Seminar Title: Patterns, Relations, and Functions

Curriculum Unit Title: Livestock Function Machine

MarSheila Yazzie

Diné Institute for Navajo Nation Educators (DINÉ)

2021

Author Note:
MarSheila Yazzie is a second-grade teacher at Tonalea Day School. Correspondence about his curriculum unit can be addressed to MarSheila Yazzie, P.O. Box 365 Tonalea, AZ, 86044.
Email contact: mmyfive@yahoo.com

<h1 style="text-align:center">Livestock Input and Output Function Machine</h1>

Introduction

Who I Am
I'm Naadaa' Naasht'eezhi Tabaahi, born for Bit'ahnii, my maternal clan is Kinlichiinii, and my paternal clan is Tlizilani. My name is MarSheila Yazzie. I am blessed with 5 beautiful children. I got my Masters Degree in Bilingual and Multicultural Education from Northern Arizona University. I am currently the 2nd grade teacher at Tonalea Day School. I have been teaching for about 15 years ranging from 6th grade to kindergarten. I enjoy making curriculum culturally relevant, hands-on, and making real life connections for my students.

Who My Students Are
My 2nd grade students mostly come from single or low income households. Some students have no electricity or running water and often live with extended family members. Most families have little or no education beyond high school, therefore education is not seen as a priority. Low attendance or tardiness at the beginning and middle of the month shows that education is not encouraged, due to Social Security Checks, Retirement Checks, Disability Checks, WIC, and SNAP deposits leading to parents or grandparents heading to Flagstaff, Page, or other towns. I teach them because they are the future community members from my community.

Context & Rational

Pandemic Schooling
The most common difficulty in teaching during the Pandemic is lack of internet access. Online instruction or classwork on Zoom/Meets is rarely turned in due to limited or no parental guidance, no electricity, or other home chores that have higher precedence. 100% of students receive free/reduced school lunch. 98% are English Language Learners. Parent involvement is zero or limited. Parent Online meetings, Teacher conference, Family Nights, Zoom/Meet training, or Afterschool Academic events have low attendance; however sports will bring in spectators you rarely see in school. Students are usually in self-contained classrooms for 8 hours. Changes made at our school routine due to Covid-19 were teachers and students have been getting asynchronous and synchronous learning. All instruction was given online through Google Meet or weekly packets. Online programs cover the computer minutes online. P.E. is done through videos online from Shaun T, GoNoodle, or other YouTube videos. Library is mainly done through a lot of read-alouds and online research through Dictionary.com or Google Search. Schooling has changed from being in the building to teaching at home. Students learning at home from a computer tablet/iPad, phone screens or phone calls. None of these options are an ideal way to educate the young.

Online Schooling has been around for years, however for us it is 60% online education (whole class, small group or individual) and 40% (independent) Xerox copies for our children. Online Teaching was done in Google Meet 4 times a day to cover Reading, Math, Writing, and Navajo instruction. During online session, learning packets were taught and 2-3 examples were shown as examples. Learning packets are also being created and distributed to parents on the bus delivery route along with food trays for students. Some students do not have a phone, tablet, iPad, laptop, or desktop to utilize the online learning. Our school distributed laptops and hotspots in January.

Hotspots have limited service in certain areas. After getting new touchscreen laptops, the students and parents don't know how to navigate on it or are scared because they signed a waiver saying they will have to pay for damaged laptops. Some students have gotten used to their personal devices and prefer to use their own. I had to become creative on how I could virtually integrate my Input and Output Functions in a Distance Learning situation. Our school is following the mandate from Navajo Nation President Nez, about school staying online, hybrid, or in-person. As such, my unit can be done in person, hybrid, or virtually.

