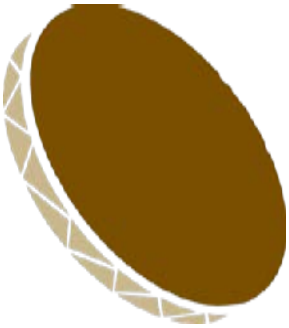
Music and Math



Grade Levels: 1 – 5

Unit Overview

This unit will focus on integrating steady beat and a sense of rhythm into basic elementary math skills. It is this unit's intent to address measurement and time, addition and subtraction, as well as basic fraction concepts while utilizing the students' musical and rhythmic talents and background.

Tlingit Educational Significance

Rhythm is an integral part of Tlingít culture and heritage. Tlingít people have a close and personal connection to rhythm. Much of the inspiration for drumming patterns in traditional music comes from observing, listening and interpreting the world around them. This rhythmic connection can also be seen in traditional dances. Traditional Music is a full kinesthetic as well as aural experience.

Drums were not only used for singing, they were also used for communication. Shamans used drums to communicate with the spiritual world.

The Killer Whale clan also has a drum song.

The Tlingit word Gaaw, which means drum, is also the word for time, clock and pulse. I feel that this linguistic connection highlights the cultural importance placed on beat.

In addition to the more common round style hand held drum; there was a tradition of Big Box drums.

According to Dr. Walter Soboleff from; *Forming a Tlingit World View Kaajaakwtí,* Tlingit clans own specific songs. Other clans who wish to sing these songs must obtain permission. Each clan owns many objects and properties each of which requires appropriate protocol when used or addressed.

The songs and activities in this unit are not Traditional Clan songs. However performance practice and language is in line with Traditional performing practices. This insight and understanding of traditional practices on the part of the individual student should help to foster an understanding and appreciation of Traditional music.

Tlingit Elder Role

Elder presence and involvement in this unit is "key" to its success and validity. Even though the actual product created by the students would not be "Traditional Art and

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Music" it would lead the students to discover Traditional elements of Drumming, Music and Composition. Understanding is directly related to respect, appreciation and value.

Elders would be able to explain the cultural value placed on drumming and songs. Elders would be able to educate students on the history, etiquette and use of Clan Songs.

Family/Home/Community Connections

Pre–Event

Introduction of cultural elements to the unit by Elders, will engage all students. During this classroom connection with Elders, parents should be invited in to meet the Elders as well. This meeting will validate the work students are about to undertake and show appreciation for that cultural connection.

Home Connections

Student sharing of music and stories with parents and siblings at home will bring value to the class project and generate interest in cultural elements present in the academic curriculum.

Culminating Event

Students will perform work created in this unit, at school and invite Elders, Family, Parents and school administrators to share in this academic and cultural collaboration.

Unit Vocabulary

Wooch.een: Together. The idea of togetherness is essential in the making of a steady beat with a large number of drummers. I feel that this idea is the essence of "beat". Any rhythm can work together alongside the presence of a steady beat. In David Katzeek's song this word is used to convey unity through working together. In the lesson 3 fraction activity song, this word is used to convey the strength of numbers. As a teacher I will often stop a drumming group when things become too independent and chaotic and point out the inconsistency of rhythm and say we need to work together to make this beat "Wooch.een!"

Yan gé yee wunéi? – Are you all ready? When working with a large group of drummers this phrase is used as a ready call. This is how many Traditional Dance Groups prepare for performance.

Gook – Start, begin, go. This is a start command given to drummer's right before they begin to play, much like a preparatory beat. This is a common Tlingit Dance Group command.

Hoochá – Here it is, get ready, last time. This is a preparation call to stop. In Tlingit Dance Groups this often means sing the song through for the last time. In the drum routines contained in this unit I use this call to prepare the groups for a sudden stop.

Tklie´t – Stop. I use this word in the following unit to suddenly stop the drumming group. I cue this stop by holding my drum about shoulder height and bring it down with the beat in a chopping motion.

