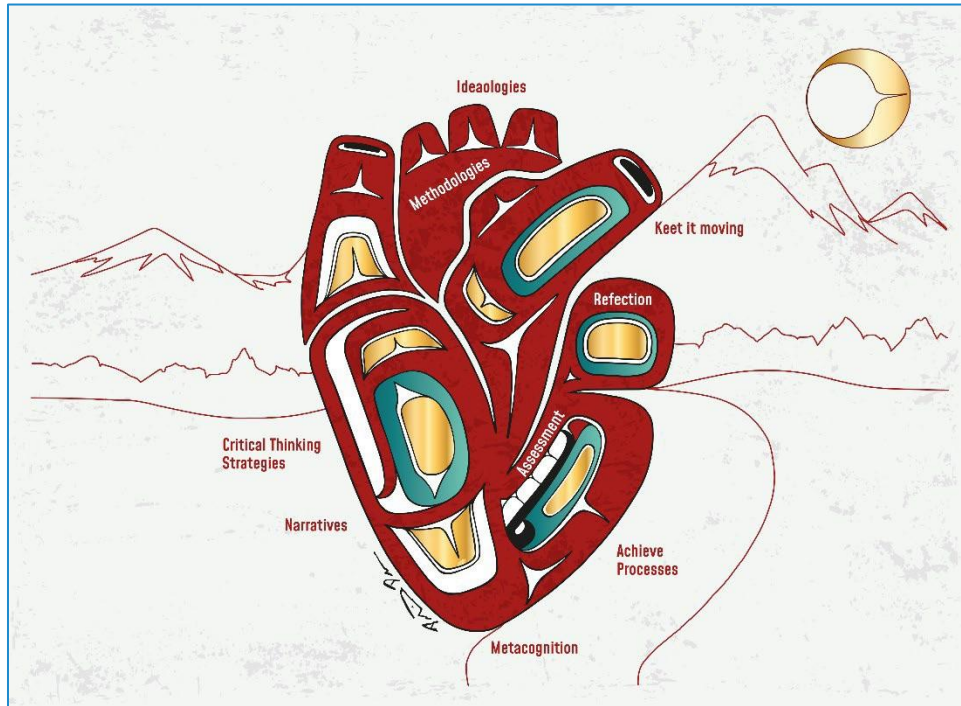


Haa Shuká Tundatáani: Algebra in Southeast Alaska



An Indigenous Framework for Learning

Haa Shuká Tundatáani represents a way of learning and understanding that connects us as people with the histories that have formed us, the knowledge we share today, and the world delivered by our future selves for future generations. This Indigenous framework seeks to heal.

This framework is designed around the heart at the center of existence, pumping what has existed before into what will exist in the future through the practice of listening, learning, and creation. This cycle of learning and belonging is in each of us and calls to be acknowledged and fostered by our surroundings and histories. Gunalchéesh, thank you to the Yanyeyidi whose story guides the visual representation and philosophy behind the heart of our learning framework and its existence rooted in landscapes.

UNIT PLAN	
Ideologies	
<p>Haa Shuká Tundatáani: <i>[Provide a unit overview that describes how and why this curriculum engages prior knowledge and experience, is meaningful to the present, and builds skills, knowledge, and/or curiosity for the future. Where is the unit coming from and where is it going?]</i></p> <p>Students will explore algebra through a series of lessons and activities tied to Southeast Alaska. Units include: Linear Equations; The Amazing Life of Trees, Measuring Wavelength, Commercial Fishing Business Simulation, Glacier Calculations)</p> <p>These units are designed to offer teachers math lessons that are applicable to their students community and home lives, giving their math learnings more impactful and longer lasting meaning.</p>	
<p>Unit Name & Level of Integration Required: <i>[Indicate the title and the level of complexity required for successfully implementing this particular unit.]</i></p> <p>Algebra in Southeast Alaska</p> <ul style="list-style-type: none"> ● <i>L1 - this unit is off-the-shelf with materials that can be found in most classrooms or schools.</i> ● <i>L2 - this unit requires pre-planning such as gathering relevant materials, collaborating with GHF Indigenous educators, cultural bearers, and/or language speakers.</i> ● <i>L3 - this unit is best taught with a GHF Indigenous co-teacher due to the expertise, cultural knowledge, perspective, and/or language required for learning.</i> 	
<p>Unit Author & Contact: <i>[What is the unit author's name and contact email if available for support?]</i></p> <p>Author: Paul Berg Math Advisor: Ward F. Ward Photo Credits: Virginia Berg Editor: Tiffany La Rue</p>	<p>Originating Source : <i>[Where is this information coming from? How can acknowledgements and recognition be shown?]</i></p>