Who My School Community Is
Tonalea School students will have access to online whole/small group reading instruction for 120 minutes each day Monday thru Thursday, along with intermittent independent practice time. Every Friday is a weekly assessment day due to a half day schedule. In a classroom students will have access to four student computers, 1 iPad, 1 Promethean board, anchor charts, and a laptop to integrate technology. Due to the pandemic, students are learning virtually from a home setting. 120 minutes of Math instruction will focus on bell work consisting of solving a problem for the day on Monday for about 15 minutes, 10 minutes of whole class instruction on vocabulary, 5-10 minutes of how to represent a number, 15 minutes on strategies for the lesson, 20 minutes to practice whole group or small group on the lesson, group presentation of group finding will take about 20 minutes overall, and 30 minutes of i-Ready Math Program. However, due to Covid-19 Pandemic, our school started in a Distance Learning format. Teachers and students are presenting instruction in a synchronous and asynchronous learning platform. We are using Google Classroom and present most lessons through Google Meets for 30-45 minutes on core instructions. Our daily schedule looks something like: 8:00 community building, 8:15 am reading, 10:00 am mathematics, 12:00 writing and vocabulary, and 1:30 Navajo. Students have textbooks at home and teachers use a document camera for live feed or pre-recorded videos with Screencastify. Then students also have independent time to complete workbooks, projects, or interactive lessons.

Assessment days are usually on Fridays, which is a half day schedule, with a quick math timed quiz, Weekly Reading Test, Spelling Test, and Math concept of the week test. The Input and Output of Livestock Unit will be designed for a second grade classroom, which will integrate Common Core Mathematical Standards and Diné Standards. This unit will take approximately 3-4 weeks with about 120 minutes of mathematical instruction daily. Students will understand functions by using a chart, or in and out function machine. Having hands on or manipulatives will help students' associate numbers to charts. Using Kinesthetic Learning, students will learn Navajo names of farm animals or objects. Hopefully, this will increase Northwest Evaluation Association (NWEA) and common core state math tests like (PARKS).

Why
I am writing this unit because I want teachers to be able to answer questions such as; How can my Navajo 2nd grade students relate to Input and Output Function? When/How can students use this in real life scenarios? How can I make math functions culturally relevant? Do my students have the background knowledge to comprehend Input and Output Probabilities?

Tonalea Day School students come from families that own livestock. Most of my students participate in rodeos, grow cattle or sheep, and raise farm animals. With all this prior knowledge,

I hope to use it to my advantage, by creating scenarios such as using the number of legs, arms, eyes, ears or other body parts in a pin, corral, shack, or house. Students already know how the animals look, feel, sound, smell, and taste. Native kids need to build self-esteem in solving math problems, and they are unique problem solvers. Integrating Indigenous culture will enhance self-worth, self-identity, and self-assurance. Culturally relevant resources in math will engage and peak the interest of students because it is something they live or have experience with. Culturally Responsive Mathematics Teaching allows students to enhance children's mathematical thinking, build bridges upon prior knowledge, assists bilingualism and build academic language so students can analyze and solve problems (Mark Ellis, 2019).

Teacher background knowledge is important. The history of patterns and functions will help me as a teacher to get a better understanding of why they have to teach these concepts, and be able to correct misconceptions with background research.

Content Objective (What)
I want to creatively increase the knowledge and information about why function needs to be incorporated in the lower grades. Building the foundational skills needed will build a base for algebra or geometry. Making this fun virtual compatible unit about functions will help teachers and students understand input/output.

Targeting Math Common Core Standards teachers will be focusing on multiples of 2, 3, 4, 5, 6, 7, 8, 9, equal groups, fluency 11-20, and adding/subtracting to 20. Students will create an Input and Output Machine out of one of the Farm Animals and be able to create an Input and Output chart with data. Therefore, when a number goes in, it will come out with a multiple number. When students master these higher level computations skills, it will help students build algebraic concepts and thinking, and functions. Functions will increase their awareness that two sets of numbers can be related, just like animals, an interesting way to intrigue hands on function to later introduce multiplication.

Relate to Text: According to Common Core State Initiative states: Functions describe where one quality determines another. Functions are important tools in the construction of mathematical models. The functions that will be used in this unit will be numerical input and outputs, defined by an algebraic expression. (SITE)
The Common Core State Standards (CCSS) come from mathematical academic standards and include mathematical practices. The standards outline the skills and knowledge that students need to be successful in college, career and life. Functions in the lower grades that will be introduced are various ways to represent and solve addition or subtraction problems within 20 and skip count by 2, 5, and 10.