Materials

- ✂ Class set of Tlingit Drums
- ✂ Metronome
- ✂ Large open space to facilitate lots of movement

Standards Addressed in this Unit

Alaska State Standards					
Math	A 1,2,6	B 2,5,6,7	C 2,3,4	D1,2,4	E1,2,3
Arts	A 1, 2, 3, 4, 5, 6	B 1,3,8	C 1,2	D 5,6	
World Language	A 1,4	B 1,2,4	C 1,4		

The lessons in this unit are aligned to Alaska Sate Content Standards. Content standards can be referenced @ www.eed.state.ak.us/standards/pdf/standards.pdf

Lesson Overview

Note: Not all lessons are appropriate for all grades but the final performance could be school wide and include all grades k-5.

Lesson 1: Measuring Time and Distance
Students will use drumming and simple dance to measure distance. During this lesson students will also make a connection between distance and speed.
Students will use estimation and non-standardized units of measurement. Students will also use concrete calculation to determine distance in terms of concrete beat measurements.

Lesson 2 Primary: Chunking Numbers
Students will work on addition skills by "chunking numbers" to add up to base 10 number values. Students will learn basic divisions of a steady beat (fractions). Students will experience this first kinesthetically through dancing and singing.

Lesson 3 Intermediate: Relating Fractions to a Steady Beat
Students will learn basic divisions of a steady beat (fractions). Students will experience this first kinesthetically through dancing and singing.
Students then will see the beat that was played in standard musical notation.
Students will then explore various fractions by drumming in small groups.

Lesson 4: Mathematics In Motion
Students will choreograph specific movements, dances and drills to accompany beats and rhythms composed in lesson 3. These "routines" can be performed for other classes and used as warm ups to math lessons focusing on fractions or base ten relationships.

Note: The following lessons are not examples of traditional drumming or traditional uses of drumming in Tlingít culture. They are intended however to relate to students who have a background in traditional music and to relate academic content to the intrinsic rhythmic connection that we all share as human beings.

Lesson 1
Drumming to measure time and distance

Materials
- ✂ Class set of Tlingit Drums
- ✂ Recording of David Katzeek's Wooch.een
- ✂ Metronome
- ✂ Measuring Sticks

Vocabulary
- **Wooch.een yei jigaxtooneé** Working together to hold each other up
- **Steady Beat** A measurable equal pulse that can be felt by many.
- **Echo** Listening completely to a musical idea and then playing, singing or speaking it back together as a group.
- **Dynamics** The volume of a sound in terms of loud and soft.
- **Tone** The character of sound; high pitch along the rim, deep pitch in the middle of the drum head and a soft click on the rim of the drum.
- **Tempo** The speed of a steady beat- this can be measured using a metronome in terms of beats per minute.

Objectives
Students will work together to create a steady beat.
Students will be able to give and recognize value to beats.
The class will use steady drumbeats to measure distance and to explore the concepts of time and speed.

Warm ups: This lesson depends on the kinesthetic feel of a steady beat. Getting large groups of kids to play together at the same time can be challenging, the natural tendency is for large groups to speed up and then fall into disarray. These warm ups are meant to build a sense of steady beat to reinforce the following activities.

Warm up #1

Step and Beat:

- Have students stand in a large circle. Start a steady beat with your drum, step with each drumbeat around the circle.
- Keep beat steady the first few times around the circle, then announce changes; “be sure to use your musician’s ear, it’s about to speed up (slow down)”.
- Once the class can make changes to the Tempo (speed) with a verbal prompt, then change the tempo without announcing changes.

Note: The skill needed to play “together” is a fundamental skill for all the lessons in this unit. It is worth the time needed to instill this group movement. I relate this to the meaning of David Katzeek’s song “Wooch.een yei jigaxtooneé”. “We are working together and holding each other up”.

Warm up #2

Echo:

The oldest and most effective way of teaching music is to follow a song leader; this reinforces good listening skills, heightens visual observation, strengthens aural memory and helps develop problem solving.