<p>Grade Range & Subject:</p> <p>9th-12th grade math</p>	<p>Time and Timing:</p> <p>18 weeks (or to be used as a supplement to preferred Algebra curriculum and implemented throughout the year)</p>
<p>Materials:</p> <p>Unit One- Linear Equations:</p> <ul style="list-style-type: none"> - Pencil and Paper - Student Packets “Lessons one- Activities #1-4” <p>Unit Two- The Amazing Life of Trees:</p> <ul style="list-style-type: none"> - Pencil and Paper - Graph Paper (optional) - Calculator - Student Packet –“Lesson Two- Activity 1” <p>Unit Three Measuring Wavelength:</p> <ul style="list-style-type: none"> - Pencil and Paper - Ruler - Graph paper (included in student lesson) - Student Packet “Lesson Three- Activities 1-3” <p>Unit Four- Fishing Business Simulation:</p> <ul style="list-style-type: none"> - Pencil and Paper - Student Packet “Lesson four- Activities 1-6” <p>Unit Five- Glacier Calculations</p> <ul style="list-style-type: none"> - Pencil and Paper - Student Packets “Lesson Five- Activities 1-3” <p>Geometry Unit Six- How High is It?</p> <ul style="list-style-type: none"> - Standard tape measure - Standard protractor - String - Eraser - Soda Straw - Tangent conversion table - Calculator with a tangent function <p>Southeast Math- Student Packet.pdf Grade 9-12 Southeast Math (Teacher Edition).pdf</p>	
<p>Essential Questions:</p> <p><i>[What are two compelling questions that will foster inquiry, understanding, and transfer the learning?]</i></p> <p>Units One and Two:</p>	

- How can we track the change in a quantity over time and how is this useful when making decisions in Alaska?
- How can you solve a multi-step equation?

Unit Three:

- How does a relationship between independent and dependent variables explain ocean waves?

Unit Four:

- How does the salmon industry shape Southeast Alaska?

Unit Five:

- How can we determine the melting rate of local glaciers?

Unit Six:

- How can we use trig ratios in Alaska to determine lengths and angles?

Student Skill Sets & Understandings to Be Developed:

[What will students be able to do with this new knowledge and skills?]

Unit One:

- Find values of unknown quantities by using algebraic expressions
- Solve linear equations for unknown quantities
- Balance linear equations
- Learn to solve for X

Unit Two:

- Learn how to calculate the age of a tree by examining the growth rings on the wood
- Calculate a tree's diameter to help determine its age.
- Learn to use pi and expressions for "circumference" and "diameter" to produce accurate measurements.
- Calculate volume of lumber (by board feet) in each tree.
- Convert measurements from inches to feet.
- Learn how to convert data from tables onto a line plot.
- Calculate averages.

Unit Three:

- Introduce independent and dependent variables and ordered pairs
- Identify the appropriate tool and/or unit of measurement with which to measure objects
- Uses appropriate symbols to justify solutions to mathematics problems
- Converts representations of data between graphs, tables and linear equations
- Analyzes, extends and applies visual, numeric and geometric patterns

Unit Four:

- Learn about the salmon industry's impact on Southeast Alaska.
- Solve multi-step problems in a real-world context.
- Solving linear equations.
- Solving formulas for a given variable.

Unit Five:

- Learn to calculate flow rate and ice melting rate to determine the amount of movement of the glacier.
- Involve the properties of exponents in the calculations of movement
- Calculate volume of the glacial ice.
- Adding and multiplying polynomials
- Simplifying and evaluating expressions
- Expressing values in scientific notation

Unit Six:

- Learn to determine a baseline (the distance from your position to the base of the object you want to measure).
- Learn to measure angles for large, fixed objects, such as a building.
- Learn to convert measurements from standard measurement (inches, feet, etc.) into fractions.

Standards / Established Goals:

[Select the academic and cultural standards, both state and local, that will remain the focus.]

