Teaching Lushootseed Math

David Cort
Marysville School District

The Tulalip Language and Culture Committee is made up of representatives of the Tulalip Tribes and the Marysville School District. In its vision statement, the Committee calls for the development of an option program in the school district using a "Tulalip-based curriculum." Since I teach all subjects to fifth graders at Tulalip Elementary School, I began to ask myself, what would such a curriculum look like during math time? What mathematical goals might we have for our students in a Tulalip-based curriculum? One goal for any multicultural math curriculum is to help students realize that there are different ways of perceiving the world mathematically, and to help them value and respect the differences in the math systems of different cultures. But because I work with Tulalip children I have a second goal. I want to help my students become as comfortable thinking about the world using Lushootseed math concepts as they are using English math concepts. I want to help my students become mathematically bicultural.

How can we realize these goals as teachers developing a Tulalip-based math curriculum? It would be easy to inject Tulalip culture into a traditional math curriculum: "Find the area and perimeter of the longhouse." But that would not help our students develop a different way of perceiving the world mathematically. I want to help my students learn to estimate, measure, multiply and divide using Lushootseed concepts; to view the world in Lushootseed categories when they perceive quantity; to count on their fingers in a way that expresses Lushootseed grouping of numbers; to experience calendar time in a Lushootseed way.

A curriculum that attempts to achieve this might include some of the following curricular components. I have organized these components in two sections. The first section, Lushootseed Math Concepts, is the most important because it contains suggestions for a math curriculum that helps students perceive the world according to Lushootseed categories. The second section, Teaching About Math in Puget Sound Culture, contains activities that expose students to some mathematical elements in Puget Sound culture.

Lushootseed Math Concepts

Measurement

The two primary Lushootseed lengths of measure are the taɬ and the x̌ʷiƛ̓. The taɬ is equal to the distance from middle fingertip to middle fingertip with arms outstretched, similar to the fathom. The x̌ʷiƛ̓ is equal to the distance from the thumb to the tip of the middle finger with fingers stretched apart. (Haeberlin and Gunther also mention the half-fathom, and Eels mentions one or two additional measurements, but I cannot find any other references for their terms.)

Student Objectives Students will:
•Measure objects using taɬ and x̌ʷiƛ̓.
•Determine whether taɬ or x̌ʷiƛ̓ is the most appropriate unit of measurement.

•Learn to estimate using taɬ and x̌ʷiƛ̓. Every time students estimate in Lushootseed units they are internalizing a different mathematical way of perceiving the world.
•Learn to convert from taɬ and x̌ʷiƛ̓ to standard units. Although we don't teach conversion between metric and English measurements, conversion between Lushootseed and standard measurements is a useful skill. I can measure a piece of wood using x̌ʷiƛ̓ and then quickly know the length of the wood in standard units.
•Discuss the advantages and disadvantages of non-standard units such as the taɬ and x̌ʷiƛ̓. Our essential learning requirements in Marysville ask students to "Demonstrate an understanding of the appropriate uses of standard and nonstandard units of measure."
•Discuss situations where taɬ and x̌ʷiƛ̓ are the *preferred* methods of measurement. (I seldom carry around a meter stick or ruler, but my taɬ and x̌ʷiƛ̓ measures are always with me.)
•In a Lushootseed-teaching classroom, students can be introduced to these units of measure through Total Physical Response activities:

"ɬugʷud tiʔiɬ qʷɬayʔ. ɬugʷud tiʔiɬ tibu. ɬugʷud tiʔiɬ šəgʷɬ."

"Measure the stick. Measure the table. Measure the door."

Special Ways of Counting (People, Containers, Canoes, etc.)

Lushootseed, like many other languages in the world, has special ways of counting different categories of things. Two people are səsaʔliʔ people, while two containers are saliʔulč containers, and two canoes are cəbagʷiɬ canoes. It appears we need to resist an ethnocentric perspective that labels this way of counting as "primitive." For example, Karl Menninger in *Number Words and Number Symbols: A Cultural History of Numbers* writes, "There are some primitive peoples who at times employ a special number sequence for various things–for example, for animate objects, round things, days and so on." We need to help our students articulate the beauty and value of the Lushootseed way of counting.

What do these special numbers tied to different categories of things teach us about Lushootseed mathematical concepts, and about Lushootseed conceptualizing of the world? Does this way of counting promote a certain way of categorizing reality, a Lushootseed way?

Student Objectives Students will:
•Count a variety of objects using the proper Lushootseed numbers. I hope that students will be internalizing a different way of categorizing reality each time they do this.
•Practice generalizing and extending their number categories by counting new and unfamiliar objects.
•In a Lushootseed-teaching classroom, students can be introduced to these number categories through Total Physical Response activities:

"ʔuxʷtxʷ tiʔiɬ saliʔulč spəčpəčuʔ dxʷʷəl tə tibu. ʔibəšəxʷ dxʷʷəl tə ɬixʷulč spəčpəčuʔ. kʷədadəxʷ tiʔəʔ ɬixʷulč spəčpəčuʔ čəxʷa ʔibəš dxʷʷəl tiʔiɬ lixʷalgʷiɬ q̓il̓q̓ilbid. q̓ilidəxʷ tiʔiɬ ɬixʷulč spəčpəčuʔ. ʔibəšəxʷ dxʷʷəl tiʔiɬ cəbagʷiɬ q̓il̓q̓ilbid čəxʷa ɬugʷudəxʷ."