- The leader calls “Echo” and the class responds “Echo”
- The leader plays a beat and the class echo back the same beat, it is best to keep these beats simple and short at first.
- Once the class can hear and repeat rhythms you can add Dynamics (volume changes) and Tone (the character of sound; high pitch along the rim, deep pitch in the middle of the drum head and a soft click on the rim of the drum.
- After leading several Echo patterns, have students come to the front of the group and practice leading the warm up. Student leaders should only be picked after the class develops the ability to echo the teacher regularly. Remind students that the goal is to work together and be successful, leader parts should be relatively short and easy to remember.

Note: The most difficult part of Echo activities is for the students to wait until the beat has been played all the way through before responding. When this happens the students are unable to hear the entire musical idea. Because of this tendency (especially among the youngest students) I make a point to say, “wait” during the first few calls and “go” before the response.

Introduction

Teacher will drum and sing David Katzeek’s song “Wooch.een yei jigaxtooneé”. While teacher introduces song, students will be playing the drum pattern with their hands on their lap. Once the class can maintain a steady beat, students should hum the melody while drumming on lap. When the class is able to maintain a humming melody and a

steady beat, the teacher will teach the lyrics using echo. The teacher should break the echo into four phrases at first, then two then the entire verse structure;

1).Wooch.een *Wooch.een*
Wooch.een *Wooch.een*
Yei *yei*
Jigaxtooneé *jigaxtooneé*

2). Wooch.een Wooch.een *Wooch.een Wooch.een*
yei jigaxtooneé yei jigaxtooneé *yei jigaxtooneé yei jigaxtooneé*

3). Wooch.een Wooch.een yei jigaxtooneé yei jigaxtooneé
Wooch.een Wooch.een yei jigaxtooneé yei jigaxtooneé

Once students can sing the lyrics, with good pitch and definition, while keeping a steady beat on their lap they will drum and sing.

Note: Young student musicians often have a hard time singing with good intonation while playing an instrument. This is why the process of learning a song is broken into small steps. Do not rush through and teach all parts at once, this will cause a learning gap between those with natural ability or musical background and those who are having their first musical experience.

Measuring Distance
Practice drumming and singing Wooch.een, one time through while moving around in a circle.

Reflections
How many times did you go all the way around the circle?

If you did not make it all the way around, how many times through the song do you think it would take to get all the way around?

How many times would it take to make it around two times? Three? Four?

Pick a distance away from the classroom (end of hall, commons area, to outside door etc.).
Ask class to estimate how many times they think they would have to play and sing the song to reach the chosen location. Record student estimations on the board and/or have students write them in their science journals.

Model to students one footstep to every two drum beats. Review class behavior expectations.

1) Sing and drum from class to chosen location.

2) Have students repeat journey from class to chosen location without their drums, this time students will step with the rhythm of the song but instead of singing they will be counting drum beats.

Reflections
How many times did you go all the way through the song to reach your chosen location? How many beats did this take?

How could we reach our destination quicker? (Play song faster)

How fast do you think we would have to perform Wooch.een to reach our destination with two times through? Three? Four?

How many drum beats do think this would be?

Record student estimations on the board and/or have students write them in their science journals.

Test student estimations.

Note: Make sure students are still doing one step for every two beats, we are developing the concept of beat value, letting students just run faster to the destination will not help instill this concept.

Conclusion: Go back and measure the distance with rulers. How far was this? Put answers on board along side song/distance estimations. How are these two measurements different?
The song estimation measurement vs. the concrete ruler measurement should help start the discussion of standardized measurement vs. un-standardized units of measurement.

Lesson 2

Drumming to reinforce addition up to 10

Materials

- ✂ Class set of drums
- ✂ Large space for rhythm games
- ✂ Recordings of activity song

Vocabulary

Haa goó **"**Come", a singular command. This phrase is used during the activity song to summon a child into the group (addition).

Yaa duú Haat "I am here". This phrase is used during the activity song to confirm the child is coming to the group (confirming the addition of the total during the game).