Students will be able to:
● Identify unknown number
● Determine operation needed to solve addition and subtraction problems in situations including add to, take from, put together, take apart, and compare
● Use drawings or equations to represent one- and two-step word problems.
● Add and subtract within 100 to solve one-step word problems with unknowns in all positions.

- Write an addition and subtraction equation with a symbol for the unknown.
- Count a group of objects up to 20 by 2s

Teaching Activities

The Livestock Input/Output Unit will have students create an Animal Function Machine. Students will create number cards to input and output. Students will use a T chart to write numbers and determine the equation to solve problems. Students will also create livestock story problems for classmates to solve. Students will determine what pattern to use to determine the next number. Students will create a poster to show animal characteristics so they can visually create a word problem. Before this can happen, students will have to be scaffolded through multiple teaching strategies such as:

- Think-Pair Share: Teacher will pose a question and allow time to write down own answer or thoughts before pairing up with an elbow partner or nearest person to share answers.
- Collaboration and Communication: A safe environment is important for students to be able to share ideas and thinking.
- Group work: Three to four students will work together to gather examples of one step word problems for functions game, edit anchor chart posters, and build an Animal Functions Machine.
- Analyze Patterns: Students will look at anchor charts to see if they see a pattern in animal characteristics, or if a problem asks for a chart to be represented for a function problem.
- Vocabulary: Math terminology is very important to put on an anchor chart, so students can use and understand the vocabulary. Pictures or examples will be added onto the anchor chart so students can utilize it in conversations in whole or small group discussion.
- Videos: YouTube or Khan Academy has videos of examples on how to play functions on a Function Machine, explain function patterns, or how word problems can be written.
- 5 Structure Problem Solving Practices Approach: Students will be given a problem to solve and students will make a prediction of how to solve the problem. Teachers will monitor how students solve their problems. Teachers will then select various methods or a way to scaffold teaching from basic to more advanced by teaching steps or multiple ways of teaching a concept. Students will be able to connect processes or understand how various skills connect to each other.
- Technology: Students will log into Desmos or other programs to extend functions expressions to create graphs and tables to see the patterns. Students can print these problems for teacher evidence.
- Multiple Representation of Functions: Students can show functions through pictures, repeated addition/subtractions, equations, tables, graphs, or charts.

Student/Classroom Activity

The Livestock Input/Output Unit will have students create an Animal Function Machine. Students will create number cards to input and output. Students will use a T chart to write numbers and determine the equation to solve problems. Students will also create livestock story problems for classmates to solve. Students will determine what pattern to use to determine the next number. Students will create a poster to show animal characteristics so they can visually create a word problem.

Small Group Instruction
Working with 3-5 students will allow the teacher to target skills and do a formative assessment to see who mastered or needs more assistance. Discussing and creating word problems in a small setting will allow teachers to hear the students' thinking and reasoning, if there are any misunderstandings, then the teacher can correct the student. Creating word problems from Animal Characteristic List under the guidance of the teacher will have students correctly write 2 statements and ask a question to pose a problem.

Virtual Visual Aid
Most Native American learn by visual aid or seeing an image. Having images or models of animals will help students create a list of characteristics of animals. Students will write down the number of ears, eyes, legs, arms, and tail in a chart form. On the anchor chart they can label animals in Navajo and numerals for representations.

Virtual Math Manipulatives website Desmos has teddy bears which students can pose questions such as; How many ears does 4 teddy bears have? Students can create a model, chart, or In/output chart to create multiple ways to answer questions. Students can use the teddy bear models to show diagrams of repeated patterns.

Culturally Relevant
Teaching will engage students more when it is culturally relevant. Students have the background knowledge of livestock. Culturally Responsive Mathematics Teaching (CRMT) is based on creating a learning environment tied to mathematical sense making where students feel appreciated, for the way they learn mathematical reasoning, and for contribution to be successful in the classroom (Ellis, 2019) The Livestock Input/Output Unit will allow students to see mathematics can coincide with their identity and culture as a Native American. Students' culture, identities, and familiar contexts will help them connect to academic content. (Ellis, 2019) CRMT will engage all students in meaningful learning. Students taking ownership of projects will allow them to understand the key concepts and relationships. Students creating Input and Output Word Problems based on Farm Animals traits. Students will create a list with animal farm's number ears, eyes, legs, arms, and tail. Translating English Animal and Number words to the Navajo Language. Being able to engage with mathematical concepts in the Navajo Language may bring ownership and culture, therefore be more meaningful. Allowing students to be bilingual will help develop proficiency in mathematics is a means for communicating various ways through language, visuals, and gestures. Students creating a poster with Navajo Animals and Numbers will allow students to visually form an image to apply to the mathematical concepts.