"Take the saliʔulč (2) baskets to the table. Now walk to the ɬixʷulč (3) baskets. Pick up the ɬixʷulč (3) baskets and walk to the lixʷalgʷiɬ (3) canoes. Put the ɬixʷulč (3) baskets in the canoes. Now walk to the cəbagʷiɬ (2) canoes and measure them."

Counting with Fingers and Words

There is a hint of how ancient Lushootseed speakers counted on their fingers in the Lushootseed word for eight: təqači?, "closed hands." This word indicates that a person began counting with fingers open and then closed them as the numbers were recited, and that the four fingers of each hand were counted before moving to the thumbs for nine and ten. Is it possible that by practicing this ancient Lushootseed way of counting on fingers students will internalize a different way of thinking about and grouping numbers? Would students taught to count in this way be quicker to group things into fours? Would this bring them closer to the ancient Lushootseed mindset?

Student Objectives Students will:
•Practice finger counting in the ancient Lushootseed manner.
•Arrange the objects they count in sets that match what they see on their fingers as they count.

Math Computation Using Lushootseed

At the Tulalip Montessori school, young students count, add and subtract using Lushootseed numbers. Students are given the option of using English or Lushootseed numbers, and many of the students feel more comfortable working math problems in Lushootseed. These students are working with small, experienceable numbers that allow them to express their personal relation to a quantity of things. But as students move on into learning about multiplication, division and fractions, how will Lushootseed function for them? And more importantly, is there a Lushootseed way of thinking about multiplication, division and fractions?

Father Chirouse, who founded a school at Tulalip in 1859, described the Lushootseed "multiplicative numbers."

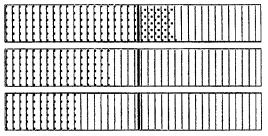
> These are formed by prefixing the syllable ʔəs- to the cardinal numbers, thus: ʔəssaliʔ...double; ʔəsɬixʷ...treble; ʔəsbuus...quadruple.

Lushootseed multiplication is based on a personal relation to a quantity of things. It is concerned with doubling, tripling or quadrupling, etc., a quantity of experiencable items, and so it may foster the same comfort that Tulalip Montessori students feel when adding and subtracting in Lushootseed. Father Chirouse also described Lushootseed fractions. He wrote,

> The Indians do not go further in fractions than one-half, other fractional quantities being described as variations of the half, as a little more than half, a little less than half, half of a half, etc.

This is a different way of perceiving fractions, and so offers us the opportunity of teaching Lushootseed fractions distinct from the standard approach. The Lushootseed concept of fractions is repeatedly dividing a quantity in half. This would also seem to be the Lushootseed concept of division, so that in a Lushootseed math program, fractions and division would be taught together as the same concept. As I read Fr. Chirouse, the Lushootseed concept of fractions/division could be pictured like this:

" half" (ʔiɬčəx̌)



"a little more than half"

"a little less than half"

"half of a half" (ʔiɬčəx̌ ʔə ti ʔiɬčəx̌)

But what did Fr. Chirouse mean by "etc."? Perhaps we could talk about "a little more than half of a half," and "a little less than half of a half."

But does Fr. Chirouse also imply that "half of a half of a half" would be the next fractional number? And "half of a half of a half of a half"?

Student Objectives Students will:
•Use a variety of manipulatives to express Lushootseed multiplication: representing the doubling, tripling, quadrupling, etc. of a quantity.
•Use a variety of manipulatives to express Lushootseed fractions: identifying and representing the Lushootseed fractions of half, a little more than half, a little less than half, half of a half, etc.
•Understand that halving is the Lushootseed way to express division.
•Use Lushootseed concepts of multiplication and fractions in solving real-world problems.

The Lushootseed Calendar

Just as Lushootseed computation involves a more personal connection between people and the things they are counting, calendar time is also expressed in a more personal way. The word "March" suggests nothing about the coming of a new season; but children can step outside on a spring evening and experience the moon of waq̓waq̓us ("frog moon") as Puget Sound frogs croak all around. And I hope that as students begin to practice using the Lushootseed calendar, they will internalize a different way of experiencing the passage of calendar time.

Also, if Wayne Suttles is correct in his speculation that Coast Salish people may have used the yearly high and low tides as a critical component of their calendar, then we must help our students experience the tide cycle if we want them to gain a Lushootseed sense of time. From my classroom, students look out at Tulalip Bay and across Saratoga Passage to Whidbey Island. We can see the spit of land identified by Tulalip elder Raymond Moses as kʷiʔkʷiḷ, or skate fish, as it is covered and revealed by the tides. How might we help Tulalip students regain a sense of the yearly tidal patterns and so recapture some feeling for the ancient Lushootseed calendar?