Unit Title: Algebra in Southeast Alaska

Subject / Course: Math

Grade Range: Highschool

Time: 18 weeks

Methodologies

Methodologies

[Choose two teaching methods from the following that will be guiding your instruction.]

- Oral narration
- Inquiry-based
- High-tech approach
- Kinesthetic learning (hands-on, tactile)
- Direct instruction
- Project-based
- Cooperative learning

Cultural Engagement:

[Describe in what ways this curriculum connects students with and elevates Tlingit Aani (land) and/or Tundatáani (ways of knowing).]

Elder / Culture Bearer Role:

[Define elder / culture bearer involvement in the curriculum, ranging but not limited to, helping to author original content, gathering materials, presenting to students, etc.]

Integrated Media Element(s):

[References, direct links, and/or attachments to related AV materials.]

Critical Thinking Strategies

Home Connections:

[How are students, families, and the community connecting from this learning effort? Are there opportunities for students to “teach or share” their new knowledge? Provide talking points for students to share with their families through discussion or activities. What do your students and their families value and how can you build on what they know and do outside of school?]

See activity one of each unit

Unit Progression & Lesson Descriptions

[\(Compiled unit activities\)](#)

Unit One – Linear Equations:

LESSONS:

[Activity 1](#): Determine the weight of an unknown quantity of a fish.

[Activity 2](#): Find the total weight of fish caught during a specific time period.

[Activity 3](#): Calculate the quantity of eggs laid by salmon.

[Activity 4](#): Determine the probable loss of eggs due to predation.

ASSESSMENTS:

Activity 1: Students use an algebraic expression to find an unknown weight.

Activity 2: Students accurately solve expression to find the total weight of salmon in a stream during a 10 day period.

Activity 3: Students solve for an unknown to find out how many salmon eggs will be deposited over a 10 day period.

Activity 4: Students calculate how many fish will be caught by bears during a 10 day period.

Unit Two- The Amazing Life of Trees:

60-120 minutes

ACTIVITIES:

[Activity 1:](#) Plotting measurements; Use of pi; Calculating averages; Determining volume, circumference, and diameter

[Activity 2:](#) Plotting measurements; Use of pi; Calculating averages; Determining volume, circumference, and diameter

ASSESSMENTS:

Students will measure approximate diameter of trees

Students will plot measurements of a tree's diameter on graph paper (line graphs)

Students will calculate the volume of lumber produced from one tree.

Unit Three: Measuring Wavelength

60-120 Minutes

LESSONS:

[Activity 1:](#) Students describe waves rolling into a beach with algebraic expressions. The cause and effect relationship of wind speed and wave height is introduced.

[Activity 2:](#) Students graph wave data on graph paper. Dependent and independent variables are introduced.

[Activity 3:](#) Cause and Effect relationships

[Graph Paper.pdf](#)

ASSESSMENTS:

Students accurately complete the computations in Activity 1.

Students understand the concepts of dependent and independent variable.

Students successfully plot the ordered pairs in Activity 2.

Students can write an equation describing a cause and effect relationship. (Lesson Expansion)

Unit Four- Fishing Business Simulation:

120-180 Minutes

ACTIVITIES:

[Activity 1:](#) Students find the average weight of one fish using simple algebraic expressions.

[Activity 2:](#) Students calculate the anticipated expenses for a fishing boat for one season.

[Activity 3:](#) In this activity, the students are asked to calculate the average catch per boat during a 12 hour opener.

[Activity 4:](#) This activity involves three distance, rate and time problems

[Activity 5:](#) Students determine average fuel consumption per day and determine if the fuel consumption is consistent with the estimated fuel expense.

[Activity 6:](#) Students calculate the expenses for the season and determine if the season was profitable, based on a fixed price for a catch of 94,650 pounds of sockeye salmon.

Unit Five- Glacier Calculations

60-120 minutes

ACTIVITIES:

[Activity 1:](#) This activity is based on the Mendenhall Glacier near Juneau, which is receding at a rapid rate. Students will calculate annual rate of recession of the glacier by subtracting the total ice loss from the flow rate at the terminus.

[Activity 2:](#) In this activity students are given the dimensions of an iceberg visible above the surface and will calculate an algebraic expression for estimating the total volume.

[Activity 3:](#) Given a quantity of icebergs, students will create an expression for the total volume of ice breaking off over a period of time.

ASSESSMENTS:

Students successfully calculate the rate of ice loss in Activity 1.