Alignment with Standards
Our school uses College Career Ready Standards (CCRS) for the Math curriculum alignment and Diné Content Standards for Navajo Implementation.
Mathematic College Career Ready Standards that will be covered in this unit will be:
Represent and solve problems involving addition and subtraction.
- CCSS.MATH.CONTENT.2.OA.A.1
Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with

unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

Students will be creating word problems with animal characteristics based on how many body parts or live in a corral. Students can draw out story problems to solve it.

Add and subtract within 20.

- CCSS.MATH.CONTENT.2.OA.B.2

Fluently add and subtract within 20 using mental strategies.2 By end of Grade 2, know from memory all sums of two one-digit numbers.

Students will have to add or subtract animal body parts in order to solve problems.

- CCSS.MATH.CONTENT.2.NBT.A.2

Count within 1000; skip-count by 5s, 10s, and 100s.

Students will be able to skip-count the number of ears, tails, eyes, or legs.

 Pre K-3rd Oral Diné Language Standards

Oral Language: I will listen to and understand the basic Diné oral language.

- Students will identify the vocabulary used in different contexts.

Students will identify farm animals and their body parts in the Navajo Language.

Assessment:

Interpretations and translations can be tools for a teacher's formative assessment of how students are understanding patterns and functions (Coulombe & Berenson, n.d.,) Students can show various ways to solve word problems or functions on a chart. Effective teaching starts from knowing the student, how they learn, and what they know about mathematics. Using assessments help guide the teachers where to start instruction, how to deliver the instruction based on the student's type of learning, and where to target the specific skill needed to master

Formative Assessment

During math lessons in the Livestock Input/Output Unit, teachers will need evidence to show students' knowledge about adding or subtracting fluently in multiples of 2, 3, 4, 5 and so forth, and writing word problems based on animal characteristics. Teachers will ask multiple questions to ensure students are understanding the input/output process. Students' discussion will be used to evaluate students' understanding of the mathematical process. Students can do group checks, pair checks, or self-evaluation on the math problems that are being solved. These are multiple ways to check for understanding and make sure students' understand the math skill.

Summative Assessment

At the end of the Livestock Input/Output Unit, students will take a summative test, so see if they understood how to solve input/output functions. Students will have to add or subtract after they figure out the rule to solve functions. Students will solve input/output sheets from the Input/Output Machine and state the rule. These examples will show if students are able to solve functions. Students will also write and share word problems for classmates to solve. If students can show evidence of student's learning through end products.

Assessments are important to check students' achievement. Assessing frequently and analyzing data will ensure all students' learning process.

Bibliography:

Reys, Linduist, Lamboin, Smith, "Helping Children Learn Mathematics", 8th Edition

English, Lyn and Kirshner, David. Handbook of International Research IN Mathematics
Education, 2016 Chapter 6 page 191-217
https://books.google.com/books?id=lpFGCgAAQBAJ&lpg=PA191&ots=ljElUMHd8F&
dq=Input%20and%20output%20mathematics%20for%202nd%20graders&lr&pg=PA197
#v=onepage&q&f=false

Hubert, T.L. Learners of Mathematics: High School Students' Perspectives of Culturally
Relevant Mathematics Pedagogy. J Afr Am St 18, 324–336 (2014).
https://doi.org/10.1007/s12111-013-9273-2

Gravemeijer, K., Stephan, M., Julie, C. et al. What Mathematics Education May Prepare
Students for the Society of the Future?. Int J of Sci and Math Educ 15, 105–123 (2017).
https://doi.org/10.1007/s10763-017-9814-6

Mark Ellis, P. (2019). Knowing and Valuing Every Learner: Culturally Responsive Mathematics
Teaching. California: Curriculum Associates.