Student Objectives Students will:
•Learn the moons of the Lushootseed calendar by experiencing the natural events and yearly activities the calendar is based on.

•Describe the advantages and disadvantages of lunar and solar calendars. Explain how some cultures (e.g., the Romans and probably Puget Sound peoples) have traditionally used a lunar calendar with an intercalary period to align it with the solar calendar.

Teaching About Math in Puget Sound Culture

Geometry and Symmetry in Art

There are many resources for introducing students to the mathematics of traditional Puget Sound art and design. Traditional basket designs offer possibilities for studying pattern, congruence and symmetry, including math concepts like slide, flip, and turn. Bill Holm has described symmetry in northern art (Holm, 84-5); how could his observations be applied to Salish and especially Puget Sound art? Claudia Zaslavsky in *The Multicultural Math Classroom* has some lessons on Yup'ik border patterns that could serve as a model for a Puget Sound art/math project.

We could use Puget Sound art and design to meet learning requirements in these areas:

•Identify, define and describe the geometrical terms 'congruent' and 'symmetrical.'

•Apply the concepts of congruency and symmetry by visualizing whether figures shown... are symmetrical and/or congruent.

•Recognize if a geometric shape is congruent to another by using slides, flips, or turns.

Probability Through Traditional Lushootseed Games

I should note first of all that players of the current game of sləhal rely on skill and spiritual help, and so it would be inappropriate to discuss this game in the context of probability. However, there are other games that would allow us to teach our students about probability at the same time we introduce them to a traditional part of Tulalip culture. Haeberlin and Gunther describe one such game.

> smetali is a woman's game widely known in the Puget Sound region. There are four beaver teeth, two with black lines (stububš, men) and two with black dots (sɬəɬadəy?, women). The under side of the dice was plain. Beans or sticks were used as counter. One woman had to get forty tally sticks four times to win, but not necessarily in succession. One of the sɬəɬadəy? had a strip of cloth or skin tied around it. This was called k!es. The throws were:
>
> 1. Highest–k!es up, other three down or k!es down, other three up, equal four sticks.
> 2. All up or all down, equal two sticks.
> 3. Both stububš up or both sɬəɬadəy? up or vice versa, equal one stick.
> 4. All other throws equal nothing.
>
> A woman played until she threw number four; then she passed the dice on. Some women "knew how to throw" (Haeberlin and Gunther, 64).

I use this game in my classroom to satisfy these learning requirements:

•Predict the outcomes of probability events using counting methods.

•Predict an event which is more or less likely to occur.

•Determine the probability of an event and express it as a ratio in fraction form.

Ancient Puget Sound Money and Values

Money is an important part of any math curriculum. While our students need to learn

about U.S. money, we could enhance their understanding of money concepts by also teaching them about traditional Puget Sound money and exchanges (Haeberlin and Gunther, 29; Castile, 202-204; Suttles and Lane, 493). Our Marysville learning requirements involve identifying, adding and subtracting, determining equivalances, and adding different types of U.S. money. These learning requirements could be modified by including ancient Puget Sound money in order to reinforce students' grasp of money concepts while they learn about traditional Tulalip culture.

We could modify these Marysville learning requirements:

•Identify a specific coin from a group of coins (Kindergarten).

•Add and subtract pennies, nickels, dimes (1st grade).

•Determine an equivalent value of money given a specific amount combining coins and currency (3rd grade).

•Complete the following: adding different coins, choosing correct combination of coins to make an exact amount (3rd grade).

Architecture

This seems to bring me back to my opening example of how we do *not* want to teach Lushootseed math: "Find the area and perimeter of the longhouse." But as long as students are being taught in ways that help them internalize a Lushootseed conception of math, there is also value in noting the geometry and measurement in traditional Puget Sound architecture. What do we know about traditional housebuilding methods in the Puget Sound? What do we know about the measuring skills that were used, the geometry, the proportions? All these are math skills that we can teach students in a Tulalip-based math curriculum.

REFERENCES

Castile, George Pierre. 1985. *The Indians of Puget Sound: The Notebooks of Myron Eells.* Seattle and London. University of Washington Press.

Haeberlin, Hermann, and Erna Gunther. 1930. *The Indians of Puget Sound.* Seattle and London. University of Washington Press.

Holm, Bill. 1965. *Northwest Coast Indian Art: An Analysis of Form.* Seattle and London. University of Washington Press.

Marysville School District. 1998. *Essential Learnings and Curriculum Design in Mathematics for Grades Kindergarten through 12.* Marysville, Washington.

Menninger, Karl. 1969. *Number Words and Number Symbols: A Cultural History of Numbers.* New York. Dover Publications, Inc.

Suttles, Wayne. 1987. *Coast Salish Essays.* Seattle and London. University of Washington Press.

——— and Barbara Lane. 1990. "Southern Coast Salish" in *Handbook of North American Indians: Volume 7: Northwest Coast.* Wayne Suttles, ed. Washington. 1990.

Zaslavsky, Claudia. 1996. *The Multicultural Math Classroom* . Portsmouth. Heinemann.