Students calculate the amount of time it takes for the glacier to travel a certain distance in Activity 1.

Students calculate how quickly (at what rate) ice is breaking off the glacier and causing it to recede in Activity 1.

Students will successfully calculate the volume of an iceberg and express this value in algebraic terms in Activity 2.

Students will calculate the average and total volume of ice breaking off the glacier during a specific time period in Activity 3.

Unit Six- How High Is It?:

ACTIVITIES:

Students construct a homemade "sextant" with a compass, string and eraser prior to beginning the activities in the lesson.

[Activity 1:](#) Using the homemade "sextant," students measure the angles by sighting the highest point of five different features (i.e. buildings, a flagpole, trees, mountains, etc.) Students can measure the baseline to a nearby object and determine the height by multiplying the baseline by the tangent of the angle (see the Tangent Table in the student lesson). This activity also includes a definition and explanation of tangent. This activity is best completed in pairs.

[Activity 2:](#) Activity 2 provides more practice as the students work in pairs to determine the height of a nearby building.

[Activity 3:](#) Teams of students measure the height of four natural or man-made features.

[Tangent Table.pdf](#)

ASSESSMENTS:

Students accurately measure angles in Activity 1.

Students accurately measure the height of a nearby building in Activity 2.

Students successfully measure the height of four man-made or natural features.

Students accurately interpret and apply conversions of tangent, sine and cosine.

Developing Critical Thinkers:

[Choose two of the main strategies and provide details as to how those two strategies will be

incorporated throughout the unit.]

- Questioning
- Student-led discussions
- Inquiry-based learning
- Collaboration
- Problem-based learning
- Embodied Observation
- Internal Bias Assessment

Tlingit Phrases:

[What Tlingit phrase captures and embodies the new, desired knowledge or skill?]

- *Kaa wudujeeyí ka kaa x'éix dus.aaxí ch'áagu haa shagóonx'ich kusteeyí: Discipline and Obedience to the Traditions of our Ancestors (Discipline and obedience to the traditions of our ancestors)*
- *Sh yáa ayakdané ka ldakát káa yáa at uwanéi: Respect for Self, Elders and Others (Self-respect and respect for everyone)*
- *Ldakát át a yáa ayaduwanéi: Respect for Nature and Property (All things are respected)*
- *Tlél kútx i yáa wdawóodlik: Patience (Have patience [don't be in a hurry])*
- *Toowú klagé haa t'aakx'í, ka haa naax sateeyí, ka haa kusteeyí: Pride in Family, Clan and Traditions is found in Love, Loyalty and Generosity (Pride in our family and our clan and our traditions)*
- *Wooch eenx haa isteeyí, wooch dusxáni, wooch éet wutudasheeyí (When we're together, we love each other, we help each other)*
- *Yee toowú klatseen: Be Strong in Mind, Body and Spirit (Be strong)*
- *Lishoogú át kanaylaneek: Humor (Tell funny stories)*
- *Dikéex' wooch gayilsháat: Hold Each Other Up (Hold each other up)*
- *K'idéin at sa.áx ka a yáa awuné wáa sá i daa yadukaayí: Listen Well and with Respect (Listen well and respect what people say to you)*
- *Tula.aan tin yóo x'adutaan: Speak with Care (People speak with care)*
- *A káx yan aydél wé tl'átgi: We are Stewards of the Air, Land and Sea (Take care of the land)*
- *Yáa at wuné haa Aan Káawu jeeyís: Reverence for Our Creator (Reverence for our creator)*
- *Wóoch een kayéix yáx nagatee: Live in Peace and Harmony (Let there be peace and harmony among each other)*
- *Yee gu.aa yáx x'wán: Be Strong and Have Courage (Have courage)*

Pinnacle Vocabulary:

[Choose up to three Tlingit and English vocabulary terms that will be emphasized throughout the unit.]

Tlingit Phrase: Yáadu Xáat! English Translation: The fish are here!

Tlingit Phrase: Goosóo wé aas gutóode? English Translation: Where is the forest?

Tlingit Phrase: Óoxjaa tóox yaa kakúx. English Translation: It (boat) is traveling in the wind.

Tlingit Phrase: Kei kuguxsa.áat´. English Translation: It will be cold

Tlingit Phrase: Ligéi. English Translation: It is tall.