Objectives

- Students will continue number statements adding to 10 (1&9, 2&8ect.)
- Reinforce fundamentals of a base ten counting system
- Students will learn to count to ten in Tlingít
- Students will be able to drum and sing together

Warm ups: It is important that the students understand that they are making number values when they drum in this lesson, instead of just following the teacher. It is fine to spend as much time on the following warm ups as needed for true comprehension.

Warm up #1 breaking up values of 5
•Students will make the value of five using two hands (3 and 2, 4 and 1)
•List number combinations on the board
•Using the drums, teacher will play first column of #'s and students will respond with second column of #'s (teacher plays 1 drum beat, student responds with 4 drum beats)

Warm up #2 breaking up values of 10
• Give each student 10 building blocks
• Each student will organize their blocks into two piles, model different combinations (a pile of 2 a pile of 8)
• Students will sort piles into patterns (by color) or use to build two different shapes (a pyramid of 7 and a tower of 3)
• Record # combinations on the board in two columns
• Using the drums, teacher will play first column of #'s and students will respond with second column of #'s (teacher plays 1 drum beat, students responds with 9 drum beats)

Introduction
Teacher will drum and sing "Haa goó
While teacher introduces song, students will be playing the drum pattern with their hands on their lap. Once the class can maintain a steady beat, students should hum the melody while drumming on lap. When the class is able to maintain a humming melody and a steady beat, the teacher will teach the lyrics using echo.

Haa goó Haa goó	Haa goó Haa goó
Ei ei aa Ei aa	Ei ei aa Ei aa
Yaa duú Haat	Yaa duú Haat
Ei ei aa Ei aa	Ei ei aa Ei aa

Once students can sing the lyrics, with good pitch and definition, while keeping a steady beat on their lap they will drum and sing.

Note: Young student musicians often have a hard time singing with good intonation while playing an instrument. This is why the process of learning a song is broken into small steps. Do not rush through and teach all parts at once, this will cause a learning gap between those with natural ability or musical background and those who are having their first musical experience.

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Chunking Numbers that Value 10:
The teacher will start by playing a steady beat and calling a students name, then the class will drum and sing Haa goó Haa goó Haa goó Haa goó Ei ei aa Ei aa Ei ei aa Ei aa.
The student who is called up will sing
Yaa duú Haat, Yaa duú Haat and the class answers Ei ei aa Ei aa Ei ei aa Ei aa.
When the student reaches the front of the room they will play 1 beat and the class will respond with 9 beats (starting on #2) and counting to 10 (this should be done in Tlingít and English). The student who was just called up will then call another students name, then the class will drum and sing Haa goó Haa goó Haa goó Haa goó Ei ei aa Ei aa Ei ei aa Ei aa. The student who is called up will sing Yaa duú Haat ,Yaa duú Haat and the class answers Ei ei aa Ei aa Ei ei aa Ei aa.

When the student reaches the front of the room they will play 2 beats (there are now 2 students at the front) and the class will respond with 8 beats (starting on #3) and counting to 10 (this should be done in Tlingít and English).

Repeat these steps until there are 10 students in the front of the room.

Variations: This game could be used to develop addition facts up to any number, it is important to have the end # decided upon from the beginning of the game so that students are actually physically practicing real addition facts.

This game would also work ell for a beginning of the year “ice breaker” activity, it would be a fun way for students to get to know each other and learn each others names.

Lesson 3

Exploring Fractions through drumming

Materials

- ✂ Class set of drums
- ✂ Large space for rhythm games
- ✂ Recordings of activity song

Vocabulary

Wooch.eenx haa sitee	We are all together
Yáadu wuháan	We are all here
Eee Shaan	Poor you, this is meant to gently tease those who sit down during the game.

Objectives

- Students will physically understand the concept of fractions being a smaller part of a greater whole.

- Students will be able to calculate and work with simple fractions; ½, 1/3, 1/4, 2/3, 3/4 using whole numbers of thirty or less.
- Students will be able to drum and sing with a steady beat and good pitch

Warm ups: It is important that the students understand that they are breaking each beat into smaller even valued sub beats when they drum in this lesson. It is fine to spend as much time on the following warm ups as needed for true comprehension.

