measurements of basket (length, width, height, perimeter, circumference, area, volume) • Number of knots and twists on each line to create the shape decorating the basket – graphing and comparing them
Bentwood Box	<ul style="list-style-type: none"> • Length of cedar planks, rope used for binding and pegs • Linear measurements of the box • Surface area and volume
Canoes and Paddles	<ul style="list-style-type: none"> • Linear measurement and weight of tree used (both before and after carving) • Graphing the different types and uses of paddles
Cedar Bark	<ul style="list-style-type: none"> • Process of gathering cedar bark: time span, lengths needed for different uses • Graphing the different uses of bark
Drums and Songs	<ul style="list-style-type: none"> • Circumference of drum rim • Measurement of deer hide to cover drum • Length of sinew to attach hide to rim • Patterns in songs/chants when drumming
Lahal	<ul style="list-style-type: none"> • Linear measurement of sticks • Probability
Masks and Headdresses	<ul style="list-style-type: none"> • Measurement when making the mask and of finished mask
House Posts and Welcome Figures	<ul style="list-style-type: none"> • Linear measurement • Weight • Scale drawings and proportion
Salmon	<ul style="list-style-type: none"> • Estimating amounts for food and preserving • Determining the age of the fish by examining the scales • Relationship of otoliths (ear bones) to fish length to determine fish weight (girth x girth) x length / 800 = weight in lbs
Shawls and Button Blankets	<ul style="list-style-type: none"> • Patterns • Symmetry • Transformational geometry and

	tessellations
Whaling	<ul style="list-style-type: none">• Linear measurement• Fractions (dividing up the portions within a village)• Weight• Rates of speed (harpooning)• Angles of harpoon (trigonometry)