Warm Up #1

• The teacher will play a VERY slow steady beat on the drum, the teacher will call out fractions that the beat will be divided into and count out each division with their drum beat to model the speed of the division for the class.

- 1/2's (1, 2, 1, 2)
- 1/3's (1, 2, 3, 1, 2, 3)
- ¼'s (1, 2, 3, 4, 1, 2, 3, 4)
- 1/5's (1, 2, 3, 4, 5)
- 1/6's (1, 2, 3, 4, 5, 6)

Introduction

Teacher will drum and sing Wooch.eenx haa sitee

While teacher introduces song, students will be playing the drum pattern with their hands on their lap. Once the class can maintain a steady beat, students should hum the melody while drumming on lap. When the class is able to maintain a humming melody and a steady beat, the teacher will teach the lyrics using echo.

Wooch.eenx haa sitee Yáadu wuháanYáadu wuháan

Wooch.eenx haa sitee Yáadu wuháanYáadu wuháan

Hei Hei aa ei aa ei "Half (any of the fractions agreed to work on) of us are gone, Half of us are gone" Eee Shaan Eee Shaan

Once students can sing the lyrics, with good pitch and definition, while keeping a steady beat on their lap they will drum and sing.

Note: Young student musicians often have a hard time singing with good intonation while playing an instrument. This is why the process of learning a song is broken into small steps. Do not rush through and teach all parts at once, this will cause a learning gap between those with natural ability or musical background and those who are having their first musical experience.

Fraction Activity

- Break class into several small groups (6-12).
- Help students figure out fraction relationships for each group (1/3 of 12 is four)
- Lead song, small groups drum and sing, when the fraction desired is called out each group reduces its size by the fraction called out (in a group of 12 if a 3rd of you are gone four students will sit down etc.).

- After the fraction group is reduced we sing Eee Shaan Eee Shaan and then the game will start over with a new fraction

Extension

- Keep the class in one large group.
- Continue to reduce the group until 1 (if possible) student is left

Example: In a class of 21 students call 1/3 of you is gone (7 students sit down). Now the large group is a total of 14 students, call ½ of you is gone (7 students sit down). Now the large group is a total of 7 students, call ½ of you is gone (7 is not evenly divided, what is the closest # (make a connection to division expectations and remainders).

Variation

This game will also work with younger grades as a subtraction fact game. "Two of us are gone" how many are left? (have the class drum the answer back in steady beats). Two are gone from a class of 20, Teacher works through math with class verbally and then the class answers back with 18 steady beats.

Lesson 4

Composing drum beats and writing drum line routines using; multiplication, division and basic fraction concepts through drumming

Materials

- ✂ Class set of drums
- ✂ Large space for rhythm games
- ✂ Paper Strips (card stock works best) 2"x12"
- ✂ Poster Board
- ✂ Colored Construction Paper cut into 4"x12" strips

Vocabulary

Quarter Note Represents one single beat unit
Eighth Note Two pulses occupying the space of one beat, a double beat.
Measure A musical statement organized by space and timing

Objectives

- Students will be able to recognize, compose and notate a two to one beat division using standard musical notation.
- Students will create and notate rhythmic patterns to integrate with other student's work and choreograph movements
- Collaborating in small group's students will be able to plan, choreograph and compose drum line routines
- Students will use and illustrate skills in multiplication, division and basic fraction skills in order to produce a drum line routine

Warm ups: One of the most prevalent beat combinations in Tlingit music is the relationship between a "single" and a "double" beat. In standard musical notations there are several ways that this could be illustrated.

In order to reinforce the concept of a beat as a unit of one whole part, we will refer to the single beat as a "Quarter Note". Quarter notes often represent "one" beat. We will refer to the double beat as Eighth Notes. Two eighth notes occupy the same amount of space and time as one Quarter note; they are twice as fast as Quarter Notes.
Reflection question: Four eighth notes are twice as fast as how many quarter notes? If you split four Quarter Notes in two, how many Eighth Notes would there be?

Warm Up #1

- The teacher will play a VERY slow steady beat on the drum, call out "single beat" and start saying the word "one" with each drum hit. Have students do this while they drum with you; One, One, One, One.
- While drumming the single beat, call out "double beat", play a steady beat twice as fast (changing from Quarter Notes to Eighth Notes) saying the word Doub-le. Have the students do this while they drum with you; Doub-le, Doub-le, Doub-le, Doub-le.
- Alternate between playing single and double beats, calling out the change and making the switch together.

Enrichment: Have students do the following movements with your drum rhythm, one motion for single beats, two motions for double beats. It is essential to announce and call the switch so students can physically prepare to feel the "2 to 1" relationship.
Wave hands
Turn body one direction, back to middle then the other direction.
Reach up high, reach down low.
Step in place
Hop

Writing Rhythms
Materials

✂ 4" strips of card stock paper cut width wise (each student will need five strips)

First student will fold one strip into fourths;

- Everybody hold your strip length wise like a tie (teacher models holding the card)
- Fold the bottom of your tie up to the top and crease the middle
- Now you have a short tie (model the fold) take the bottom of your tie and fold it up into a small box and crease the middle.
- Unfold the strips and point out the four separate boxes

The space occupied by each box can accommodate the value of one full beat. Each box may have either a "Single Beat" (quarter note) or a "Double beat" (two eighth notes). This works best if you fill only one box at a time. "Everyone chose a single or double beat for the first box, look at mine I chose two eighth notes (double beat) for the first

box. What did you chose? Hold up your strips so that I can see. Let's all look at the second box, you can chose the same kind of note or pick a different one. I chose a quarter note (single beat) for the second box. What did you chose? Hold up your strips so that I can see.

- Continue this process until all four boxes are occupied either by a "Single Beat" (one quarter note) or a "Double Beat" (two eighth notes).
- Hold up student cards and count the rhythm (have students echo)

Example; a card that was notated Quarter, Quarter, Eighth Eighth, Quarter would be counted: One One Dou-ble One

- Poll students as you demonstrate; "Did anyone else make this rhythm?" Because of the limited note choices and the predetermined length of the writing sample many students will have the same rhythms.

Teacher Note: Each Rhythm strip represents a Measure an organized musical unit built on beat values. All of our student's measure strips are four beats long.

Video #1 Measure writing lesson

Reflection questions: If each strip (measure) is four beats long, what are the most eighth notes (double beats) you can have in 1 measure (full strip)? What are the most quarter notes (single beats)? How many eighth notes could fit in 4 measures? How many quarter notes? If each card (Measure) is 4 beats long how many measures would it take to have 16 beats? 20? 32? 100?

Making a Rhythm Quilt Activity

For the notation component of this activity use the same process for setting up Measures as in the echo activity above. When doing this activity with younger grades, I still model each card one fold at a time.

Have each student make four-measure cards. For younger students I have them make their four cards identical so that they can see that they are creating patterns. With older students, challenge them to stretch their patterns over a two or four measure (card) phrase.

Poll students for repeated patterns. Glue all identical rhythm cards with the same colored backing paper. Example: all quarter quarter eighth quarter rhythms will be backed on red etc.

Break class into small groups and combine cards to make larger patterns.

Organize each group's pattern on the floor from left to right, "quilting out" the class's ideas. Move cards around in different orders changing pattern ideas by looks and sounds, playing each variation as a group.

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After you have agreed on an order of each group's ideas; paste prearranged cards to poster board. The end effect will be a colorful lead sheet of student-composed rhythms.

Once the "Quilt" is created practice the beat regularly until the group can execute the changes in the rhythm together "Wooch.een". This togetherness will be essential for the enrichment activity.

Extension Activity: Once students have finished, became familiar with and practiced the Rhythmic Quilt they may use this music to choreograph a drum-line routine based on their composition.

Organize measures of the quilt as having primarily a double or single beat emphasis.

Pick individual routine moves based on the speed required to execute each move.

Break into original pattern groups and have each group choreograph their portion of the rhythmic quilt.

Video #2 Children's Celebration, Drum Routine